The Impact of Information and Communication Technology

(ICT) on Vocational and Technical Students' Learning

Oyebolu, Samuel O.[1]*   Lemo, Olusiji O.[2]
1. Department of Technical Education,Tai Solarin College of Education, Omu-Ijebu,Ogun State, Nigeria.
2. Department of Vocational and Technical Education,Tai Solarin University of Education, Ijagun,Ogun State.
*E-mail of correspondent author: stephenolaopa@yahoo.com

Abstract

The wider rise and proliferation of the computer is interwoven with the broader transition from the modern era to post-modernity. In these ICT-enabled post-modern conditions, knowledge becomes a commodity in the global economy, and such commodity exchanges are mirrored in the relationship between teacher and learner. This is judged in relation to an efficiency view of the cost/benefit equation, with an emphasis on measurable outputs from the system. The incorporation of ICT into the vocational and technical education or education system in general has multifaceted implications for teaching and learning. This study therefore focuses the integration of Information and Communication Technologies (ICTs) on teaching of Vocational and Technical Education students and how this integration can support or aid their learning.

Keywords: Computer Aided Instruction (CAI), Computer Aided Learning (CAL), Education Management Information System (EMIS), Interactive Information System, Constructivist Model of Learning, Technical and Vocational Education (TVE).

Introduction

Information and communication technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy. UNESCO (2000) aims to ensure that all countries, both developed and developing, have access to the best educational facilities necessary to prepare young people to play full roles in modern society and to contribute to a knowledge nation. In fact, Information and communication technologies (ICTs) are a major factor in shaping the new global economy and producing rapid changes in society. ICT permeates the business environment, it underpins the success of modern corporations, and it provides governments with an efficient infrastructure. At the same time, ICT adds value to the processes of learning, and in the organisation and management of learning institutions.

The United Nations Educational Scientific and Cultural Organization (UNESCO) and the International Labour Organization (ILO) recommendations of 2002 on technical and vocational education and training for twenty-first Century, define the "technical and vocational education" as a comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. Technical and Vocational Education (TVE) is concerned with the preparation of learners for employment, through the provision of knowledge, skills and attitudes desirable in the world of work. Technical and vocational education is further understood to be:

(a) an integral part of general education;

(b) a means of preparing for occupational fields and for effective
    participation in the world of work;

(c) an aspect of lifelong learning and a preparation for responsible
    citizenship;

(d) an instrument for promoting environmentally sound sustainable
    development;

e) a method of facilitating poverty alleviation (UNESCO and ILO, 2002).

Technical and vocational education can be formal, informal, continuing or life-long learning, in-service training with various ranges of providers: public, semi-public and private institutions. Technical and vocational education has an orientation towards the world of work and the emphasis of the curriculum on the acquisition of employable skills. Its delivery systems are therefore well placed to train the skilled and entrepreneurial workforce that nation needs to create wealth and emerge out of poverty. Due to the dynamic levels of its training delivery, it can respond to the different training needs of learners from different socio-economic and academic backgrounds, and prepare them for gainful employment and sustainable livelihoods. The needs for TVE around the world are enormous because of the changes occurring in the world of work, which have implications on the

structure of appropriate courses in TVE. It is therefore essential for every government be it local, state, or federal to be deeply aware of the importance of human resources development (HRD) and makes great efforts to develop technical and vocational education. For education to reap the full benefits of ICTs in learning, and effectively accomplish the aforementioned goals of technical and vocational education, nation's educational system needs to develop strategies and plans to enhance the teaching-learning process through the use of new tools for learning.

ICT Integration to Support Students' Learning

The use of information and communication technology in the delivery of vocational and technical education is absolutely pertinent in Nigeria so as to support superior forms of learning. No doubt that theory and research in learning provide an extremely important source of ideas and basis for designing environments conducive to learning. Generally, the key areas for information and communication technologies integration or application in vocational and technical education include Information and Communication Technology Mediated Learning, Access to information and Communication via the Internet/Intranet, Education Management Information System (EMIS) etc.

Information and Communication Technology Mediated Learning (ICTML) covers Computer Aided Instruction (CAI) for vocational and technical teachers and the use of multimedia technologies for producing course materials and Computer Aided Learning (CAL) for their students. Computer assisted instructions have been in use elsewhere in developed countries especially at early years of learning. They provide ample opportunities for students to broaden their learning skills and for teachers to develop better multimedia and interactive courseware. Studies indicate that learning takes place through communication. This is generally poor in the classroom model. Classroom models are largely "one-way teaching models" in which the teacher plays the acting part whereas pupils and students are merely reacting. Computer assisted instructions can greatly complement traditional teaching techniques to help students to learn much more much faster.

Internet and Intranet have become a source of vast amount of information and interactive tools. Intranet is a closed user-group Internet. An example of Intranet could be a school campus network where students and teachers share local information such as teaching materials and course schedules while at the same time accessing the Internet. The Internet is a set of linked computers characterized by protocols used across a wide-range of hardware platforms. Each machine on the Internet contains information shared across the globe - (the content of Intranet is only available to a small closed community such as school-teachers and students). Information on the Internet could be accessible from any location regardless of the type of computer system being used. It also means one can have access to and/or publish information regardless of the subject, location, age, race and time limitation. Internet is thus an empowering tool for all that are involved in education. A wide array of techniques have been developed to access to information on the Internet ranging from logging onto a remote server, chatting over the Internet with colleagues on specific subjects, sharing information via mailing lists and user groups, file transfer protocol to get files on servers to the World Wide Web - an interactive multimedia based information access tool. The World Wide Web has now gained the momentum due to its ease of use and its multimedia capability.

Education Management Information System (EMIS/or EDMIS) is a multi-user, interactive information system and a planning tool for storing and retrieving education information on students, student grades, test results, courses, personnel, finances at school, district or regional levels. Student information such as demographics and attendance, subject, program, and performance, staff information such as demographics, employment related data, classroom schedule, vocational education course taken by the staff and staff performance report could be gathered in a standard format and entered at school, district and national level to inform decision-making. The EMIS financial data include information on budgets, cash balances, expenditures, receipts, schedule of indebtedness and miscellaneous financial reports for higher level management and others such as building profile information. Although it has been in use elsewhere in developed world, EMIS use in developing countries is often limited to students' affairs office in the Universities and offices of the Ministries of Education. Data on education planning is usually gathered using manual techniques and is often prone to errors and inconsistency.

Multimedia and telematics can contribute in several ways to the development of various skills and attitudes in vocational and technical education. The use of them in the learning process can actually teach students how to access and productively use information which is presented in a new and very attractive way. Multimedia communications and information retrieval skills are highly necessary for the minimum level of business and professional communication. When working with multimedia and telematics applications, students are engaged in activities which develop higher order thinking skills such as problem solving, reflecting, recognising relationships, analysing and creatively synthesizing information, as they deal with complex, realistic information. These tools can give vocational and technical education students the experiences they need to be

informed, intelligent decision-makers, producers and problem solving adult members of twenty-first century society.

In addition to this, the open-ended, non-linear, constructivist model of learning is very compatible with use of multimedia and telematics software. In particular, multimedia or hypermedia authoring software enables constructivist learning experiences by allowing teachers and students to create interactive lessons, multimedia reports or presentations. Furthermore, through the process of discovery, or guided discovery, the student learns facts, concepts, and procedures, in other words they learn by exploring. These applications also facilitate important educational and cognitive processes, including presentation of complex, authentic tasks, engagement in active problem solving and critical thinking, utilisation and synthesis of knowledge from a variety of domains and others. Multimedia authoring tools are inherently meta-cognitive: they help students think about thinking. In addition to this, multimedia software provides a platform for interactive exploration, inquiry and creative application which is context-based. The context in which learning occurs (situated cognition), and the activities through it occurs have a direct and significant influence on what is learned.

Another significant point is that interactive multimedia and telematics services manage to develop students' interest in learning activities, at least for the time being. Moreover, it is not too surprising that they also increase their confidence in their abilities. In turn, this confidence of the students in themselves undoubtedly explains in part the spontaneously receptive attitude that a large number of them adopt in which technology plays a role and the perseverance that they show in accomplishing this activity. Among the reasons that contribute to student motivation there is the fact that these technologies can be as key vehicle for stimulating learning, primarily because they create environments and present content in ways that are more engaging and involve students more directly than do textbooks and more traditional teaching tools. They possess an interactive capacity and they allow vocational and technical students to take part in activities that invite them to create and share with others.

Stages of Teaching and Learning through ICT

Teaching and learning are best thought of, not as separate and independent activities, but rather as two sides of the same coin, interconnected and interrelated. Studies of teaching and learning in schools around the world identify four broad stages in the way that teachers and students learn about and gain confidence in the use of ICT. They are in terms of discovering, learning how, understanding how and when, and specializing in the use of ICT tools. The first stage is that teachers and learners go through in ICT development is of discovering ICT tools and their general functions and uses. In this discovery stage, there is usually an emphasis on ICT literacy and basic skills. This stage of discovering ICT tools is linked with the emerging approach in ICT development. Following the discovery of ICT tools comes the stage of learning how to use ICT tools, and beginning to make use of them in different disciplines. This stage involves the use of general or particular applications of ICT, and is linked with the applying approach in ICT development. The next stage is understanding how and when to use ICT tools to achieve a particular purpose, such as in completing a given project. This stage implies the ability to recognise situations where ICT will be helpful, choosing the most appropriate tools for a particular task, and using these tools in combination to solve real problems. This stage is linked with the infusing and transforming approaches in ICT development. The fourth and last stage involves specialising in the use of ICT tools such as occurs when one enters more deeply into the science that creates and supports ICT. In this stage students study ICT as a subject to become specialists. Such study concerns vocational or professional education rather than general education and is quite different from previous stages involving the use of ICT tools UNESCO, 2002).

The Imperatives of ICT for Vocational and Technical Students' Learning

Information and communication technology (ICT) is an indispensable part of the contemporary world. The field of vocational and technical education has certainly been affected by the penetrating influence of information and communication technology worldwide and in particular developed countries, ICT has made an impact on the quality and quantity of teaching, learning, and research in the traditional and/or distance education institutions using it.

In concrete terms, ICT enhances teaching and learning in vocational and technical through its dynamic, interactive, flexible, and engaging content. It provides real opportunities for individualised instruction. Furthermore, information and communication technology has the potential to accelerate, enrich, and deepen skills; to motivate and engage students in learning; to help relate school experiences to work practices; to help create economic viability for tomorrow's workers; contributes to radical changes in school; to strengthen teaching, and to provide opportunities for connection between the school and the world. The pervasiveness of ICT has brought about rapid technological, social, political, and economic transformation, which has eventuated in a network society organised around ICT (Yusuf, 2005).

Accordingly, the application of ICT makes institutions more efficient and productive, thereby engendering a variety of tools to enhance and facilitate vocational and technical teachers' pedagogical activities. For instance, e-learning is becoming one of the most common means of using ICT to provide education to

students both on and off campus by means of online teaching offered via web-based systems (Yusuf, 2005; Mutula, 2003). Thus, ICT-based technology like e-learning has great potential to supplement traditional learning. This is so because ICT enhanced learning can provide new opportunities to explore high-level cognitive activities such as autonomy, creativity, problem solving and team work while providing vocational and technical teachers with the means to take into account individual needs of their students, especially while using web-based technology. Accordingly, and in addition to some of the imperatives mentioned above, some of the definite and specific reasons for implementing ICT-based technology for vocational and technical teachers are:

1. New ICT facilities allow vocational and technical students and teachers to control, manipulate and contribute information to learning and teaching environments as interactive books, journals and the like are usually made available via Internet (Oxfam Education Report, 2002).
2. The use of new multimedia technologies and Internet will improve the quality of teaching-learning elated activities not only in Nigeria but Africa sub Saharan region as well.
3. As a social process it will facilitate interaction and collaboration not only among learners but among teachers as well both at local and/or global levels.
4. It will give opportunity to individuals who might wish to combine work and learning at his or her own pace, irrespective of location.
5. It enhances performance of vocational and technical lecturers in time of course materials delivery and provides maximum attention to their students as they could meet through email feedback facility or other wise.
6. It will revolutionize distance learning which used to be "just-in-class" to "just-in-time", thus enhancing easy accessibility to education.
7. A flexible user interface, since it is attractive and interactive, may motivate   the   learner's   interest, which in turn will sustain continuous learning.
8. It promotes human resources capable of responding to the demands of the new world economy that is supported and driven by ICT.
9. Open and distance university education, if well supported by e-learning technology, will provide accessibility, flexibility, and collaborative work to both the urban and rural populace of Nigeria and Africa in general, who   might not have the privilege to attend conventional universities. This has lifelong value to quality education and to all who seek knowledge irrespective of age and/or geographical location and time.

Therefore, with the evolution of the new Information and Communication Technology, higher education institutions are able to provide a flexible and more open learning environment for students and teachers alike. In Nigeria, indications are that with increasing enrollments at all levels of education, distance or blended learning shall continue to grow, which calls for immediate technology support (Kwache, 2007).

Furthermore, the use of these technologies do not isolate vocational and technical students from one another, but instead increases the relations and promotes co-operation among students in the same class and among students or classes in different schools. By participating in scientific experiments or other projects conducted jointly with students in other schools, using powerful telecommunications networks, students learn how to co-operate in order to get a job done. Consequently, they not only acquire the standards inherent in co-operation, they also actually acquire them through real situations. Furthermore, in situations where two students work on one computer can prove very positive, because it contributes in particular to developing the ability for social interaction, it deemed indispensable for mastering certain intellectual skills and performing certain tasks. Thus, the use of ICT in the school system is likely to transform the current competitive social structure of the classroom into a more co-operative social structure.

In cases in which these technologies are used correctly in the classroom they do produce positive results and they have the potential to transform the classroom into a better and less boring environment for learning. Of all areas in which change could occur, the time students concentrate on a learning activity heads the list. The attention span or concentration that the majority of students are willing to devote to learning activities is greater when they use a new technology than they are in a traditional setting using traditional resources. Because they like working with a computer, because they can progress at their own pace and because they receive immediate feedback on what they are doing, the students remain engaged and they are willing to devote more time and energy to a learning activity on a computer.

Additionally, through these new offered technologies, vocational and technical teachers quickly obtain information on the availability and value of a very diverse selection of instructional resources, and also often benefit from support for their use. For example, a teacher can preview software to see if it is appropriate for vocational or technical students or establish contact, sometimes instantly and simultaneously, between his students and experts or other students located anywhere in the world. Similarly, through advanced telematics applications vocational and technical teachers can gain immediate access to classes sharing a common interest in

a particular topic or to educational resources which can provide them with help and ideas. Furthermore, educational projects can supply the focus and boundaries for interaction and can provide teachers with content; accompanying materials, organizational help, and technical assistance they may need to work multimedia and telematics into their curriculum and lesson plans.

Multimedia and telematics applications allow for a more individualised approach to learning. Much of the software lets vocational and technical students progress and learn at their own pace, and teachers become more like facilitators and coaches who tailor their assistance to the needs of the child. Part of the transfer of the information inherent in teaching is shifted from the teacher to the technological media as explained above, and the teacher has more time to support each student in the individual process of discovery and mastery of knowledge, skills and attitudes. In addition to this, when teachers use the computer to teach, they tend to work with small groups of students or individual students rather than with the class as a whole at a given time. This allows them to develop a much more accurate and realistic impression of what the students do and do not understand and to concentrate more on students who need help.

In a context where new technologies play an important role, vocational and technical teachers begin to view knowledge less and less as a series of facts to be transferred and more and more as a process of continuous research in which they share the difficulties and results with their students. Successful computer-based learning technologies, such as multimedia and telematics, are a component of a larger pedagogical approach that warrants the use of technology. Viewing computer-based learning technologies as a tool or instrument implies that there exists a pedagogical approach which is well enough articulated so that the inputting, presentation, and communication facilities of the computer are realised as effective aids to student learning and performance. Just as teachers must be knowledgeable about the learning technologies they and their students are using, they must also be knowledgeable and experienced in the pedagogical approach to be taken in their classrooms. This would appear to be necessary if it is to determine how computer capabilities can be used to promote learning, and how to design computer-based learning environments (Turoff, 1995).

ICT foster a positive, close association of students with the assessment of their own learning. Given the potential of these technologies, students' work can easily take other forms than that of written text, or combine various forms, and can be transmitted at any time, virtually in an instant, to examiners in another location. These technologies also allow a student's work to be reviewed as often as necessary, and allow the student as well as other people or authorised organizations to keep a copy. Furthermore, these technologies can be used to build libraries or multimedia centres that bring together examples of students' work and instruments for interpretation. These locations may also have video editing and multimedia production equipment so teams of teachers can propose other approaches to assessment of student learning to their colleagues. Finally, these technologies make possible the dissemination over computer networks of the best assessment instruments prepared by vocational and technical teachers and the best work produced by students.

Conclusion

Information and Communication Technologies are seen to many educational authorities as a way of raising educational standards to improve the quality of education at affordable and stable costs, while addressing the new literacy targets deemed necessary in the up-coming knowledge society. Creating an environment based on these technologies in the educational sector is in itself necessary in order to educate and train a competitive work force because both pupils and adults will have to be able to function in a world and in a labour market penetrated by ICT. Information and communication technology has been much heralded as holding great potential value for the improvement of teaching and learning in vocational and technical. We should also be mindful the integration of ICT into our education delivery system may post some tutelage problems that usually arise due to change because it is indeed an innovation. We must be able to juxtapose the pros and cons deriving from embracing it.

Apple (1992) while supporting the introduction of new technologies per se into schools, warns of some of the potential dangers which should be borne in mind when attempting to reap the assumed benefits associated with ICT. "We should be very clear about whether the future it promises our students is real, not fictitious. We need to be certain that it is a future all of our students can share in, not just a select few" (p.120). Efficient education and training based partly on these technologies can handle larger class sizes (taken as an average), reduce the number of "classical" teacher-based lessons and still offer a more individualised learning environment adapted to the single pupil's needs. We should as well note that teachers are also expected to model appropriate ICT use with regard to health and safety, including Internet safety for young people. Since, Technical and Vocational Education (TVE) is concerned with the preparation of learners for employment, through the provision of knowledge, skills and attitudes desirable in the world of work. With our working world now being permeated with ICT, it is logical that TVE should include training in ICT applications.

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