Assessment of the impact of computer assisted instruction on teaching and learning in Nigeria: A theoretical viewpoint

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ABSTRACT

The objective of this study is to determine the impact of computer assisted instruction (CAI) on teaching and learning in Nigeria. The methodology adopted for the study is secondary data analysis. Two research questions were used to guide the study to a logical conclusion. The concept of CAI is discussed together with a review of some of the related literature on its impact on teaching and learning in Nigeria. CAI was assessed as having powerful features that could positively improve the performance of teachers and learners in Nigeria and thus transform the education system. However, the study identified some factors militating against the adoption and efficient use of CAI in Nigeria, such as, inadequate funding of the education sector, a poor maintenance culture and the lack of a constant supply of electrical power. Given the findings, the recommendations include the need for adequate funding of the education sector, proper training of staff on the application of CAI and regular supervision of schools to improve the adoption of CAI in the education system in Nigeria.

Keywords*: Assessment, Computer assisted instruction, Teaching, Learning, Nigeria*

INTRODUCTION

The rapid proliferation of information and communication technologies (ICT) has significantly changed the educational landscape globally (Thang & Wong, 2010). The advent of computer-based learning has necessitated the shift in instructional methods from traditional methods to computerized methods of instruction in developed nations. In Nigeria, computers are used not only as a means of helping schools for analyzing data, it is also a pervasive tool toward optimizing student's learning (Gambari, Shuaibu,& Shittu, 2013). Bawa and Moyijo (2015) noted that educational needs have grown beyond the competence of teachers alone, thus there has been growing emphasis on the quality of teachers, teacher education programmes and availability of training and development facilities in all educational planning and development in Nigeria.

The potential benefits of Computer Assisted Instruction (CAI) cannot be underestimated in the contemporary world since there are established findings on the instructional value of computers, particularly in advanced countries (Gambari et al., 2013). The Integration of ICT in the teaching-learning process has been adopted through the use of computers and other technological gadgets for curriculum content delivery (Ayuba and Timayi, 2018). The computer could be accessed individually or as a group unlike in a conventional classroom where students are lumped together irrespective of their individual differences and class size (Laleye, 2019).The use of ICT in teaching is a relevant and functional way of providing education to learners in order to assist them developing the required capacity for the world to work (Kosoko-Oyedeko & Tella, 2010).

In the teacher-centred method of teaching, teachers are the key source of information and transmitters of knowledge while students are passively receiving information. This method of teaching needs to be complemented, more especially in the era of ICTs, where the role of a teacher has shifted from being the key source of information and transmitter of knowledge to that of becoming a collaborator and co-learner (Samaila, Makinde,& Zambwa, 2016). Mohammed and Yarinchi (2013) noted that ICT has taken a prominent collaborative position as a tool for various creativities in education. It is equally serving as a catalyst in modifying teaching and learning activities to the advantage of both teachers and learners in the learning environment. There is an urgent need for a paradigm shift from conventional teaching to a practical demonstration such that, when appropriate content matches appropriate strategies, students and teachers will benefit immensely (Alade, 2011).

Teachers are important instruments in education. They are the pivot on which the educational process hang. They can influence the teaching- learning outcomes either positively or negatively. They determine the quality of instructional delivery and also influence quality education when it comes to implementation of the curriculum and educational policies (Ofojebe & Ezugoh, 2010). Teachers can only effectively integrate technology in their instruction if they are themselves knowledgeable about the technology (Buabeng-Andoh, 2012). Part of the drive towards greater use of modern technology in education is equipping teachers and learners of today with skills that will enable them to use such technologies that will expose them to experiences that will help them to think and act globally (Laleye, 2019).

The fact that Nigeria's education system is still characterized by a few high performing and many low performing schools is not acceptable to stakeholders in the education sector (Okebukola, 2013). The situation needs to be improved so that the country can compete with its peers in all global competitive academic standards. In this regard, CAI possess powerful features to support a boost in schools performance through a shift from teacher centred to student-centered learning, and likewise make the learning environment more engaging for teachers and learners (Olabiyi, Aiyelabowo,& Keshinro,2013). The main thrust of the paper therefore is to assess the impact of CAI on teaching and learning and also to identify the factors militating against the adoption of CAI in Nigeria. A secondary data analysis approach was adopted to answer the research questions stated below.

  I.   What is the impact of CAI on teaching and learning in Nigeria?
  II. What are the factors militating against the adoption of CAI in Nigeria?

THE CONCEPT OF COMPUTER ASSISTED INSTRUCTION (CAI)

CAI, according to Edutech202 (2012) is an automated instructional technique in which a computer is used to present an instructional programme to the learner through an interactive process. Audu and Agbo (2010) view CAI as an instructional technique in which the computer instructs the students and the computer contains a stored instructional programme designed to inform, guide, control and test the students until a prescribed level of proficiency is reached. Sharma (2017) understands CAI as an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. Eyo (2018) in like manner, sees CAI as a self-learning technique, usually off-line or online using the computer as a tool to facilitate and improve instruction. CAI is simply the type of instruction aided by a computer controlled display and a response entry device which uses a combination of text, graphics, sound and video to enhance the learning process through interaction, to achieve certain instructional goals and improve educational outcomes.

Okebukola (2013) postulated that CAI can be applied to all ages and forms of education, from pre-school to professional school and even in many employment areas. It can also be used in a wide range of fields including all the main disciplines in elementary and secondary school. Edutech202 (2012) summarized the characteristics of CAI to include learner controlled instruction, prompt feedback to the learner, self-pacing, adaptability of instruction, multiple-user approach and random access facilities. CAI uses diverse applications to present topics, test students' understanding, receive immediate feedback and summarise students' performance (Patel, 2013).

CAI methods of delivery are classified into drill and practice, tutorials, simulation, problem solving approaches, educational games, discovery mode and dialogue level. Drill and practice is the commonest used CAI application due to its simplicity. It usually provides different set of questions in varied formats. At each stage, the computer asks questions and seeks responses objectively, using a very repetitive type of procedure (Eyo, 2018). Most drill and practice programs have a tracking device that enable students (and teachers) to monitor their progress. In addition, drill and practice activities have sounds and other motivating characteristics that encourage students to progress at their own rate while using the software (Mukuna, 2013).

Tutorials are computer programs where the computer acts as an instructor. It is used in teaching new topics. The computer presents and teaches new concepts and principles and once the learner exhibits clear understanding, the learner immediately goes over to the next activity (Busari, Ernest & Ugwuanyi, 2016). Tutorial activity includes both the presentation of information and its extension into different forms of work, including drill and practice, games and simulation (Sharma, 2017).Tutorials are often very interactive. Some tutorials capitalize on individualized instruction and adjust the pace and feedback based on the students' progress (Nwanne & Agommuoh, 2017)

Dialogue level is a form of CAI application that involves sophisticated interaction between the learner and the computer (Torruam & Abur, 2013). The learner interacts with the machine by asking questions and providing responses, to which the computer program reacts appropriately (Adeshina, 2015). Simulation is a program that models real life situations and enables the students to manipulate and experiment with it (Anyamene, Nwokolo, Anyachebelu & Anemelu, 2012). It involves using the computer to represent the operation of a system in a real-life situation (Audu & Agbo, 2010). Simulation software can provide an approximation of reality that does not require the expense of real life or its risks (Reffell & Whitwort, 2010). The justification for using simulations is where the reality may be too expensive, too dangerous or too time consuming (Thang & Wong, 2010).

Educational games are useful for instruction. The games are normally placed in a group of their own. In practice, it is often difficult to differentiate between games, drill and practice programs or simulations (Azih & Igboke, 2017). Game software often creates a contest to achieve the highest score. It is designed to either beat others or beat the computer (Yusuf & Afolabi, 2010).The aim of educational games is to motivate learners to interact with instructional materials. Games will be a good instructional tool only if it is content-based (Chawla & Deshwal, 2013). The discovery approach provides a large database of information specific to a course or content area. It challenges the learner to analyze, compare, infer and evaluate based on their exploration of the data (Sharma, 2017).

In discovery, the inductive approach to teaching and learning is followed. The learner is encouraged to proceed through trial and error by solving a given problem (Audu & Agbo, 2010). The problem solving approach helps children develop specific problem solving skills and strategies (Torruam & Abur, 2013).Problem solving software does not necessarily utilize realistic

scenarios. The software allows learners to see the results of their reactions to various events. Learners manipulate variables, and feedback is provided based on these manipulations. There is great benefit to using problem solving applications in the classroom, provided they match the curriculum (Sharma, 2017). Problem solving software present problems relevant to learning objectives, provide necessary directions, hints and assistance to solve problems according to the learners' need (Mathew, Onimisi, Meligah, & Abuh, 2016).

METHODOLOGY

The methodology used in the study is the secondary data analysis approach (analysis of existing data) mainly through literature review. Related literature on the objectives are reviewed and analysed in answering the research question and to arrive at the findings of the study.

REVIEW OF RELATED STUDIES ON IMPACT OF CAI ON TEACHING AND LEARNING

Yusuf and Afolabi (2010), investigated the effects of CAI on secondary school students' performance in biology. A sample of 120 first year senior secondary school students (SSS I) from three private secondary schools, in Oyo State, Nigeria was used. The students' pre-test and post test scores were subjected to analysis of covariance (ANCOVA).The findings of the study showed that the performance of students exposed to CAI either individually or cooperatively were better than that of their counterparts who were exposed to the conventional classroom instruction. Adeshina and Hanna (2016) also carried out a study that investigated the effects of CAI on independent learning skills of economics students in secondary Schools in Kaduna State, Nigeria. A two by two pre-test, post-test quasi experimental control group design was adopted. A targeted population of twenty three thousand four hundred and sixty (23,462) public senior secondary students (SS2) in twelve educational zones of Kaduna State was used. The results revealed that students taught with the use of CAI performed significantly better than those taught without CAI.

Samaila et al., (2016) conducted research on the development of computer aided instruction for effective teaching for use of electrical and electronic devices at the Nigeria Certificate in Education (NCE) technical level in north eastern Nigeria. CAI was tested by using it to teach an experimental group (S1), while control group (S2) was taught using the lecture method. The results of the study revealed that there was variation between the mean scores of students taught about the use of electrical and electronic devices using CAI and students taught using the lecture method. The CAI was found to be effective in teaching use of electrical and electronic devices. In a related development, Laleye (2019) used a quasi-experimental pre-test- post test design to find out the efficacy of a computer assisted instructional package (CAIP) on students' performance in basic science in Ondo State, Nigeria. Two secondary schools were purposively selected and assigned to experimental groups 1 and 2 in equal numbers. Students in experimental group 1 were exposed to CAIP individually and experimental group II in cooperative groups. An equivalent school was selected as the control. The results of the analysis revealed that students taught with the developed package performed significantly better than their counterparts taught with the conventional method of instruction.

Alasoluyi (2015) conducted a study to examine the effect of CAI on students' performance in economics in senior secondary schools in Ekiti State, Nigeria. Public senior secondary schools in Ekiti State were used to compare the performance of students taught using the CAI method with the performance of the group taught using a traditional method. The findings of the study revealed a significant difference in the post-test performance scores of students taught economics with the use of a CAI enhanced method when compared with those taught using the traditional method of instruction. The study found that students taught using CAI performed better

and scored higher. Likewise, Gambari et al., (2013) carried out a study on students' perception towards the use of computer assisted instruction on learning mathematics in Minna, Niger State, Nigeria. 540 students (270 male and 270 male) from six secondary schools in Minna formed the sample for the study. The findings revealed that the majority of the students have a positive perception toward the use of CAI. The implication is that the students perceived the use of CAI as a way of improving their performance in mathematics.

Eyo (2018) conducted a study that investigated the effects of a computer assisted multimedia instructional (CAMI) package on secondary school students 'achievement in biology in two educational zones of Niger State, Nigeria. The sample comprised of 364 students (206 boys and 158 girls) selected from six senior secondary schools in two educational zones. The samples were divided into an experimental group and a control group. The experimental group was taught using a CAMI package while the control group was taught using lecture method. The findings of the study showed that students in the experimental group achieved significantly better than their counterpart in the control group. Busari, Ernest and Ugwuanyi (2016) carried out research on the effect of CAI on senior secondary students' achievement in chemical reaction and equilibrium in Egbeda local government area of Oyo State, Nigeria. The instrument used in the study was the chemical reaction and equilibrium achievement test (CREAT).The students' scores from CREAT were collected and analyzed using mean and standard deviation to answer the research questions. The results showed a significant difference between the mean achievement of students taught chemical reaction and equilibrium using CAI and those taught using a conventional teaching strategy. Thus the students taught using CAI performed better than their counterparts.

Kosoko-Oyedeko and Tella (2010) conducted a study to examine teachers' perception of the contribution of ICT to the pupil's performance in christian religious education (CRE). A population of 200 primary school teachers selected through census from 15 schools in Epe local government, Lagos State, Nigeria was used. A modified questionnaire known as teacher's perception of ICT contribution to pupil's performance was used to gather the data for the study. Data collected was analysed using percentages and t-test statistical tools. The result indicated that teachers had a strong perception that ICT contributes to the performances of the pupils in CRE. Umar (2014) conducted a study on the effects of CAI on the teaching of social studies education in junior secondary schools in Jigawa State, Nigeria. A computer assisted instruction and social studies education questionnaire (CAISSQ) was used to elicit information from a sample of 340 students. The students were divided into experimental and control groups. The data obtained were analyzed by using t-test and descriptive statistics. The research finding showed that the use of computers in teaching social studies greatly enhanced the teaching and learning of the subject more effectively.

SUMMARY OF FINDINGS

In answering the study questions, the following were observed in the literature reviewed.

    a.   CAI helps students to learn rapidly, and it allows students to have more control over their own learning (Adeshina & Hanna, 2016).

    b.   Effective use of CAI assists in regulating the pace of information flow among different classed of learners and has the potential to stimulate and maintain students' interest in the learning process (Daramola & Yusuf, 2017)

    c.   Use of CAI keeps teachers abreast and provide reliable ideas and information from various sources for the purpose of comparison that helps with retention of knowledge by the teachers and learners (Umar, 2014).

d. CAI has a multi-user quality which allows for the flow and transmission of ideas from the teacher to the students and likewise from the students to the teacher or across groups (Alasoluyi, 2015)

e. The application of CAI in classroom instruction is helpful for effective evaluation (formative) of the teacher and instruction in the subject matter (Zakaria et al., 2010).

f. The teachers of respective disciplines perfect not only their methods of teaching but also perfect content and situations (activities) to be taught with the use of CAI, and this strengthens teaching and learning strategies in the schools (Babalola & Yaduma, 2016).

g. Employing CAI in the teaching and learning process makes learning real, practical and more permanent for learners. It makes conceptual abstraction more meaningful (Torruam & Abur, 2013).

h. The use of CAI in the teaching and learning process has shifted learning from teacher-centered (where the teacher is seen as a key source of information and transmitter of knowledge) to learner-centered (where the teacher is seen as a facilitator rather than a dispenser of knowledge) (Laleye,2019).

i. In education, CAI has enabled instruction to be delivered and received anytime and anywhere, providing students with more varied and convenient learning environments (Daramola, 2016).

j. CAI is successful in raising examination scores, improving student attitudes, and reducing the amount of time required to master certain material (Nazimuddin, 2014).

FACTORS MILITATING AGAINST THE ADOPTION OF CAI IN NIGERIA

There are numerous challenges facing the adoption of CAI in Nigeria. Some of these challenges emerged with the changing socio-economic and political reality while others evolved as a result of government's neglect of the education sector. Some of these impediments are:

Lack of constant power supply

An erratic power supply in Nigeria has been the bane of economic and industrial development in the country (Ohajianya, Abumere, Owate & Osarolube, 2014).Despite the clearly laid down policy framework on power development and sustainability, the power supply in Nigeria cannot be said to have substantially improved even after privatization (Alphonsus,2016). Currently, there is hardly any part of the country that can boast of a 24 hour supply of electricity. When the electricity supply is not stable and constant, Alasoluyi, (2015) noted that it is difficult to keep high-tech equipment such as computers functioning.

Lack of computer knowledge by teachers

Yusuf and Afolabi (2010) revealed that most school teachers lacked the skills to fully utilize technology in curriculum implementation. Similarly, Buabeng-Andoh, (2012) observed that the majority of teachers who reported a negative or neutral attitude towards the integration of ICT in teaching and learning lacked the required skills that would allow them to make an informed

decision. Hence a teacher who is not computer literate will find it difficult to fully integrate CAI into the teaching-learning process in the education system.

Lack of relevant software

Relevant software and applications suitable to the Nigerian education system has been in short supply (Alade, 2011).Even though, software developers and publishers in the developed countries have been trying for long to develop software and multimedia that have universal application, the differences in education standards and requirements has made the integration of these products into curriculum across countries very difficult. Alasoluyi (2015) has noted a great discrepancy between relevant software supply and demand in developing countries like Nigeria.

Poor Maintenance Culture

Lack of proper supervision of school activities breeds poor a maintenance culture towards learning facilities. This attitude has manifested through rough handling of facilities, concealing of defects and compromise of proper servicing of facilities to ensure their availability for future use (Torruam and Abur, 2013). This culture reduces the durability and life span of the facilities.

Inadequate funding of the education sector

Inadequate funding of the education sector has been a major challenge facing the sector. It is no longer an overstatement that over the years the Nigerian government has not been able to meet UNESCO's recommendation for budgetary allocation to the education sector (Balogun, 2010). An analysis by Abdusalam (2019) revealed that only 4%, 7.40%, 7.04% and 7.02% was allocated to the federal ministry of education by the government in 2016, 2017, 2018 and 2019 respectively. This low allocation is a setback to the education sector in areas of programme implementation and project execution.

Policy inconsistencies

In Nigeria, policies change frequently with almost every change in leadership. The inconsistency in education policies constitutes a serious challenge to the reforms in the education sector (Bakare, 2017). Okebukola (2013) averred that Nigeria has never lacked a great educational transformation blue print to achieve greatness. The problem is that the plans are always discarded or arbitrarily implemented without achieving the desired result.

Teachers' attitudes

The teacher as an individual personality is an important factor in the learning environment. The successful implementation of educational technology in schools to a large extent depends strongly on the teachers (Usman & Madudili, 2019). It is likely that they will not integrate the technology into their teaching and learning if they perceive technology programs as neither fulfilling their needs nor that of the students (Buabeng-Andoh, 2012).

RECOMMENDATIONS

Arising from the findings the following recommendations are indicated.

1. Problem of erratic power supply can be managed by providing alternative source of supply. Stand by generators or solar power can be used to upgrade power supply from the national grid to schools.

2. There should be on awareness campaign and computer literacy training program particularly for teachers and school administrators through in-service training, seminars and conferences to improve their technical know-how on computer application.

3. Computer literacy and operation in schools should be encouraged while relevant and user friendly CAI packages should be developed for use within the Nigeria school system.

4. Regular supervision and appraisal of educational programmes should be conducted. This will assist in identifying lapses in programme implementation processes.

5. Proper maintenance plans for all school facilities should be developed, monitored and implemented to improve maintenance culture and guarantee the life span of learning facilities.

6. The funding of the education sector should to be increased to enable the sector to conveniently execute its projects.

7. Mechanisms that will ensure policy continuity should be put in place through a national education development plan that will ensure that succeeding governments buy into the education policy rather than discarding it completely because of political interest or regional concern.

8. Community participation in the administration of schools should be encouraged so as to promote a harmonious school-community relationship that will enhance the security of learning facilities.

9. Teacher's attitude towards CAI can be changed by integrating ICT-based methodology into teacher education processes. In addition, classrooms should be equipped with necessary infrastructure that will give students access to media laboratories that will enhance interaction with their teachers.

CONCLUSION

CAI possesses powerful features for making the learning environment more engaging for both teachers and learners, which implies that adoption of CAI can positively transform the education system and considerably improve the performance of teachers and learners in Nigeria. In spite of the bright prospect of CAI for the teaching and learning process in the education system, there are numerous challenges facing the adoption of CAI in Nigeria, such as inadequate funding of the education sector, a poor maintenance culture and lack of constant power supply. Some of these challenges emerged with the changing socio-economic and political reality while others evolved as a result of government's neglect of the education sector. Implementation of directed recommendations is expected to enhance the adoption and utilization of CAI in the education system in Nigeria.

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