

CONSTRAINTS TO COMPUTER AIDED INSTRUCTION APPLICATIONS BY SECONDARY SCHOOL TEACHERS FOR INSTRUCTIONAL DELIVERY IN FEDERAL CAPITAL TERRITORY, ABUJA.

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Abstract

This research identified the constraints to effective applications of computer Aided instruction (CAI) by Teachers for effective instructional delivery in Secondary Schools in Federal Capital Territory (FCT), Abuja, Nigeria. Descriptive survey research design was adopted for the study. Two research questions and two null hypotheses guided the study. The population of the study comprised of all the 64 Teachers in FCT, Abuja of Nigeria. A 22 item questionnaire was adopted for data collection for the study. The reliability of the instrument yielded .85 using Cronbach alpha formular. Data collected were analyzed using mean, standard deviation and t-test at 0.05 level of significance. The findings revealed that Teachers were faced with daunting challenges in the applications of CAI in classroom instructional delivery process such as inadequate instructional material, inadequate ICT skills, shortage of resources among others. The findings also revealed training of teachers on ICT for adoption of CAI in classroom, purchasing of adequate computers, providing teachers with incentives, provision of internet facilities, among others can reduce the constraints experienced by the teachers. It was discovered that, here is no significant difference in the mean responses of male and female Secondary schools teachers on the challenges and ways of reducing the challenges. The study recommends that Workshops and seminars should be organized by Ministry of Education to enlighten school administrators on the need to train teachers on a regular basis so as to assist them develop their desired competencies in instructional delivery using CAI.

Keywords: Constraints, CAI, Applications, Secondary School Teachers, Instructional Delivery

Introduction

The role of technology in education is rapidly becoming one of the most important and widely discussed issues in contemporary Nigeria education scene. The role of technology in shaping the future of secondary education according to Nwana, (2009) includes: online learning which is gaining firm foothold; applications of various electronic media for distant learning; storage and retrieval of learning materials; research and evaluation of learning materials; individualization of instruction; applications of ICT in instructional communication. Technology is seen as the application of scientific principles, skills, devices, tools and systems in the solution of human problems (Eze & Obeta, 2006). Technology simply means electronic tools applications in everyday activities. Information and Communication Technology (ICT) is a fusion of information technology and communication technology.

It is "diverse set of technological tools and resources applications to communicate, create, disseminate, store, retrieve and manage information" (Burlton, 1999). It is the most powerful force which is shaping the 21st century (Ayo, 2001). ICT has reduced the world to a global village and as a result, it is repositioning the social, economic, political and academic outlook of man (Chinwe, 2005). This implies that ICT has brought about reform or innovations thereby improving dissemination of information and bridging the gap of communication with broad range of technological equipment such as computers, mobile telephone, storage devices, file transfer protocols, world- wide web and video system. From the above perspectives, ICT for this study can be defined as a range of technology usage for processing, storing, retrieving information for effective communication. Education systems around the world are under increasing pressure to apply the new ICT. Yuen, Lee, Law and Chan (2008) pointed out that ICT is important in bringing changes and improvement in education. Considering the need for Information and Communication Technology (ICT) in education, the Federal Republic of Nigeria included ICT in education policy through the Federal Executive Council (FRN, 2004). The policy on ICT was one of the innovations of the National Policy on Education. The first move for implementation of the policy started in 1988. However the implementation of the policy started in 2001 after the establishment of National Information Technology Development Agency (NITDA), the implementing body. The enactment of the NITDA Act in 2001 became a legal framework for creation of NITDA (National ICT Policy, 2012). Since then, there has been significant improvement in the ICT sector. For instance, Nigeria has progressed from 400,000 fixed telephone lines in 2001 to 90.5 million available mobile telephone lines by the first quarter of 2011. Some of the objectives of Nigeria's ICT policy, according to Osei (2007) include: to ensure that ICT resources are readily available to promote efficient national development; to empower Nigerian's to participate in software and ICT development; to integrate ICT into the main stream of education and training.

In the light of the above, applications of ICT in teaching and learning will enhance instructional delivery, reduce occupational stress and increase student academic performance (Emenike, 2003). Amaefule (2009) asserted that the applications of ICT in education have made the traditional applications of paper obsolete. He added that the computer facilities have greatly improved the process of information organization and management, as access and retrieval of books or information is now a matter of seconds with a click of applications or keyboard. However, the benefits offered by ICT seem not to have been fully exploited in teaching and learning in the FCT and perhaps in other states in the country. As Amaefule (2009) puts it "ICT spirit is gradually trickling-in into the secondary schools in Nigeria." It seems that the application of ICT is still in its infancy in secondary schools in the FCT and perhaps other secondary schools in Nigeria. Although there is evidence of ICT facilities in some of the Secondary Schools visited, how far these Secondary Schools have availed themselves of the opportunities offered by ICT in coping with complexities of teaching and learning functions are yet to be ascertained. So there is the need to examine the extent of applications of ICT for effective instructional delivery in Secondary Schools in FCT. Despite the interest of some educators to effectively use ICT in teaching and learning, there are some constraints to its usage. The most significant of these constraints are inadequate of basic ICT infrastructures; lack of electricity; insufficient funds (Olorundare, 2006). These problems impede the full adoption of ICT in teaching and learning

The issue of making teaching and learning to be interactive, efficient and effective is a major constraint to education all over the world. Researchers have pursued this problem from various angles and pedagogy researches have also emanated in response to the challenge. Pedagogy depicts differences in learners' approach to learning. Even though learners are different in their approach to learning, educational systems lump them (learners) in confined settings called classrooms for purposes of learning and instruction. The classroom is an interactive learning environment where teacher-learner interaction goes on and culminates into learning experience especially for the learner. For the learning experience to be meaningful, the learners' differences and attention must be taken into consideration. Similarly, Griggs (1991) opined that capturing learners' attention could result in improved attitudes towards learning and an increase in productivity, academic achievement and creativity.

This study therefore explores the potentials to arouse students' attention and improve their performance. The ICT is a concept that is currently making waves in the 21st century. It is not a new concept per se but with the advancement and boom in computer technology, the ICT has become a house hold name owing to its versatility in operation and application. There is no doubt that the ICT has permeated all spheres of human endeavour worldwide. The educational sector is not an exception. According to Kasakowski (1998) cited in Kalu and Ekwueme (2003) "most of the developed countries have exploited the potentials of ICT to transform their educational landscape at the tertiary, secondary and even primary school levels particularly the instructional process". Thus, in the western world, the ICT has been exploited for the transformation of the classroom at all levels of education. One of the applications of ICT in teaching and learning is through the use of Computer Aided Instruction (CAI).

Computer Aided Instruction (CAI) is a courseware that has applications for decades to support instructional delivery in schools, especially for mathematics, grammar and language learning (often referred to as computer Aided language learning). CAI is made up of three words: computer + Aided + instruction which stand for the type of instructions aided or carried out with help of computer. CAI is the instruction which is given to the students with the help of computer.

Teachers in Secondary Schools are supposed to be using various forms of CAI for lesson planning, instructional delivery and evaluation of what has been learnt. Globally, teachers play significant roles in the system of educational delivery. One of the vital roles of any educational system is to promote the process of instructional delivery, as well as seeking better ways for improving performance or academic achievement of students. Teachers in FCT Secondary Schools should be able to utilize technology-based materials, such as computer Aided instruction, web-based materials, and other forms of electronic materials to augment their instructional activities, but how many of these teachers can effectively use this CAI for instructional delivery process.

Apply, in this case means the use of CAI by teachers of Secondary Schools in FCT Nigeria to further explain instructional content and get the attention of learners, as well as enhance teaching-learning process in a meaningful, interesting way. The researcher sees the need to embark on an academic research to identify the constraints faced by teachers in Secondary Schools in FCT Nigeria on the use of CAI in instructional delivery.

Statement of Problem

One major problem facing education all over the world is the challenge of making instructional delivery worthwhile. The Information and Communications Technology (ICT) has permeated all spheres of human endeavour, the educational sector inclusive. The situation in Nigeria is such that the potentials of the ICT are not being harnessed for instructional purposes among other applications whereas literature evidences have suggested that the instructional applications of ICT facilities enhance achievement in learning. Poor achievement of students, a situation attributable to poor instructional delivery modes among other factors has also been associated with the Nigerian education system. The arrival of an innovative and technology driven teaching era should change the ways teachers and students of secondary schools. The conventional method of teaching hitherto had not yielded much meaningful impact on students' achievement, hence the need to imbibe new innovation. Nowadays, the use of the technology and education resources to help form a learner oriented teaching environment. These ICT resources such as word processing, internet usage and power point presentation constitute the procedures of teaching. Therefore, it becomes imperative to identify the challenges of use of ICT such as CAI for lesson delivery by Senior Secondary School teachers in FCT.

Purpose of the Study

The main purpose of this study was to identify challenges facing teachers in the use of CAI by Secondary Schools in FCT, Abuja Nigeria for effective teaching in classroom. Specifically, the study sought to achieve the following objectives:

1. Identify the constraints to effective usage of CAI in instructional delivery.
2. Suggest ways of improving effective usage of CAI by Teachers in Secondary Schools in instructional delivery.

Research Questions

The study answered the following research questions;

1. What are the constraints to effective usage of CAI in instructional delivery?
2. What are the ways of improving the effective usage of CAI by Secondary Schools teachers?

Null Hypotheses

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

H₀, There is no significance difference in the mean responses of male and female teachers on the constraints to effective usage of CAI in instructional delivery in Secondary Schools in FCT.

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Method

The study adopted descriptive survey research design. In the view of Ezeji (2004), descriptive survey research design is one which involves the assessment of public opinion using questionnaire and sample methods. The study was conducted in all the Senior Secondary Schools in Federal Capital Territory (FCT). The population for the study comprised 64 teachers in all the Senior Secondary Schools in FCT.

The instrument employed for the collection of data was a questionnaire designed by the researcher. It is titled "Challenges of using Computer Aided Instruction by Senior Secondary School Teachers for Instructional Delivery. The instrument was made up of Sections (I and II). Section I elicits teachers personal information while Section II comprised two parts (A & B). Section A was designed to collect data on the constraints to effective usage of CAI by Senior Secondary School teachers for instructional delivery. While Section B sought data on ways of reducing constraints to effective usage of CAI in instructional delivery, the instrument has a five point response scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) Strongly Disagree (SD) with assigned weights of 5, 4, 3, 2, and 1 respectively. The instrument was face validated by three experts. The experts were asked to examine the list of items in the questionnaire and indicate whether they were comprehensive and in line with the purpose of the research. They were equally requested to modify the items where necessary. Cronbach alpha reliability method was used to determine the internal consistency of the item in the questionnaire and the reliability coefficient of .76 was obtained. An indication that the instrument was consistent in measuring what it intended to measure.

The researcher employed the services of two trained research assistants to assist in administering the questionnaire. Respondents were given the instrument to go through and respond to the items on the spot and then collect back after completion. A total of 64 copies of the questionnaire were administered to the respondents.

The data collected were analyzed using mean and standard deviation to answer research questions and t-test to test null hypotheses at 0.05 level of significance at relevant degree of freedom, with the applications of Statistical Package for Social Sciences (SPSS).

Results

Research Question 1

What are the constraints to effective usage of CAI in instructional delivery in Secondary Schools in FCT, Abuja?

Table 1

Mean and standard deviation ratings of Secondary Schools teachers on the constraints to effective usage of CAI in instructional delivery

| S/N | Item | X ₁ | SD ₁ | X ₂ | SD ₂ | X _A | SD _A | Decision |
|-----|----------------------------------------------------------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------|
| 1 | Substantial ICT infrastructure | 4.13 | 0.73 | 4.22 | 0.65 | 4.18 | 0.69 | Agree |
| 2 | Poor competency level of teachers in manipulating CAI packages | 4.11 | 0.69 | 4.21 | 0.72 | 4.16 | 0.71 | Agree |
| 3 | Lack of interest in the use of ICT facilities by some teachers | 4.31 | 0.75 | 4.25 | 0.70 | 4.28 | 0.73 | Agree |
| 4 | Poor competency level of teachers in manipulating CAI packages | 4.19 | 0.60 | 4.30 | 0.52 | 4.25 | 0.56 | Agree |

| | | | | | | | | |
|-------------------|----------------------------------------------------------------------------------------------|------|------|------|------|------|------|-------|
| 5 | Irregular power supply for usage of CAI packages | 3.65 | 0.72 | 3.70 | 0.65 | 3.68 | 0.69 | Agree |
| 6 | Inadequate computer facilities in classrooms and laboratories | 3.59 | 0.63 | 3.45 | 0.60 | 3.52 | 0.62 | Agree |
| 7 | No Internet Facilities in Schools | 3.73 | 0.70 | 3.60 | 0.56 | 3.67 | 0.63 | Agree |
| 8 | Lack of access to computers by teachers and students | 3.74 | 0.77 | 3.65 | 0.65 | 3.70 | 0.71 | Agree |
| 9 | High cost of resources required to design and develop CAI package for instructional delivery | 3.83 | 0.43 | 3.76 | 0.50 | 3.80 | 0.47 | Agree |
| 10 | No technical support staff in Secondary Schools | 3.79 | 0.81 | 3.85 | 0.75 | 3.82 | 0.78 | Agree |
| 11 | Inadequate funding for production of CAI packages and maintenance of computer systems | 4.27 | 0.68 | 4.18 | 0.70 | 4.23 | 0.69 | Agree |
| 12 | Lack of motivation for teachers to effectively apply CAI for instructional delivery | 4.16 | 0.69 | 4.23 | 0.65 | 4.20 | 0.67 | Agree |
| 13 | Fear of being challenged by student in the applications of modern technologies | 4.30 | 0.72 | 4.35 | 0.58 | 4.33 | 0.65 | Agree |
| 14 | No training for teachers on use of CAI for instructional delivery | 4.33 | 0.81 | 4.25 | 0.70 | 4.29 | 0.76 | Agree |
| Grand Mean | | 4.42 | 35 | | | | | Agree |

Table 1 show the constraints faced by Secondary Schools teachers on the use of CAI in instructional delivery in FCT Nigeria. All the 14 items in the table had their means above the cut-off point of 3.00, thus, indicating that the teachers agreed that these item statements are the constraints to effective applications of CAI in instructional delivery by Secondary School Teachers in FCT Nigeria. Similarly, the standard deviation ranged from 0.43- 0.81, indicating that the respondents were close to one another in their opinion.

Research Question 2

What are the ways of reducing the constraints to use of CAI by secondary school teachers in FCT, Abuja?

Table 2: Mean and standard deviation ratings on the ways of reducing the constraints touse of CAI in secondary in FCT, Abuja

| S/N | Item | X ₁ | SD ₁ | X ₂ | SD ₂ | X _A | SD _A | Decision |
|-----|---------------------------------------------------------------------------------------------------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------|
| 1 | Provision of stand-by generators | 4.30 | 0.66 | 4.25 | 0.60 | 4.28 | 0.63 | Agree |
| 2 | Training and retraining of teachers on ICT of skills required for adoption of CAI in the classroom | 4.12 | 0.72 | 4.15 | 0.62 | 4.14 | 0.67 | Agree |
| 3 | Provision of enough computer facilities for teaching and learning by Government, NGO, PTA or management | 3.70 | 0.80 | 3.66 | 0.73 | 3.68 | 0.77 | Agree |

| | | | | | | | | |
|-------------------|---------------------------------------------------------------------------------------------------|------|------|------|------|------|------|-------|
| 4 | Employment of technical support staff that will provide technical support for applications of CAI | 3.69 | 0.75 | 3.60 | 0.80 | 3.65 | 0.78 | Agree |
| 5 | Adequate provision of funds for the design and development of CAI packages. | 3.76 | 0.62 | 3.85 | 0.65 | 3.81 | 0.64 | Agree |
| 6 | Providing teachers with incentives to encourage them in teaching with CAI packages. | 4.51 | 0.71 | 4.45 | 0.66 | 4.48 | 0.69 | Agree |
| 7 | Granting teachers and students frequent access to computer laboratories and facilities | 4.17 | 0.67 | 4.20 | 0.73 | 4.19 | 0.70 | Agree |
| 8 | Provision of free Internet facilities for applications by teachers and students by management. | 4.20 | 0.64 | 4.30 | 0.54 | 4.25 | 0.59 | Agree |
| Grand Mean | | 4.45 | .37 | | | | | Agree |

Table 2 shows the ways of reducing the constraints to the applications of CAI by Secondary School teachers in FCT Nigeria. All the 8 items on the table had their means above the cut-off point of 3.00, thus, indicating that the respondents agreed that these item statements are the ways of reducing constraints to the applications of CAI by Secondary School teachers in FCT Nigeria. Similarly, the standard deviation ranged from 0.62- 0.84, indicating that the respondents were close to one another in their opinion.

Hypothesis 1

There is no significant difference the responses of male and female Secondary Schools teachers in FCT Nigeria on constraints to use of CAI in instructional delivery.

The data for testing hypothesis one was presented in Table 3.

Table 3: t-test Analysis of the mean ratings of male and female Secondary schools teachers on the constraints to applications of CAI in instructional delivery.

| Source | Group | N | X | Std | T | Df | p-value | Remark |
|---------|--------|----|------|-----|-------|----|---------|--------|
| Overall | Male | 46 | 4.38 | .39 | 2.324 | 62 | .023 | S |
| | Female | 18 | 4.61 | .22 | | | | |

Table 3 show the statistical means, the standard deviation, t-value, degree of freedom and the p-value of responses of male and female teachers on constraints to the use of CAI in instructional delivery based on gender. The Table showed the cluster t-value of -2.324, at 62 degree of freedom and p-value of .023 which is less than 0.05, thus, the null hypothesis was rejected therefore, here is a significant difference in the mean ratings of male and female teachers on ways of improving the effective applications of CAI in instructional delivery in Secondary Schools in FCT Nigeria.

Hypothesis 2

There is no significant difference the responses of male and female Secondary Schools teachers in FCT Nigeria on ways of reducing the constraints to use of CAI in instructional delivery.

Table 4: t-test Analysis of the mean ratings of male and female Secondary schools teachers on ways of reducing the constraints to use of CAI in instructional delivery.

| Source | Group | N | X | Std | T | Df | p-value | Remark |
|---------|--------|----|------|-----|-------|----|---------|--------|
| Overall | Male | 46 | 4.38 | .39 | 2.324 | 62 | .023 | S |
| | Female | 18 | 4.61 | .22 | | | | |

Table 4 indicate the statistical means, the standard deviation, t-value, degree of freedom and the p-value of responses of male and female Teachers on ways of reducing the constraints to effective applications of CAI in instructional delivery based on gender. The Table showed the cluster t-value of 2.324, at 62 degree of freedom and p-value of .023 which is less than 0.05, thus, the null hypothesis was rejected that there is a significant difference in the mean ratings of male and female Teachers on ways of reducing the constraints to effective use of CAI in instructional delivery in Senior Secondary Schools in FCT Nigeria.

Discussion of Findings

The findings on Table 1 revealed that Senior Secondary schools teachers are faced with challenges in the process of applying CAI in instructional delivery process of lessons. Among the constraints identified in this study include poor competency level of teachers in manipulating CAI packages, irregular power supply for applications of CAI packages, inadequate computer facilities in classrooms and laboratories, inadequate internet facilities in Secondary Schools, poor access to computers by teachers and students, high cost of resources required to design and develop CAI package for instructional delivery, poor funding for the development of CAI packages and maintenance of computer systems, professional development of teachers are not usually taken into consideration and staff professional development on the applications of ICT/CAI for instructional purposes are not usually organized on a regular basis.

Furthermore, the findings revealed that no significant difference exists in the mean ratings of male and female teachers in Secondary Schools in FCT, Abuja on the constraints to effective use of CAI in institutional delivery by Secondary Schools teachers in FCT, Abuja Nigeria. The findings of this study support the view of Saini (2014) who opined that in Nigeria Education System, the applications of computer in instructional delivery continue to suffer setbacks as a result of inadequate computer number of computers, poor internet connectivity, power instability blackout in towns and lack of internet service in rural areas, limited access to computers, shortage of teachers who can comfortably teach with ICT, cost of facilities and resources, hardware hazards, among others.

Justin (2004) argued that one of the challenges facing universities in Africa today is how to provide increased, effective and sustainable information services and access to wide varieties of information and knowledge resources on the faces of reduced funding. In order for teachers and students to apply technology as a tool to improve learning, they must have ready access to technology and the competency to use this technology effectively. Teachers who are seen as the facilitators of knowledge are expected to possess ICT skills required for effective applications of CAI in the instructional delivery process to enable them impact relevant and up-to-date knowledge and skills required in learning with computers.

The findings on revealed the strategies or ways of reducing the constraints to effective use of CAI by Secondary Schools teachers in FCT, Nigeria include: provision of stand-by generators, training and retraining of teachers on ICT skills required for implementation of CAI in the classroom, procurement of adequate computer facilities for instructional delivery by Government, NGO, PTA or management, employment of technical support staff that will provide technical support for applications of CAI, adequate provision of funds for the design and development of CAI packages, providing teachers with incentives to motivate them in teaching with CAI packages, granting teachers and students frequent access to computer laboratories and facilities, provision of free internet facilities for use to teachers and students by management. It was found from the study that there was no significant difference in the mean ratings of respondents in Secondary Schools in FCT, Abuja, Nigeria with respect to their age on the applications of CAI in preparation of instructional contents.

Furthermore, the findings, however, revealed that a significant difference in the mean ratings of male and female teachers on ways of reducing the constraints to effective applications of CAI in instructional delivery in Secondary Schools in FCT zone of Nigeria. The findings of this study is in line with Ogwu and Ogwu (2010) and Olorundare, (2006) that suggested that adequate and functional ICT equipment and facilities be supplied to schools by the Nigeria government in order to encourage teacher and students to maximize the full potential of CAI. In addition to provision of ICT facilities, teachers should be encouraged to apply ICT in instructional delivery by providing them with free or subsidized laptop computers (Sombunsucha, Thavara and Anibon (2012). Edukugho (2008) also pointed out that poor application of these ICT tools in academic and administrative work in the universities, poor infrastructure, lack of skills and lack of relevant software are the obstacle to the use of ICT. Moreover, Nigeria as a country should as a matter of urgency provide schools and the entire nation with regular and uninterrupted power supply. Computer systems are powered by electricity and so lack or shortage in supply is likely to discourage teachers and students from making optimal applications of the facilities.

Accessibility to computer laboratories and facilities is one of the ways of improving the applications of CAI in instructional delivery in schools. Higher education teachers need to have access to facilities, such as projectors, interactive whiteboard (IWB), computer systems and conducive teaching learning environment so as to maximize the quantity of instructional delivery. Virtually every concept in science education is practical-oriented and requires students to visualize the processes involved in carrying out a particular experiment or to visualize how chemical reactions occur. In the field of computer education, concepts such as "printing a word document" can effectively be target using the projector with the aid of an interactive whiteboard.

This approach not only enables learners see what is being taught, there is high rate of assimilation and retention, acquisition of practical skills, as well makes the teachers teaching (explanation and demonstration) very easy. These benefits, as mentioned above, can only be achieved when teachers and students are allowed access to ICT facilities in schools.

Conclusion

In Federal Capital Territory, ICT is not being utilized by teachers in many schools for instructional delivery; however the traditional methods are still in practice in most schools. The teachers that are willing to use it in teaching and learning process are faced with many challenges. There is need for full integration of ICT in instructional delivery to enhance students' achievement. Constraints to effective applications of CAI in teaching and learning such as epileptic electric power supply, inadequate funding, inadequate technicians, inadequate number of trained personnel, lack of interest in the use of ICT facilities, high cost of accessing ICT services, limited access to internet, substandard ICT infrastructure among others should be addressed for effective application of ICT in Secondary Schools and other levels of education. The traditional method of instructional delivery should be re-emphasized while emphasis is placed on integration of ICT into teaching and learning

Recommendations

The following recommendations were made:

1. Workshops and seminars should be organized by FCT Secondary School Education Board to enlighten school administrators on the importance of integrating ICT tools like CAI into teaching and learning.
2. The Government in collaboration with donor agencies, communities, PTAs, and private sector in funding computer studies and ICTs in general in Nigerian schools to enable teachers and students to experience hands-on training on a regular basis.
3. Enabling environment should be created in the classroom to encourage the use of ICT facilities by teachers and to students within and outside the classroom.
4. Issues relating to challenges to provision of ICT facilities in schools should be given urgent and adequate attention.
5. Problems associated with the use of ICT for educational activities should be addressed for proper implementation.

Nigerian government should address seriously the issue of erratic power supply while institutions should procure generating set to compliment power holding company for power supply.

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