INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) INTO TECHNICAL AND ENGINEERING EDUCATION IN NIGERIA: POTENTIALITIES, PROBLEMS AND STRATEGIES

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ABSTRACT

This paper discussed the role of ICT in the world of work and development in science and technology. It considers the potentialities of using ICT in the teaching and learning technical and engineering education in Nigeria. Among the ways through which ICT can be integrated into TEE include: the use CD-ROMS, videodisks, electronic encyclopedia, and video libraries, computer assisted instruction, animation, web-based and computer aided design (CAD). Similarly, the paper highlighted some of the problems facing the efforts of integrating ICT into technical and engineering education and training. It concluded with suggestions on how to integrate the technology in technical and engineering education delivery process.

Keywords: Information, Communication, Technology, Technical, Engineering, Education

INTRODUCTION

Globalisation and technological developments are introducing new skills and demanding higher commitment to the provision for life-long education [17]. Many countries are now putting efforts towards meeting-up these challenges, and reconsidering development of their technical and engineering education system [4]. But, efforts to ensure access to this form of education and opportunities are not yielding substantial positive outcomes on the economy of many developing countries like Nigeria [16].

It is rather unfortunate, in developing countries like Nigeria to notice that use of ICT is still at its infancy stage as many teachers use it as a neutral tool; that is, a tool that can be used in words processing or record keeping purposes only meanwhile the mode of instructions is still traditional paper-based approach [7], [14].

Even though ICT is introduced in many schools in a form of infrastructure, professional development, and new curricula; it can also be seen as a catalyst for changing teacher practices, and introducing a variety of network-based tools that serve as an effective means of helping teachers to develop a more student-directed and constructivist classroom learning environment [5].

Further, it can form an effective technical support group for teachers involved with implementing new technologies [19]. It is in the face of these challenges and recognition of the prominent roles of ICT, the government of Nigeria decided to integrate these technologies into her educational system [8]. Thus, it is in view of these challenges; this paper highlights some potentialities, discussed problems and proposed strategies for the implementation of information and communication technology into technical and engineering education in Nigeria.

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POTENTIALITIES OF INTEGRATING ICT INTO TECHNICAL AND ENGINEERING EDUCATION

Improving Students Achievement and Attitude

Computer use in education is becoming a highly dynamic technology and a dominant delivery system in education which appeared to have potentialities of improving teaching and learning. According to [12] it provides an increase in students' achievement scores, reductions in necessary learning times, and improved attitudes towards instruction. Furthermore, [9] stressed that it minimized shortage of facilities and equipment in education and provides students and teachers with a means of studying, investigative simulating or practicing complex skills, procedures and concepts in a non-realistic situation without risk to people, capital, or other resources. In classrooms, it is proofed to be cost effective mean of instruction in which learning materials or information can be accessed easily irrespective of time and space [4]. Many teachers can interact with a group or whole class of students and be provided with immediate feedback on their performances and appreciate the self-paced and private learning environment, [19], [13].

Paradigm Shifts

Paradigm shifts is demanding many educators in changing their classroom environments from being teacher-centred to learner-centred; where teachers move from being the key source of information and transmitter of knowledge to a guide or facilitator in student learning; and the role of the students changes from being passive in receiving information to active in making meaning to their own learning, prepared for challenges and life-long learning [16]. Thus, computer technology is considered to have the potentiality of transforming a passive learning environment into one which is more active [12]. When used within a learning environment that endorses the cognitive flexibilities theory it allows students to integrate concepts from seemingly unrelated parts of the curriculum. This would satisfy the concerns of researchers who stated that classroom practices must change in order for computer technology to be efficiently implemented [10].

Broadening the Range of Materials Used in Classrooms

ICT is increasingly enhances teachers and students accessibility to a broader range of materials than they can use in the classroom. Supplementary computer tools such as scanners or digital cameras allow teachers to bring in outside sources, enter them into a computer, and customize assignments. Encyclopedias, art collections, atlases, and other reference books in a less expensive, and less space-consuming electronic format will be of everyday use in classrooms Already, in many schools, students can browse interactively or conduct electronic searches in CD-ROM databases, encyclopedias, or other reference work. Thus, the new technologies allow access to a broader range of instructional resources. They also offer students the opportunity to learn how to use electronic tools to access information and develop research skills in solving problems.

CAD allows students to create a 3D object on the screen that they can then turn around in space or zoom in on to see in more detail. CAD systems have been used in architectural design, fashion design, machine construction (cars, aircraft), electronic design, etc. So-called Computer Aided Manufacturing (or CAM) is computerized design of the manufacturing process. CAD/CAM is a combination of two. Few among the software used in technical and engineering education includes: AutoCAD, MultiCAD, TurboCAD, Autodesk mechanical simulation, solidworks among others.

Computer Assisted Instruction (CAI)

Through computer assisted instruction ICT provides a direct instructional tool for a single student or small group of students with the goal of students learning a particular subject. Further, ICT in classrooms can support and enhances the actual teaching and learning process, drill and practice activities, modelling, representation of complex knowledge elements, discussions, collaboration, project work, etc which are offered either by themselves or as supplements to traditional, teacher directed instruction, [1]. These provide practical and methodological innovations in the teaching of various subjects, scaffolding for the construction of knowledge, and test experiments which would be too expensive or dangerous in real settings (for example in electrical/electronics and automotive technology [3].

Computer Animation

Sophisticated and expensive instruments as well as children's simple tool-kits can be used to create artistically impressive or scientifically precise and enlightening computer animations. More and more movie scenes are now produced in artificial settings with characters designed on a computer by means of special software. Students' animations are usually simple and two-dimensional. Adding a time dimension makes them 3D objects. Simple animations made by groups of students over several hours can be more educative for the creators and more exciting for the spectators.

Web-Based Learning (On-Line)

Learning on the Web referred mostly as e-learning is one of the most promising and rapidly developing areas of ICT in education. Advantages of e-learning for learners include an increased accessibility to information, better content delivery, personalized instruction, content standardization, accountability, and on-demand availability, self-pacing, interactivity, confidence, increased convenience and reduced costs of content delivery [19]. Similarly, [19] added that e-learning reduces classroom and facilities cost, training cost, travel cost, printed materials cost, labour cost, and information overload.

However, like any other, innovation, information and communication technology diffusion and implementation, suffers setback due largely to some fundamental challenges that have virtually remain and barriers to its acceptance and smooth integration in to technical and engineering education.

PROBLEMS ASSOCIATED WITH ICT INTEGRATION INTO TECHNICAL AND VOCATIONAL EDUCATION

Studies by [1], [15] indicated that among the barriers hindering proper integration of ICT into education generally includes:

Lack of institutionalization of the use of ICT

The rigid structure of the traditional system of education could not gain a lot from modern ICT unless it is totally changed from its conservative principles to more constructive principles. Some educators may be eager to utilize it into their classrooms, but the system does not make the provision for that. This call for a total change in mindset

Unavailability of ICT facilities in Schools

In most institutions of learning, apart from computer departments that are equipped with few computers for students' usage, most of the schools are without internet facilities. The building structures of most of the classrooms can not contain enough computers for every lesson. Space is becoming a crucial issue as most classroom spaces were designed to reflect

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the traditional instructional style with little, if any, thought given to investigation-based, group learning, regardless of fibre-optic cabling. Funding is needed to renovate and rebuild the short-term reality for most schools in the existing spaces which must be adapted to accommodate new learning technologies.

Lack of Training for Teachers

Most teachers in our schools have not been trained on the use of ICT facilities. Few of them may be trained only to appreciate the use of which will be inadequate for them to apply in teaching and learning process. The teachers do not have sufficient time to learn about the use of ICT and its applications in a particular discipline and due anxiety they do not have confidence in using it for teaching.

Maintenance Issues

Maintenance and access to the computer laboratory and internet services for wider school population at any given time is also an issue of serious concern. Getting personnel to ensure things are in order and secured is also another issue of serious concern in the institutions. The cost of ICT hardware, software and maintenance is still unaffordable to a majority of schools in many countries.

Low reliability of ICT hardware and software

Most of the ICT facilities supplied to school were initially designed and developed for non-educational purposes, and are somehow poorly fitted physically for ordinary classrooms activities are not of good quality and reliability. Available computers often do not work, which is aggravated by lack of maintenance support and inadequate software.

Integrating ICT into technical and engineering education requires a holistic approach to some fundamental challenges that remain as bottleneck to the entire process. Therefore, there is need for effective and comprehensive strategies that will aid the general acceptance and utilization of the change.

STRATEGIES

In order to ensure that teachers effectively integrate computers into their instruction the followings recommendations were been proffered:

Setting of guidelines

It is recommended that a comprehensive set of guidelines on application of ICT be set-out for technical and engineering education teacher preparation programs by educational regulatory bodies and teacher training institutions in Nigeria. These will help in establishing standards on necessary computer-related skills for individuals seeking initial certification or endorsements from teacher preparation programs. Competencies should focus on the ability of teacher to utilize and integrate a wide variety of educational computing and technology applications to enhance student learning and teacher productivity in their discipline.

Teachers' capacity building

Professional training on the use of ICT in education should be organized and be made mandatory for teachers in technical and engineering education in Nigeria. And as a matter of urgency the government of Nigeria to set up machinery that will re-train teachers at all levels of educational system on the use of ICT in education. Refresher courses and seminars should be organized from time-to-time by states and local governments in the country in order to update teachers' experience on use of ICT in their lessons.

Enhancement of IT Infrastructures

Facilities that would enable wider application of ICT methods in schools should made available into classrooms by the government. Teachers should be taught on how to use them and be made easily accessible to the teachers and students. In any case, special security rules and regulations should be issued and good habits formed in schools. Proper planning should be made in providing space for ICT development in the schools.

CONCLUSION

Development in ICT is shifting the role of many teachers in teaching and learning situation from being a teacher-centred to a learner-centred activity in many developed countries, where teachers move from being the key source of information and transmitter of knowledge to collaborators and co-learners. And the role of students is changing from passive receiver of information to that of being actively involved in their own learning. Many countries now regard understanding of ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy Computer integration will help in providing students and teachers with a means of studying, investigating and practicing complex skills, procedures and concepts in a realistic but non-risk situation. Among problems associated with computer integration into technical and engineering programs include lack of institutionalization of the use of ICT, unavailability of ICT facilities in schools, lack of training for teachers, cost of maintenance, lack of policies that encourage teacher experimentation and collaboration, lack of understanding and endorsement of the importance of ICT as a learning and teaching tool and lack of funds. A comprehensive guideline must be developed in Nigeria, integration of computer into the entire pre-service curriculum for professional development of teachers, and ICT facilities and equipment should be provided into various institutions.

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