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INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN EDUCATION

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1. Introduction

Globalization and technological change—processes that have accelerated in tandem over the past twenty years—have created a new global economy "powered by technology, fueled by information and driven by knowledge".[1] When the first computers made their entry into schools in the late 1970s, people used to talk about computers in education. With computers came printers, floppy disk drives, canners and the first digital cameras. We began to use the term IT, or Information Technology, to describe computers and these various peripheral devices. Then the internet arrived together with computer networks, the World Wide Web, email and search engines. A new term entered the language – ICT. ICT is an acronym that stands for **Information Communications Technology.** The term ICT, short for Information and Communication Technologies, embraces the many technologies that enable us to receive information and communicate or exchange information with others.

ICTs stand for information and communication technologies and are defined, for the purposes of this primer, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information."[2] However, apart from explaining an acronym, there is not a universally accepted definition of ICT. That is so, because the concepts, methods and applications involved in ICT are constantly evolving on an almost daily basis. It is difficult to keep up with the changes - they happen so fast. ICT comprise many technologies for capturing, interpreting, storing and transmitting information. The term ICT is plural, referring to a great many technologies. To sum up, ICT is an all encompassing term that includes the full gamut of electronic tools by means of which we gather, record and store information, and by means of which we exchange and distribute information to others. (UNESCO Bangkok Asia and Pacific Regional Bureau for Education ICT TRANSFORMING EDUCATION) [3]

2. Exponential growth in information and knowledge – Skills for 21st century

Any child born since the beginning of this century is growing up in a digital world. Those born at the start of the century, already in the middle years of primary school, have been dubbed the "Net generation" or, more descriptively, "digital natives". [4] Notwithstanding regional differences, governments generally recognize that along with national ICT policies students need education or training in new ICT skills if they are to function in the changed global environment. The new kind of skills required is driven in large part by the exponential growth of information in repositories around the world. Students need to develop information literacy and other related skills to search for information from these seemingly unlimited sources on the internet, to evaluate this information and to select wisely from it. An organization known widely for its analysis of skills required for 21st century student success in the new global economy is Partnership for 21st Century Skills (P21).The members of P21 include most major multinational information technology corporations, together with key education, library, publishing, industry and media organizations. Based in the United States, P21 has a mission to serve as a catalyst to position 21 st century skills at the centre of K-12 education. Although US-based, many of the materials developed, with only minor adaptation, are appropriate for the Asia-Pacific region. The broad sets of skills identified by P21 that students need for the 21st century, namely:

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Digital Age Literacy	• Basic scientific, mathematical, and technological literacies • Visual and information literacies • Cultural literacy and global awareness
Inventive Thinking	• Adaptablility and ability to manage complexity • Curiosity, creativity, and risk-taking • Higher-order thinking and sound reasoning
Effective Communication	• Teaming, collaboration, and interpersonal skills • Personal and social responsibility • Interactive communication
High Productivity	• Ability to prioritize, plan, and manage for results • Effective use of real-world tools • Relevant, high quality products

"The enGauge 21st-Century Skills" is adapted from materials provided by NCREL, North Central Regional Education Laboratory (http://www.ncrel.org/engauge/skills/21skills.htm*).*

Information literacy, media literacy and ICT literacy form one of the four broad sets of skills identified by P21 that students need to acquire to be effective citizens and workers in the 21st century. At the core of digital literacies are reading and writing, not only page reading and writing on paper, but also their electronic extensions – on the one hand, screen reading and internet surfing [reading],and on the other hand, texting, keyboarding, and mailing [writing]. (**UNESCO Bangkok,** Asia and Pacific Regional Bureau for Education)

3. Impact of ICT on school, teaching and learning

In recent years there has been a groundswell of interest in how computers and the Internet can best be harnessed to improve the efficiency and effectiveness of education at all levels and in both formal and non-formal settings. But ICTs are more than just these technologies; older technologies such as the telephone, radio and television, although now given less attention, have a longer and richer history as instructional tools. [5] For instance, radio and television have for over forty years been used for open and distance learning, although print remains the cheapest, most accessible and therefore most dominant delivery mechanism in both developed and developing countries. [6] The use of computers and the Internet is still in its infancy in developing countries, if these are used at all, due to limited infrastructure and the attendant high costs of access. Moreover, different technologies are typically used in combination rather than as the sole delivery mechanism. For instance, the Kothmale Community Radio Internet uses both radio broadcasts and computer and Internet technologies to facilitate the sharing of information and provide educational opportunities in a rural community in Sri Lanka. [7]

The Open University of the United Kingdom (UKOU), established in 1969 as the first educational institution in the world wholly dedicated to open and distance learning, still relies heavily on print-based materials supplemented by radio, television and, in recent years, online programming. [8] Similarly, the Indira Gandhi National Open University in India combines the use of print, recorded audio and video, broadcast radio and television, and audio conferencing technologies. [9] An important and forward-looking book from UNESCO, Teacher Development in an E-Learning Age (Resta and Patru,2010) [10] ,describes how teachers ' roles are changing as a result of implementing ICT in their classrooms. There has a shift from teacher as a knowledge transmitter; a primary source of information, controlling and directing all aspects of learning to a learning facilitator, collaborator, coach, knowledge navigator and co-learner teacher giving students more options and responsibilities for their own learning. The use of ICT also brings about changes in student roles, there is a shift from passive recipient of information, reproducing knowledge and learning as a solitary activity to

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being an active participant in the learning process, producing knowledge and learning collaboratively with others.

The first revolution came with the invention of written language, which meant that for the first time people could store information and retrieve it without needing to rely on memory. The second revolution that occurred in the middle of the fifteenth century came with the invention of the printing press. With this revolution, information in books and pamphlets could be disseminated much more widely and quickly. The third revolution brought about by ICT is accelerating the dissemination of information and knowledge. (UNESCO Bangkok Asia and Pacific Regional Bureau for Education ICT TRANSFORMING EDUCATION) The Director of UNESCO Asia and Pacific Regional Bureau for Education, raised in his opening address at an international conference in China (Kim, 2009) [11]The internet and such services as Google and email, together with numerous new by-products like Wikipedia, Skype, Facebook and Twitter are transforming further the way we live, learn, work and play. In suggesting the emergence of a possible fourth revolution, Kim described how in some countries learning is moving beyond the walls of the classroom, and that new terms have been coined to express these innovative ways of learning, terms like: m-learning or mobile learning, and u-learning or ubiquitous learning.

4. Role of ICT – a powerful tool for extending educational opportunities

Groups traditionally excluded from education due to cultural or social reasons such as ethnic minorities, girls and women, persons with disabilities, and the elderly, as well as all others who for reasons of cost or because of time constraints are unable to enroll on campus. Anytime, anywhere. One defining feature of ICTs is their ability to transcend time and space. ICTs make possible asynchronous learning, or learning characterized by a time lag between the delivery of instruction and its reception by learners. Online course materials, for example, may be accessed 24 hours a day, 7 days a week Access to remote learning resources. Teachers and learners no longer have to rely solely on printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at anytime of the day and by an unlimited number of people. This is particularly significant for many schools in developing countries, and even some in developed countries, that have limited and outdated library resources. ICTs also facilitate access to resource persons - mentors, experts, researchers, professionals, business leaders, and peers—all over the world. [12] Improving the quality of education and training is a critical issue, particularly at a time of educational expansion. ICTs can enhance the quality of education in several ways: by increasing learner motivation and engagement, by facilitating the acquisition of basic skills, and by enhancing teacher training. [13]

5. Modes of learning are different in the 21st century

Digital literacy (or in the plural digital literacies), e-literacy, new literacies, screen literacy, multimedia literacy, information literacy, ICT literacies – these are all terms to describe clusters of skills that students (and their teachers) need in the digital age of the 21st century. The term e-learning is apt for education because it combines in its name e (electronic) and learning. Where ICT provide the vehicle, e-learning can be described as the journey, with increased knowledge, understanding and skills as the destination. In other words, we use ICT to participate in various electronic learning activities. Underlying these activities are all the electronic devices that enable learners to connect to networks – the World Wide Web or simply the web – and associated web technologies like browsers and search engines that allow learners to interact with content on the web.

E-learning is commonly referred to the intentional use of networked information and communications technology in teaching and learning. A number of other terms are also used to describe this mode of teaching and learning. They include *online learning*, *virtual learning*, *distributed learning*, *network* and *web-based learning*. The term e-learning comprises a lot more than *online learning*, *virtual learning*, *distributed learning*, *networked* or *web-based learnin* g. As the letter "e" in e-learning stands for the word "electronic", e-learning would incorporate all educational activities that are carried out by individuals or groups working online or offline, and synchronously or asynchronously via networked or standalone computers and other electronic devices. (Som Naidu, 2006)[14] There is no universally agreed upon definition of e-learning. One writer defines e-learning as "pedagogy empowered by digital technology "(Nichols,2008) [15] Others list variations of e-learning. The differences lie generally in what electronic devices for learning are included in the definition. The UNESCO publication, Teacher Development in an E-learning Age: A Policy and Planning Guide ,the approach here is to start with the observation that e-learning is learning by communicating using the internet and

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interacting with content accessed on the internet, all within the context of sound pedagogy. This approach shows e-learning to have two dimensions:

1.Communication – communicating using the internet or web; and

2.Content – content on the web..

The two dimensions of e-learning, communication and content, put them together to build a two-dimensional model of e-learning. In a way that is not possible when working with a single dimension, we can now position different categories of e-learning within the two axes as each varies along both communication and content dimensions results Four basic categories of e-learning.

1. E-resources refer here to information and learning resources on the web that are available for access by teachers and learners for instruction.

2. Online courses are offered by many teaching institutions around the world, usually for a fee, and often as part of a diploma or degree

3. Blended learning is a term to describe learning that combines different learning environments: typically the use of learning via the web and face-to-face teaching. Thus blended learning can combine the use of web instructional tools or online courses and traditional teaching methods such as teacher instruction, discussion, seminars and tutorials.

4. Communities of practice are groups of people such as teachers or even students who share a common interest. Communication between members may be by email, by videoconferencing, or increasingly by using social networking tools. (UNESCO Bangkok Asia and Pacific Regional Bureau for Education ICT TRANSFORMING EDUCATION) Blackboards have been a standard feature in classrooms since they were invented in 1801.

Then the whiteboard was introduced with its marker pens that eliminated messy chalk. Classrooms of tomorrow are installing interactive whiteboards, connected to a computer and projector. Research studies around the world show that ICT help to broaden access to education as well as improve learning outcomes. The new ICT tools allow further kinds of interactive learning. Connected to a computer and projector, interactive whiteboards allow students in classrooms to see displayed on a large board whatever is running on the connected computer. Virtual excursions, virtual field trips, and web tours are various terms used to describe organized student online learning experiences around visits to different places. Audio conferencing or video conferencing facilities that allow students in one location to meet with and hold discussions with others in a remote location. interactive whiteboards enhance interactive learning in classrooms, videoconferencing and audio conferencing enable interactions with the outside world. Mobile learning and its shortened form m-learning are terms increasingly encountered in educational circles. In an early working paper on learning/teaching/tutoring in a mobile environment, O 'Malley and his co-workers (2003,p.6) [16] define m-learning as "learning that takes place via such wireless devices as mobile phones, personal digital assistants (PDAs),or laptop computers ". New devices like the iPad and slates extend further the range of devices that enable e-learning. M-learning, then, widens the scope of e-learning. The mobility provided by hand-held, portable devices like smart mobile phones and other mobile technologies removes some of the limitations of learning in fixed locations. This increased mobility for learners gives rise to yet another term, ubiquitous learning or u-learning , where opportunities for learning are expanded even further.

In the United States in particular, university students frequently have access to computers in class. Sometimes, the university provides personal computers (PC), but increasingly, the installation of wireless loops allows students to use their own laptops for access to the Internet anywhere in the university buildings, including in class. Although these are widely used for teaching scientific subjects, anecdotal evidence suggests that they are less useful for teaching other courses. Instead, lecturers are growing used to the idea that they have to compete with the Internet and e-mail for their class's attention.[17] From December 2008 the Korea National Open University (KNOU) initiated a mobile learning system under a memorandum of understanding with the Korean Telephone Company, KT.Mobile learning, or m-learning, is novel in that it facilitates delivery of learning to the right person, at the right time, in

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the right place, using portable electronic devices. In the near future, m-learning could become a normal part of open and distance learning for lifelong education and self-directed learning. At KNOU, m-learning is expanding to almost every department in the university.

6. Conclusion

This paper has sought to explore the role of ICT in education has argued that ICTs have impacted on educational practice in education and that ICT will become a strong agent for change among many educational practices to advance learning and is a powerful means of supporting students and teachers in transforming education. Undoubtedly, ICTs are potentially a useful tool both for managing education and for teaching. Well-designed ICTs can allow educators to reach new groups of potential students, particularly mature students, lifelong learners, students with physical disabilities, students in employment and students who are far from education centres. Though it may involve heavy initial costs to prepare teaching materials, and recurrent costs to replace hardware and software. Many education policy-makers seriously underestimate the total costs of operating ICT-based learning. At the same time, the role of ICT in education is becoming more and more important and this importance will continue to grow and develop in the 21st century. Finally, technology is never a substitute for good teaching. Without skilled instructors, no electronic delivery can achieve good results

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