IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON TEACHING AND LEARNING IN NIGERIAN TERTIARY INSTITUTIONS

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Abstract

This study investigated the availability and utilization of Information and Communication Technology (ICT) facilities by Teacher Educators for effective teaching and learning in Nigerian Universities, using descriptive survey research design. The research findings indicated that ICT have great impact on teaching and learning in tertiary institutions in Nigeria. Also the introduction of ICT makes learning so interesting for the students. T he findings also revealed that ICT facilities which serve as a major contributor to effective teaching and learning in teacher education programmes were not available. Based on the findings suggestions and recommendations were made. The study recommends among others strategies for its (ICT) maximum utilization; and that ICT facilities should be made available for effective teaching and learning of teacher education programmes.

Keywords: Information and communication technology, Teaching Learning and Tertiary Institutions

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INTRODUCTION

In today's global economy and competitive environment, Information Communication Technology (ICT) is becoming a widely accepted tool for multi-faceted development in all fields. In view of the flexible services it offers, the new digital technologies offer the potential to revolutionize the traditional education system. There is the need to produce technologically literate workforce with positive disposition to technology use and reasonable competency of performing in a borderless knowledge based economy. According to UNESCO (2002) cited in Owhotu (2006), ICT is a term used to describe the tools and the processes to access, retrieve, store, organize, manipulate, produce, present and exchange information by electronic and other automated means. These means include hardware, software and telecommunication in the form of personal computers, scanners, digital cameras, phones, faxes, modems, CD and DVD (digital view disc), players and records, digitalized video, radio and TV programmes and multimedia programs.

Information and Communication Technology (ICT) has been proven to be a very important aspect of teaching and learning process. It plays a significant role in development efforts as they open up new opportunities for progress, the exchange of knowledge, education and training and for the promotion of creativity and intercultural dialogue. These technologies can also help to strengthen social cohesion and reinforce the capacity development for humanities education.

Learning in Information Age requires new teacher role. Teachers cannot depend only on the traditional tools such as chalk, textbooks, overhead video projectors and other types of traditional instructional materials to teach students the skills required for survival in the Information Age. They have to use technologies of the day such as computers, interactive video, CD-ROM, Satellite communications and develop new teacher roles. The development and use of these Information and Communications Technology (ICT) devices and ideas to promote human learning is the hall-mark of an ICT-driven curriculum. Effective implementation of this type of curriculum requires new teacher roles regarding the and how of instruction. The era when teachers were traditionally considered as "directors, lecturers and disseminators of information" (Rhodes, 1990: 46) is over. The new roles of teachers include managers and

leaders of instruction. Rhodes (1990) opines that teachers should assume the roles of seekers, long-range planners, collaborators, researchers and mentors/mentees. However a teacher cannot assume these roles unless he/she is at home with ICT.

BENEFITS OF ICT ON TEACHING AND LEARNING IN TERTIARY INSTITUTIONS

Information and Communication Technologies (ICTs) have impacted greatly on teaching, learning, research, and school management in a number of ways. They are electronic technologies used for accessing, processing, gathering, manipulating and presenting or communicating information. It encompasses software, hardware, and even the connectivity (Anderson & Baskin, 2002). When ICTs are employed in education given the right condition, they can accelerate, enrich, and deepen basic skills in reading, writing, mathematics and the sciences, and they can motivate and engage students to learn as they become more independent and responsible for their learning. Furthermore, ICTs help to relate academics to the practices of today's work. Information and communication technologies, especially network technologies have been found to encourage active learning, support innovative teaching, reduce the isolation of teachers, and encourage teachers and students to become active researchers and learners. They can also strengthen teaching through the provision of powerful tools to teachers (Cradler & Bridgforth, n.d.).

Other derivable benefits of ICT integration in education are enumerated as follows. First, ICTs can assist in reducing teachers' workloads through its use for lesson preparation and worksheet, writing students' report and individual education plan, collating and analysing students' attainment information for target setting; recording and analysing attendance and disciplinary information, and maintaining link between the school and parent to ensure parental involvement in school activities (British Educational Communications and Technology Agency, BECTA, 2004). Second, it can be used in getting necessary instructional content of subjects, and collaboration can be ensured with teachers globally. In addition, teachers can also have up to date knowledge of a subject area.

Third, ICTs can assist in teachers' development, for instance, the Internet. In the context of teachers' development e-learning can be used for both initial and continuing development

through courses, workshops, and other activities, formal and informal, where students and practicing teachers learn about integrating ICTs across curriculum to support learning. There are several global gateways of on-line resources to support teachers' development. These include: ICTs in Education, developed by UNESO, Paris; Education Network of Australia, developed by Education Institute, Adelaide; Institute of Education Technologies in Education, developed by UNESCO, Moscow; and so on. These portals provide opportunities for users to ask questions, post materials, and submit assignments (Anderson, 2004).

Also, ICTs will shift focus from teacher-centred to student-centred learning, where learners are active participants in the learning process, produces and share knowledge, and participate and learn in collaboration with others. Thus, teachers become learning facilitator, collaborator, coach, mentor, knowledge navigator, and co-learner and not a dispenser of knowledge.

In addition, ICT can be multi-media for instructional delivery. Instructional content can be delivered in textual, audio, visual, and audio-visual forms. Thus, equity can be ensured for all categories of learners (disabled, geographically disadvantaged, those who cannot attend regular school, etc.).

Several studies have indicated the academic benefit of ICTs in education. Meta analyses have found consistently positive and moderately high achievement gains at all educational levels from computer mediation in school subjects, particularly mathematics. The computer-assisted instruction was found more effective in all educational levels and with lower achieving students (Kulik, 1983; Kulik, Kulik, & Cohen, 1980). Information and communication technologies significantly improve students' problem-solving skills, provide opportunities for student-constructed learning, increase students' collaboration on projects, increase mastery of vocational and workforce skills, increase the preparation of students for most careers and vocations, and improve confidence and attitude of students (Cradler & Bridgforth, n.d). It must be underscored that the best predictors for achievement gain in the use of computer were prior positive attitudes towards the technology by teachers and students, consistent access to the technologies, and teacher training in the technology, among others (Maldonado, 2000).

From the foregoing, it can be deduced that ICTs are essential for contemporary educational development of any nation. Nigeria, as a nation, recognizes the pivotal roles of ICTs in the revitalization and the development of the country's education system. This recognition brought about the development of specific ICTs related policies so that the country education system could husband the potentials of ICTs.

POSITIVE IMPACT OF ICT ON TERTIARY EDUCATION IN NIGERIA

ICT has increasingly played a critical role in all fields of human endeavours. It is being used globally to translate ideas into realizable goals and develop same into concrete achievement. ICT is readily useful in the areas of agriculture, engineering, medicine, law, architecture, aviation, commerce, insurance, banking and finance as well as maritime activities. ICT has the potential to contribute to substantial improvements in the educational system (Moursund, 2005). However to date, relatively little of this potential has been achieved in spite of ICT having significant impact on traditional school system. They have provided innovation for teaching and learning, and have engendered advances in research about how people learn, thereby bringing about rethinking the structure of education (Lopez, 2003). It is also widely acknowledged that ICT can be used to improve the quality of teaching and learning in the school system (Yusuf, 2000).

The prevalence and rapid development of ICT have transformed human society from the information age to the knowledge age (Galbreath, 2000). In fact, ICT is becoming a natural part of man's daily life. Thus its use in education is becoming a necessity. Moreover, the pace of change of ICT field currently exceeds the pace of progress of making effective use of ICT in education. There is a lot of transformation through ICT. There is an international consensus on the importance of intellectual input in creating value, underlining the need for investment in education and skills in general with a special focus on ICT skills and research development. ICT has changed the face of modern researches, requiring research organizations to be linked to each other through advanced network that is connected to the rest of the world.

ICT provides resources and services to support the education, research and public services missions to universities. ICT also enhances the development and implementation of policies and

procedures necessary to ensure the effective, secured and appropriate use of universities information resources and services. ICT provides a lot of services for students including distance education programmes, inexpensive printing, cell phone plans, internet connection, free dial-up, technology equipment, rentals classroom media stations, etc. Lecturers and students get relevant materials needed through the Internet. Such quality materials are used in equipping the students and upgrading their knowledge in their field of study.

Moursund (2005) stated that ICT brings some very powerful aids to translating theory into practice. Two of these aids are computer-assisted learning and distance education. These days, computers with Internet connectivity have become common household items. Students often have access to: pure educational, designed specifically to provide instruction to help the user learn; communication tools and reference materials including e-mail, web, encyclopaedia, books, and other reference materials; pure entertainment, that is, games that are not designed to be educational; tools such as word processor, graphics software, e.t.c. Cellular phones, household computer games and toys, television, CD players and recorders, video tape players and recorders, are now commonplace.

When students grow up in an ICT environment, they may gain many hours of experience using ICT facilities.

ICT is an example of a technology that is a powerful change agent. In the view of Moursund (2005), ICT is a mind tool. Butcher (2003) & Ofojebe (2006) in Okeh & Opone (2007) viewed ICT as electronic technology for collecting, storing, processing (editing) and communicating (passing on of) information in various forms. It is an applied technology of Science and Technology for effective and efficient generation, storage, organization, protection and dissemination of information (Adjaiho, 2006 in Okeh & Opone, 2007).

It is evident that ICT incorporates and extends some of the power of reading, writing and arithmetic. It facilitates the automation of many mental activities. ICT has proven to be a valuable aid to solve problems and accomplishing task in education, business, industry, science and many other human endeavours. The Science Of Teaching and Learning (SOTL) have made great progress in recent times. Braisford (1995) in Bamigboye,

Aderibigbe & Buraimo (2007) described four important components of SOTL to include: Constructivism, Situated Learning, Motivation, and Transfer of Learning. Each of these is important to all teachers and students at all levels and in all academic discipline.

Today, ICT provides knowledge based system that includes knowledge acquisition, knowledge incubation, knowledge amplification and knowledge dissemination. It is evident that information is a key resource which permeates teaching, learning, research and publishing. To this end, Robinson (1991) in Okeh & Opone (2007) stated that the use of new information technology can serve three main functions in the national educational growth. These are to: a. deliver all or part of the learning experiences to learners; b. supplement and extend content provided in different forms other than printed (hard copy); and c. provide a two-way channel of communication for exchange between tutors and students with their peers for feedback or for learning, problem solving, advice, debate, and reports.

Other ways in which ICT can be used in education as stated by Ikelegbe (2006) in Okeh & Opone (2007) include:

i. Supporting conventional classroom work; the teacher could ask his/her students to use ICT approach;

ii. Helping in the design and development of learning materials. A lot of materials can be downloaded from the Internet. Such materials must however be adapted to suit the specific instructional objectives;

iii. Accessing electronic teaching materials such as books, journals. These can be accessed, stored and analyzed by the use of ICT;

iv. Accessing virtual library "stocks" electronic versions of books' journals;

v. Giving or providing access to the world of resources especially in electronic form;

vi. Playing a key role in educational administration. Students' data, personnel administration, purchasing and supplies, advertisement, etc can be handled with ease using ICT;

vii. Facilitating independent study and individual instruction especially on the open distance-learning programme;

viii. Making learning more vivid and engaging;

ix. Assisting the teacher in assessment and testing; and

x. Bringing a permanent solution to brain drain problems as we now live in a global village.

ICT is now a global phenomenon. It has been embraced all over the world due to its importance. Governments all over the world are harnessing the rich potentials of ICT and are using ICT as a tool for educational developments, economic recovery and wealth creation (Okonta, 2006). It is very useful in tackling the ills and problems facing the educational system. Today, no nation can attain its height educationally, economically and socially without ICT. ICT has also increased the ability to perform 'impossible' experiments' by using simulations, as well as the possibility for students to have individual learning programs within a topic, rather than everybody having to do the same thing at the same time at the same pace. More able students can be given more challenging work, less able students can access remedial lessons.

BARRIERS TO ICTS INTEGRATION IN NIGERIAN TERTIARY INSTITUTIONS

The world, outside the school system has been able to achieve much in the area of ICT integration in their daily routine. The digital divide between Africa and the developed world is well established in literature. Nigeria ranks 15th, even in Africa in Internet host at 1998 (Hall, 1998), and deprivation in ICT use persists in Nigeria when compared with global standard (FME, 2004). Globally, ICTs implementation in schools has not been smooth sailing. Researchers have been concerned about the barriers that have militated against effective integration of ICTs in education.

Organizations in Africa have been concerned with the problem of poor implementation of ICT in African school. For instance, the Association of African University (AAU, 2000) examined the problem and major obstacles affecting the use of ICT in African universities, and thus defined the problems to be technical, non-technical, human and organizational and financial. Technical obstacles identified include the poor telecommunication infrastructure, absence of national information communication infrastructure lack of university coherent plan for ICT, problems of connectivity, lack of or limited bandwidth for ICT for learning, teaching, and research, non-reliability of public electricity supply, thus necessitating extra cost for standby generators. The non-technical deals with lack of professional development for faculty, human and organizational aspect relates to inadequate planning for ICT integration in regular activities

of universities, and inadequate human resource base, while financial relates to inadequate funding of ICT infrastructure, maintenance of available facilities, and staff development.

Research findings on barriers to ICT application in other levels of education have provided similar results. Some of the findings of these studies are enumerated as follow. First, is the lack of teacher's confidence and teacher's computer anxiety (BECTA, 2004). Second, lack of teacher's competency due to lack of time for training, lack of pedagogical training, lack of skills training, and lack of ICTs focus in initial teacher training (BECTA, 2004; Yusuf 2005b). Third, there is lack of access to resources due to lack of hardware, poor organization of resources, poor quality hardware, inappropriate software, and lack of personal access for teachers. Fourth, is lack of time to use ICTs as a result of school time table (BECTA 2004). Fifth, there are technical problems which encompass lack of technical support, fear of things going wrong, lack of telecommunication and other infrastructure, and unreliability of electricity (BECTA, 2004).

Others include lack of or ineffective technological leadership in schools, lack of clear vision, lack of incentives for teachers, lack of teachers' participation in planning for ICT integration (Spodark, 2003). Since these barriers are known it is important to device strategies that will provide enabling environment for ICTs use in Nigerian Schools.

STRATEGIES FOR ICT INTEGRATION IN THE NIGERIAN TERTIARY INSTITUTIONS

Using the necessary strategies ICTs can become a major tool for improving the quality of teaching, learning, and research in Nigeria Schools. Given the right condition the potentials of ICT that had been enumerated earlier can be husbanded by school administrators, classroom teachers, curriculum developers, researchers, and so on, to improve the administration of the schools and provide sound basis for innovative education in Nigeria. The following initiatives should be taken to encourage ICTs use in Nigerian Schools.

First, the Nigerian Policy for Information Technology (FRN, 2001) should be reviewed to give specific sectoral allowance for education. The document should not only be market driven in orientation but should also give detailed direction on the Integration of ICTs in instruction. In this direction, relevant stakeholders should be part of the process to review the document. Furthermore, ICTs policy for education should be developed at levels for Nigerian education.

Thus, each state, local government and school administration should evolve ICTs policies as done in advanced countries.

Secondly, teachers in Nigeria schools should be trained not only to be competent in the use of ICTs but capable in their use and integration for instructional purposes. Capable teachers, in this context, refer to teachers who know how to learn, are creative, have a high degree of self efficacy, can apply competencies in novel as well as familiar situations, and work well with others (Stephenson & Weil, 1992). Since lack of teacher computer skill is the single largest barriers to ICTs use in education, initial teacher training in Nigerian schools should incorporated necessary ICTs training, and staff development should be developed for serving teachers. Compulsory ICTs training should be enforced for all teachers, that is, ICT components should become integral part of teacher education programme for pre-service teachers at the colleges of education, universities, and other teacher training institutes, and also for serving teachers. In addition, regular workshops and seminars should be organized for serving teachers to keep them abreast of developments in the field of ICT as they relate to education.

Thirdly, provision of infrastructure needed for the implementation of ICTs in school should be made and this has several dimensions. In the first instance, schools should be equipped with necessary ICTs facilities as envisaged in the national IT policy. For a start, shared ICT parks can be established for schools within a defined location to use on rotationally scheduled basis. The NITDA initiative in mobile computer laboratory can also be explored. Teachers at all levels should be assisted to acquire personal computer through loans as obtained in other countries, such teachers should have lap top or palm top computers which can be used at various setting (home, offices, classroom, workshops, etc). The British government teacher computer acquisition programme led to increased use of ICTs in British schools (Scrimshaw, 2004).

Fourthly, attempts should be made to develop a crop of school leadership who are committed to ICTs implementation in Nigerian schools. Such leaders will lead others in embracing ICT. School administrators/heads should be part of the people developing ICT issue through projects and initiatives. These leaders will be able to give leadership through

knowledge from the multiple training and initiatives. In achieving this, NITDA and the Digital Bridge Institute should develop appropriate programmes for school administrators.

Fifth, communities, alumni associations, and significant others should be involved in developing ICTs policies at school level and be involved in the implementation. Working with community will lead to development of a more authentic and conceptualised approach to learning (Scrimshaw, 2004). The community and others can also be involved in the provision of ICTs infrastructure in schools. Locally based training can also be provided for teachers and students.

Sixth, at the initial stage government can evolve community based ICTs, centre with adequate facilities for use of a group of schools. Such centres should have Internet access. The facilities can be opened to the community at a prize to generate fund for sustaining such centres.

Seventh, there is a need for a national agency to be in-charge of ICTs implementation in Nigerian schools. Such Nigerian Agency for Information Technology in Education shall conduct research into ICTs issues in schools, develop curriculum on ICT for various levels of education, encourage the development of local content software, monitor ICTs implementation at school levels, regulate ICTs specialized institutions, assist states, local government, and schools in developing ICTs policy for education, advice government on ICTs and education, and so on. For instance, BECTA takes care of ICTs issues as they relate to education in Britain.

Eight, teacher-training institutions in Nigeria must develop programmes on ICTs in education, apart from degrees in computer science. Specialist in ICTs in education can thus be developed at various levels. They will be promoters of ICTs use in schools. In addition, teacher-training institutions should encourage further research on ICTs in Nigerian Schools so as to identify the present status, that is, the knowledge map on ICTs in Nigerian schools, the problems, and other sundry issues.

It must be underscored that research should be conducted nationally on the issue of ICT in schools. Such national researches are regularly conducted in advanced countries to gauge the progress in ICT application in the field of education. Government, non-governmental agencies and organisations, professional organisations in the field of education, educational agencies

and educational research institutes, institutes of education, among others should conduct research on needs, infrastructure, access, digital divide (gender, geographical, social, etc.), staff development, barriers to ICT implementation, and so on. Such studies can serve as precursor for adequate planning and they can also serve as evaluation for ICT policy implementation within the Nigerian school system.

CONCLUSION

Though emerging ICT tools offer new opportunities in education through expanding access to formal and informal education, most countries (including Nigeria) face significant challenges in harnessing their educational systems to promote broader economic and social development plans. Nevertheless, governments are articulating broad visions of the development of "information societies" in which widespread access to technology can nurture human capital, improve government services, promote culture and support economic growth. The ICT sector is being targeted as a vehicle for this growth and social development; and business education has a crucial role to play in such efforts. The challenge for educational systems moving forward, therefore, is to take advantage of the opportunities provided by ICTs to support learning outside of schools while, at the same time, incorporating ICT-related practices and models from daily life in wider society into formal educational structures and processes. Exploring and realizing the potential for ICTs help make schools more productive and efficient than they currently are, transform teaching and learning into an engaging and active process connected to real life, and prepare the current generation of young people for the future workplace may be a key determinant of the future success (or failure) of such initiatives.

RECOMMENDATIONS

Considering the myriad of challenges confronting ICT use in education, the paper recommends the following:

The approaches to the use of ICTs in education should be pursued holistically. The success or failure of most ICT/education initiative is based not only on sound implementation practices, but on the nature and quality of broader educational policies and strategies in which the use of ICTs is embedded. Technology is only a tool to enhance the quality of education. No technology can fix a bad educational philosophy or compensate for a bad practice. Considerations of the

potential use of a variety of ICTs should flow out of concern for specific developmental challenges and not merely on a desire to introduce ICTs per se.

The investments in ICTs should not only be used to promote the development of basic ICT skills (such as keyboarding, competencies in operation and office productivity), but also to enable the development of broader set of critical thinking, problem-solving and communication skills.

Technology changes very quickly. Thus, utmost care should be taken in making big investments on a singular technology (or vendor). Over-reliance on a particularly promising technology solution today may inhibit an education system's ability to adapt as new technologies emerge in the future.

Special attention should be placed on the professional development of teachers. Teachers are at the heart of the educational process. The introduction of ICTs makes this position of the teacher more important. ICTs play valuable roles in upgrading the subject-specific competencies of teachers through increased access to quality education content, distance learning opportunities and self-placed tutorials. More fundamentally, it also helps in building formal and informal support networks at both the pre-service and in-service levels which enable teachers to explore the use of new tools and techniques to help engage with and support learners in new and productive ways.

The use of ICTs should be monitored and evaluated regularly and closely to meet a variety of educational objectives. Nigeria tertiary Institutions should be prepared to change direction if required. Success requires meeting all the conditions of innovation and change to occur. This calls for stakeholder engagement, relating the innovation to the conventional, articulating the added value of ICTs, assessing and mitigating risks and planning for and implementing necessary change management processes.

Proactively ensure that teachers or business educators have necessary knowledge, skills and tools to respond to, and take advantage of, the challenges and opportunities that technological advances present to addressing key developmental challenges in the education sector.

Tertiary Institutions needs to be well equipped to anticipate and respond to challenges and opportunities ICTs present and represent, in helping education systems meet not only the Millennium Development Goals, but to participate productively and equitably in an increasingly technology-rich, knowledge-driven world.

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