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Use of Information and Communication Technology in E-Education

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Abstract: In the South African context, the concept of e-Education revolves around the use of ICT to accelerate the achievement of national education goals. e- Education is about connecting learners to other learners, teachers to professional support services and providing platforms for learning. E-Education will connect learners and teachers to better information, ideas and one another via effective combinations of pedagogy and technology.

Keywords: Information, Education, Technology, Teachers, Pedagogy.

Conceptual Framework: The challenge is to transcend the mere exchange of information and to transform e-Education into a range of education activities that meet educational objectives. e- Education is more than developing computer literacy and the skills necessary to operate various types of information and communication technology. It is the ability to:

- Apply ICT skills to access, analyse, evaluate, integrate, present and communicate information;
- Create knowledge and new information by adapting, applying, designing, inventing and authoring information;
- Enhance teaching and education through communication and collaboration by using ICT; and
- Function in a knowledge society by using appropriate technology and mastering communication and collaboration skills.

ICT, when successfully integrated into teaching and learning, can ensure the meaningful interaction of learners with information. ICT can advance cognitive skills such as comprehension, reasoning, problem-solving and creative thinking. Success in the infusion of ICT into teaching and education will ensure that all learners will be equipped for full participation in the knowledge society before they leave a further education and training (FET) institution.

Moreover, these learners are likely to utilise e-Government processes, not only to acquire and use information, but also to

implement public sector reforms that can enhance transparency in government operations. These learners will use ICT to enhance interaction between citizens, governmental organisations and public and elected officials. These learners will invent new ways of using ICT to realise the Department of Education's vision of developing a new citizen who is a critical and active lifelong learner. The challenge facing our education and training system is to create a education culture that keeps pace with these changes and equips people with the knowledge, skills, ideas and values needed for lifelong learning. Our education system must create graduates who use information effectively and constantly keep abreast of technological advances.

Background: Globalization as a consequence of information and communication technology has changed the ways of living and thinking and man has greatly benefited from the facilities provided by information technology. It has also evolved education and education mechanisms. Education is a process in which people get information, to enhance their knowledge for improving their performance (Rosenberg, 2001). There are different sources through which information can be acquired; however it is of great concern of how much this information is beneficial for its users. If the information is in an organised form, then a purposeful education goal can be achieved easily. Currently, there is the emergence of new and modern information technology programs that are instrumental in organisation and delivery of information. When information is delivered electronically, with the support of components of information technology like a computer or computer networks etc then this is called E-learning.

Derek Stockley defines E-education as an electronic delivery of learning, training or education programs. E-education requires the use of a computer or electronic device (e.g. a mobile phone) in specific way to provide learning, educational or training material (Stockley, 2003).

Information technology has helped to change the education and teaching methods with proper use of computer and computer networks. The traditional way of education through accessing a classroom physically, is not necessary nowadays in developed countries. Students can learn

when they want and from where they want using a computer and computer networks. They are not bounded by time and boundary. Information technology not only provides support for the delivery of education or training material but also it helps to organise, rearrange, reuse and store the education material. P.Hitch and MacBrayne (2003), proposed a model which describes how information technology is effectively supporting E-learning:

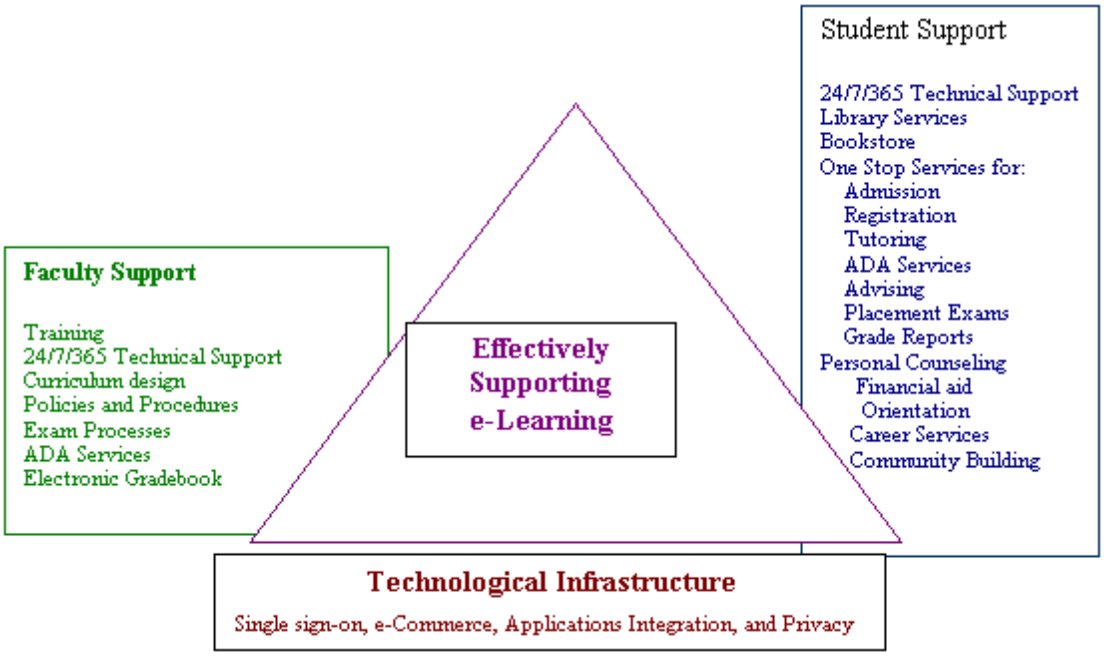

Figure 1: Effectively Supporting E-education System (Hitch and Mac Brayne, 2003).

From the model it is seen that an E-education System is formed with information technology that facilitates the instructors/faculty members by providing training, technical support, curriculum design, procedures and other services for performing multiple functions. While at the same time it provides different facilities like library services, advisory services and a purchase resource facility to students. On campus and off campus help is available at both ends.

According to Lahad, Dafoulas, Atkinson and Murphy (2004), some of most prominent benefits of E-education are that it is less time consuming, comprises of simple processes that do not require lengthy processes for delivery of education

material. E-education contains standardised content without the requirement of continuous change and structure updates and needless human resources for proper functionality. They further claim that with the support of the internet, education is shifting toward constructive or learner centric paradigm, thus the role of instructor has reduced. On behalf of this paradigm learner are able to select what, when and how they have to learn. The beauty of E-education is that it does not have geographical barriers; anyone from anywhere can achieve its benefits. The key advantage of E-education is that it has introduced many education styles and has enhanced the communication and collaboration of learners. The learners who are shy or not able to get face to face education can get extra benefits through this system. Developed countries are using E-education systems for the delivery of information within their organisations and educational institutions. They have taken the initiative to promote numerous education opportunities for their citizens through E-education Systems. Well informed communities in the world are ahead to grasp the benefits of E-learning. Evidently, E-education is still a new concept in developing countries. Lahad, Dafoulas, Atkinson and Murphy (2004), argue that the developing countries are still using traditional ways of getting an education because of their lack of resources and infrastructures. They are not able to use/get the full benefits of E-learning. The people in developing countries who don‘t have time to attend classes due to other commitments are not able to acquire further studies. They also lack study materials and teachers in their premises. This is creating an obstacle for the development of people in developing countries. These countries have their own problems and deficiencies which are hindering proper implementation of E-learning. According to my opinion, if developing countries were aware of this new phenomenon and adopt it warmly, then E-education would provide an avenue to eradicate economic, social and political problems. Dr. Wolfram LAASER in his report has talked about the virtual universities of African and Arab countries. This shows that developing countries are trying to implement E-education in their countries, but because of lack of resources and

infrastructure they are unable to implement fully functional E-education systems. Therefore this area is of great interest in informatics.

E-education with Informatics Perspective: Informatics is a science which deals with development and use of information technology in different contexts (Lind Ann, 2005). Gammack, Hobbs and Pigott (2006), define informatics as the process of information handling usually supported by technology. Informatics in the field of education is used for the processing of information and reengineering of information systems (Wikipedia, 2011). E-education is a system in which information is collected and organised in a way that could be helpful for learners. In the context of E-learning, the collection of information and its organisation is called knowledge management. Information technology is facilitating E-education with its advancement and widening its scope but developing countries are unable to implement E-education systems properly.

Key Concept: In this section, I will briefly explain some important concepts to facilitate the understanding of the text. The concepts are more thoroughly elaborated later in the thesis.

Blended Education: Blended education is a form of education which gives an opportunity to incorporate technology to traditional learning. In blended learning, technology supports to change pedagogical ways and helps learners within and outside the class. Computer based or web based technologies integrate with blended learning.

Computer Based Training: From this kind of training, students learn to use computers with the support of different software, CDs, DVDs and LAN etc.

Web Based Training: WEBOPEDIA (2010) explained web based training as instructions delivered through the internet or intranet using a web browser. Web based training includes streaming videos, audios, hyperlinked web pages, live web broadcasts, and portals of information and interactive methods such as bulletin boards, chat rooms, instant messaging, video conferencing and discussion threads.

Virtual Education Environments: Virtual education environments (VLE) are the software which helps to enhance education and teaching. Students use computers and

the internet during the education process through virtual education environments. VLE helps to manage knowledge, students tracking, online support for students and teacher through electronic communication. Students and teachers can interact in VLE through designated ID's and both have specific rights to perform certain tasks. However, teachers have more rights than students. Blackboard, WebCT, Moodle etc. are most commonly used virtual education environments for E-education systems.

Asynchronous and Synchronous Communication: In the new era, personal growth and success depends on his/her knowledge and how much he/she is well informed. It does not matter how that person is acquiring the information. When we talk about the information acquisition through E-education then two basic types of E-education comes to front, asynchronous and synchronous. The start of E-education was with asynchronous but with the improvement in the quality of the internet and emergence of new software synchronous type gained more popularity.

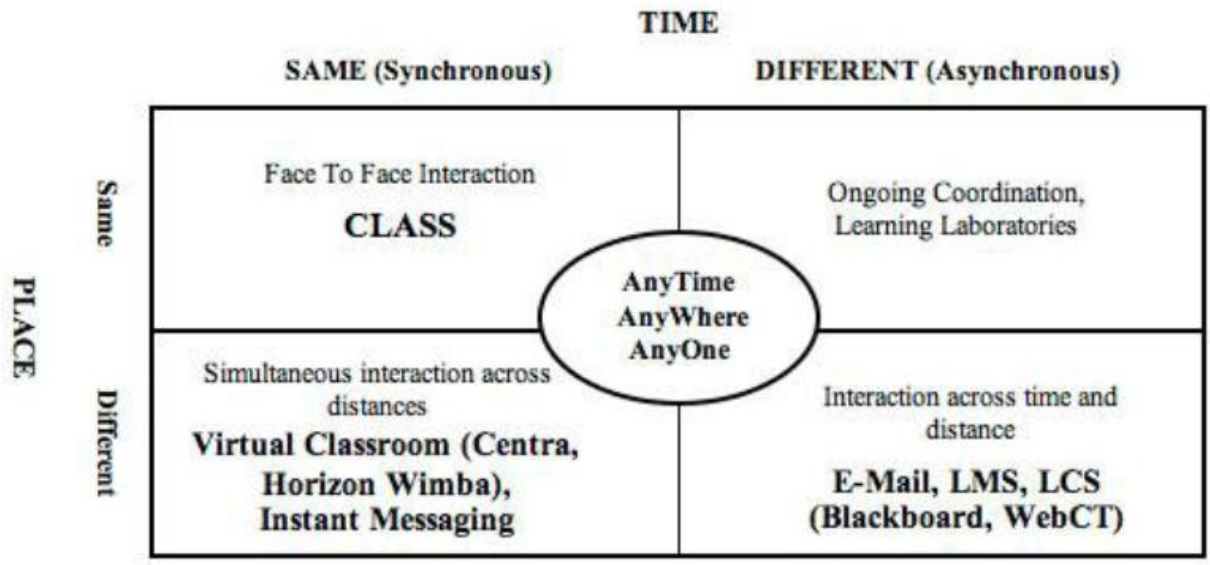

Figure 3: Time Space Matrix Source: Tim Daniels and Melinda(2005)

A. Asynchronous: In asynchronous learning, normally teachers and learners communicate via email, discussion board or a shared website even when both are not online simultaneously. Teachers usually upload course material on the website and

learners access this material at anytime and from anywhere at their comfort.

- *Self Paced Courses:* Self paced course material can be delivered through the internet, intranet or local network, CDs or DVDs with the features of multimedia, interactivity, bookmarking, tracking, simulation online experts, multiple bookmarks, notes and highlights.
- *Discussion Groups:* Discussion groups can also be known as message boards, bulletin boards and discussion forums. Discussions by different people at different times are indicated on the discussion board. On the discussion board the question can be posted by anyone and which any other member can be answer. Teacher can also start an open discussion for the class.

B. Synchronous: In synchronous type of e-education teachers and students have to be online at the same time and they talk face to face with the support of video conferencing software or through chat. But students and teachers do not have to wait for the response from both sides.

Virtual Class Rooms: Within virtual class rooms, students and teachers work as they work in real classrooms. Students and teachers come online at the same time. Teachers can take an attendance; ask questions to students and vice versa. Students can raise hands for asking the question when they are talking on video conferencing. Different ways of delivering lectures are slide presentations, audio/video conferencing, chat, shared whiteboard, application sharing and instant messaging etc.

Learning/Knowledge Object: Education objects are small chunks of instructions or information that can stand alone. Knowledge objects are basically a collection of small contents or practice items which help learners. By creating the object libraries, these objects can be reused or combined with other objects. These objects can be curriculum, information objects, testable objects, training components etc.

Human factor: This is the study of how to introduce information systems to human beings and make their work life easier (Berg, 2003).

Usability: A computer system is effectively manipulated by the user in order to assist in performance of tasks (Berg 2003). Usability

is therefore associated with the functionality of the system.

Interface design: Interface design is the part of HCI and is related to input, output devices such as keyboard, mouse, screens etc (Berg 2003).

Possibilities of E-learning: What is supposed to be unchangeable, has been in other times and place organised quite differently and therefore human possibilities are in almost every way greater than we ordinarily imagine (David, 2007, p1). A possibility of E-education means that, what we can do with the help of E-learning. It's all about the imagination of the potential of E-learning.

Limitation of E-education: Limitations are the boundaries which interfere with the possibilities after a certain extent. For E-education systems the limitations are its technologies, without which it cannot be implemented. Other limitations of E-education systems are that it does not support when physical existence is required for experiments. If education could not be justified without laboratory work, then that kind of education could not be achieved from distances by just watching and reading.

Basics of e-education: The evolution of internet and World Wide Web (WWW) has affected all part of life dramatically. Also the area of education has not remained untouched. Previously, student used to spend their time in library searching for information in books and journals. Now days they use web search engines and figure out the web sites containing the required information. The information sharing has become very easy due to access to Internet.

Before delving further into the impact of internet on education, let us try to understand the terms teaching, education and learning. In order to understand these, one need to find how a person acquires the knowledge. An immediate observation is that teaching, education and learning all have a common purpose, i.e., to impart knowledge to their subjects to enable them to do certain tasks. Elaborating further, learning is done by subjects and the process involves cognitive abilities of subject, which leads to learning via experience via all the senses. Teaching is the effort done by teacher (instructor). The system where teaching and learning both happen in a harmonious fashion is education.

Consequently, education is a paradigm. Teaching in essence creates an environment which leads to learning experience for the student. The ability of teacher lies in the fact that he can create an environment which leads to a certain desired experience for the student. In the conventional scenario, the teacher takes the feedback by evaluating the students through examination or by the questions asked by the students. On the basis of this feedback, the environment is modified to enable the student to learn. The mechanism by which teaching and learning take place constitutes education. In conventional scenario, the education system consists of teacher, black board, chalk, books, students, classroom and laboratory and interaction between them. The teacher uses this environment to create problems for student and then guides them through to experiences leading to desired learning.

Here one important point is that all the components except teacher and students of an education system are dependent on technology and has evolved over the development of civilization. With the evolution of internet and proliferation of computing devices all over with the progression of time, the tools are going to change. But their basic essence is going to remain same. One can classify the tools of an education system as follows _ study material - can be in form of book, can be delivered on line, web pages etc..

_ Interactivity tools - Black board, white board with writing tool (chalk etc.)

_ Space - classroom and associated facility – Infrastructure for operation of educational system.

Information communication technology defined: Information technology (IT) is a term used to describe the items of equipment (hardware) and computer programmes (software) that allow us to access, retrieve, store, organise, manipulate and present information by electronic means. Personal computers, scanners and digital cameras fit into the hardware category; database programmes and multi-media programmes fit into the software category.

Communication technology (CT) is a term used to describe telecommunications equipment through which information can be sought, sent and accessed – for example, phones, faxes, modems and computers.

Information and communication technology (ICT) represents the convergence of information technology and communication

technology. ICT is the combination of networks, hardware and software as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge.

Digital literacy is the ability to appreciate the potential of ICT to support innovation in industrial, business, learning and creative processes. Learners need to gain the confidence, skills and discrimination to adopt ICT in appropriate ways. Digital literacy is seen as a "life skill" in the same way as literacy and numeracy.

Information literacy is the ability to locate, evaluate, manipulate, manage and communicate information from different sources. As learners become increasingly information-literate, they develop skills in discrimination, interpretation and critical analysis. ICT offers opportunities for higher-order thinking and creativity in processing, constructing and conveying knowledge.

e-learning is flexible learning using ICT resources, tools and applications, and focusing on interaction among teachers, learners, and the online environment and on collaborative learning. e-learning usually refers to structured and managed learning experiences, and may involve the use of Internet, CD-ROM, software, other media and telecommunications.

Online learning refers more specifically to the context of using the Internet and associated web-based applications as the delivery medium for the learning experience.

The significance of e-Education: New models of learning are radically changing our conception of education. Education for human development in the learning society requires collaborative learning and involves focusing on building knowledge. These changes arise from shifts in educational goals, and from new concepts in learning and knowledge creation.

The Department of Education believes that developments in ICT create access to learning opportunities, redress inequalities, improve the quality of learning and teaching and deliver lifelong learning. ICT can accommodate differences in learning styles and remove barriers to learning by providing expanded opportunities and individualised learning experiences.

Experience worldwide suggests that ICT does play a role in the transformation of education and training. ICT can enhance educational reform by enabling teachers

and learners to move away from traditional approaches to teaching and learning. In a transformed teaching and learning environment, there is a shift from teacher-centred, task-oriented, memory-based education (with technology at the periphery), to an inclusive and integrated practice where learners work collaboratively, develop shared practices, engage in meaningful contexts and develop creative thinking and problem-solving skills. There is sufficient empirical evidence that investments in ICT yield positive results for learners and teachers. Studies have demonstrated improved learner achievement in:

• application and production of knowledge for the real world;

• ability of learners to manage learning;

• ability to promote achievement for learners who experience barriers to learning; and

• access to information that increases knowledge, inquiry and depth of investigation.

Furthermore, the use of ICT has demonstrated improved inventive thinking skills, such as creativity, problem solving, higher-order thinking skills and sound reasoning, along with improved effective communication. Improvements in interpersonal skills, such as writing, public speaking, teamwork and collaboration, and improved productivity skills, including creating high-quality products, have also been reported.

ICT encourages a teaching and learning milieu that recognises that people operate differently, have different learning styles and have culturally diverse perspectives. ICT embraces inclusive education by providing opportunities, alternative methods of instruction and flexible assessments for learners who experience barriers to learning.

Benefits to the broader society include increased opportunities for lifelong learning, communication and exchange essential to democratic living and the creation of a pool of globally competitive human resources.

E-Education policy goal: The achievement of the e-Education goal will require the development of schools that are learning organisations consisting of a community of both teachers and learners. In such schools, teachers and learners will be able to think about what is worth knowing about education and new technologies along

three dimensions, namely, operational, cultural and critical.

Conclusion:

• The operational dimension attends to the skills that are necessary for the use of new information and communication technology. Demonstrated acquisition of these skills is as important as the process by which they are acquired. Approaches that employ an elaborate human network of support among teachers and learners, and espouse a collective approach to knowing and problem solving, are rich and powerful for the processes of learning and knowing about ICT in education. In order to facilitate collective learning, provincial departments will establish opportunities for schools to learn together and from each other about ICT in education.

• The cultural dimension involves stepping into the culture that supports the practice of using ICT for educational purposes, regardless of one's level of expertise. This requires teachers to move beyond a purely instrumental role that views ICT as an educational add-on, to regarding technology as something that poses interesting and important questions for administration, curriculum and pedagogy.

• The critical dimension invites teachers and learners to step outside the culture and ask questions about the taken-for-granted assumptions that are embedded in the success stories about ICT inside and outside of schools. This requires a critical dialogue, analysis among teachers and research resources to provoke and expand teachers' perspectives on the benefits of ICT.

E-schools will therefore be characterized as institutions that have:

• Learners who utilize ICT to enhance learning;

• Qualified and competent leaders who use ICT for planning, management and administration;

• Qualified and competent teachers who use ICT to enhance teaching and learning;

• Access to ICT resources that support curriculum delivery; and

• Connections to ICT infrastructure.

E-Schools will connect with the community. An e-school will:

• Allow community access to its computer facilities after hours;

• Receive support from the community and local SMMEs to maintain and sustain ICT interventions; and

• Serve as a venue for business advisory services and training for community based small computer and repair businesses.

The Department of Education will determine the basic ICT tools to be supplied to each institution defined as an e-school.

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