# Teaching and Learning in the 21st Century: Digital Literacy Skills for Tertiary Education Teachers in Developing Countries

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## Abstract

This paper focuses on digital literacy skills required to teach and impart knowledge to students of this 21st century. The researchers analytically emphasised the concept of digital literacy, examining its three vital aspects, namely, technology literacy, ICT literacy and information literacy. The core or basic skills required, which also serve as the audit yardstick for measuring digital literacy skills possessed by teachers, were clearly tabulated and summarised. Hence, it was observed that the challenge of the present day educational institutions in developing countries is to shift from their traditional methods of being mere venues for the transmission of prescribed knowledge/information from a teacher to students in a given time and place to a technology-driven space which permits the acquisition of knowledge and skills for continuous learning. The way forward is outlined.

**Keywords:** *Digital Literacy, Technology Literacy, Information Literacy, ICT Literacy, Tertiary Education Teachers*

## Introduction

The 21st century, like many other centuries, came with its own revolution, this time, the information revolution. Teaching and learning in the 21st century focuses on information analysis, evaluation, synthesis, and creation that are critical for sense-making in the vast world of information resources (Dede, 2010; Dede 2011). Consequently, various concepts relating to the skills and tactics needed for reading and writing in digital environments has become burgeoning issues that gave birth to what is known as digital literacy. This also includes the necessities for participating in online knowledge creation and exchange such as simulation, appropriation, collective intelligence, transmedia navigation and networking. Thus, this paper, analytically, navigates along education, briefly juxtaposing the past and the present, and diving into establishing the central role of digital literacy in teaching and learning nowadays, with a particular focus onss tertiary education teachers.

## Education in the Past and in the Present: An

## Overview

A teacher is a person who provides education for students. Education, by general definition, is the transfer of knowledge from one person to another. It is a system or practice of teaching and learning. Education has been an age-long exercise. It, however, took a formal shape after the fifteenth century. Consequently, education - the transfer of knowledge - was undertaken in schools, though, as religious principles with the primary purpose of training the clergy. Later on, in the seventeenth century, the concept changed and thus, involved the teaching of men and women who will take up manufacturing and service-sectored jobs. Government came into the scene at this time and the monopoly of Monasteries to teaching and learning was decentralized (Cubberley, 1920).

In the late 19th century, most of the West, Central, and parts of East Europe began to provide elementary education in reading, writing, and arithmetic, partly because politicians believed that education was needed for orderly political behaviour. As more people became literate, the need for secondary education sprang up. As a follow up to making many people educated, after the First World War, a revolutionary education conference was held in London at the International Health Exhibition Centre. The conference attracted education specialists from all over Europe and around the world. The aftermath metamorphosed into the twentieth century education, which cuts across primary, secondary and tertiary education. At this time, the educator (teacher) was one who must have obtained specified professional qualifications from a university or college of education. Their teaching role is seemingly simple; revolving around the ability to study their teaching materials properly with an aim to understanding what to teach the students.

However, during this period, teaching materials were insufficiently available for tertiary education. In Africa, works of knowledge were restricted by geographic locations and access to them involved huge expenses that scarcely would a tertiary education teacher purchase up to half of what he needs as teaching text and resources (Peterson, 2010). Hence, the possibility of accessing a handful of teaching materials, at a point in time, rested on the libraries. Because of this dearth, most teaching materials or notes that the tertiary education teachers used had to be the same for several years, handed down from one teacher to another, year after year, with little or no modifications (Malcolm, Long & Chamberlain, 1999 cited in Beets & Louw, 2005). This situation continued until this twenty-first century - an era of knowledge explosion. The proliferation of works of knowledge around the globe in this era, together with the birth of information and communication technologies (ICT), particularly the Internet, has jettisoned the traditional approach of teachers in general and tertiary educators in particular to teaching methods and practices. Hence, going by the general definition of education as a process of transferring knowledge from one generation to another, knowledge of nowadays and the methods of transferring it are changing rapidly. And, only digital literate teachers can function effectively in the stage that we are now (International Summit on ICT in Education, 2011).

## Digital Literacy

Digital literacy is the ability to effectively and critically search, find, evaluate and create information using a variety of digital technologies. (http://en.wikipedia.org/wiki/Digital_literacy). The concept of digital literacy lies in the ability "to recognise and use that power, to manipulate and transform digital media, to distribute pervasively, and to easily adapt them to new forms" (Jenkins, 2009). Digital literacy does not replace traditional forms of literacy. It builds upon the foundation of traditional forms of literacy (Selfe, 1989). Digital literacy is the marrying of the two terms *digital* and *literacy*. The former is an electronic technology that generates, stores, and processes data in terms

of two states: positive and non-positive. The latter is the ability to read and write, but, more conventionally, it refers to the competence and knowledge required to decode, assess and use media and electronic text. Thus, digital information is a symbolic representation of data, and literacy refers to the ability to read for knowledge, write coherently, and think critically about the written word. This is an indispensable skill for teachers in this knowledge society (the 21st century).

In fact, the concept of digital literacy has evolved so much so that it has precipitated into clusters of research. Digital literacy researchers explore a wide variety of topics, including how people find, use, summarise, evaluate, create, and communicate information while using digital technologies. The technologies, as dependable variables, include variety of hardware platforms, such as computer hardware, cell phones and other mobile devices, and software or applications, including web search or Internet applications. Nonetheless, the yardstick for measuring the possession of digital literacy is spread across three aspects namely, technology literacy, ICT literacy, and information literacy. Hence, tertiary education teachers that must be relevant to the "digital native" students of nowadays must be balanced on these three digital literacy aspects (Gui & Argentin, 2011). These three vital aspects of digital literacy are herein discussed.

### Technology Literacy

Liddell and Scott (1980) define technology "as the making, modification, usage, and knowledge of tools, machines, techniques, crafts, systems, and methods of organisation in order to solve a problem, improve a pre-existing solution to a problem, achieve a goal, handle an applied input/output relation or perform a specific function". This means that technology is the application of scientific knowledge for practical purposes. In other words, technology literacy refers to the competencies and knowledge required to handle technology. Elaborately, technology literacy can be defined as the ability of

an individual, independently or with others, to responsibly, appropriately and effectively use technology tools to access, manage, integrate, evaluate, create and communicate information.

Hence, as it concerns tertiary education teachers, The International Summit on ICT in Education (2011) has adopted technology at all levels of formal education. Instructional technologies are highly recommended these days. The implication is that tertiary education teachers of today must become technology-literate in order to fit into the system. Research has shown that digital native students - students who are not only born in this 21st century but also are digitally-compliant - cannot do well in class without sufficient incorporation of instructional technologies into their teaching (Moseley, 2010). As a matter of fact, as we transit from the current generation of students to the next, the usefulness of our teachers' current methods of using technology in education will be diminished (Prensky, 2001; Gee, 2003; Johnson, 2005) and the "diminish" is as a result of "the disparity between the technological skills/interests of new students and the limited/unsophisticated technology use by present day teachers" (Bennett, Maton & Kervin, 2008). Indeed, studies have shown that there is a positive relationship between a technology-rich environment and academic achievement, especially when students and their teachers have the requisite skills to take advantage of the technology (Baker, 2007 cited in Moseley, 2010). However, for the benefit of tertiary education teachers who may not be able to determine whether they are technology literate or not, Becker, Hodge and Sepelyak (2010) have summarised technology literacy into three dimensions, namely: knowledge; critical thinking/decision making; and, capabilities. In summarising these three dimensions, it appears obvious that a technology literate teacher is one who:

- recognises the inescapable role of technology in everyday life
- understands the basic parts of a technology system; as in computers, identifies the keyboard,

mouse, monitor, etc.

- understands what he can do with the identified components of the technology system
- understands how the technology system functions
- differentiates his roles from that of the technology; he understands the principles of cabbage-in (input) and cabbage-out (output)
- understands that technology has its costs and benefits both economically, socially and otherwise
- evaluates the benefits and risks in the use of technology
- weighs available benefits, risks, costs and trade-offs of technology in a systematic way
- participates, when appropriate, in decision about the development and uses of technology
- operates a variety of home and office appliances and uses a computer for word processing and surfing the internet
- identifies and fixes simple mechanical or technological problems at home or at work
- makes informed judgment about technological risks and benefits
- uses technology to solve problems that may be encountered in daily life
- can obtain information about technological issues of concerns from variety of sources

Notably, a good number of technologies has been employed into the 21st century education. Tertiary educators, therefore, have got to be technology literate in order to handle the varying teaching and learning technologies produced every day, which cut across most common technologies such as: audio CD players, audio tape cassette recorders, DVD players, overhead projectors, and electronic whiteboards; and is precipitating to the relatively complex technologies such as iClickers, tripod screens, learning space, huskycast, web and video conferencing, among others. As a matter of fact, technological literacy, for tertiary education teachers, brings to the teacher the awareness of the interplay between technology and society and positions them to understand the technological

principles needed to develop relevant solutions and achieve goals.

### ICT Literacy

ICT literacy is a term that is used to describe the extent of knowledge and proficiency in the use of information and communications technology (ICT) systems. ICT systems mainly relate to the use of computers. In the context of tertiary education, ICT literacy refers to the skills needed to make effective and efficient use of ICT in teaching and research. ICT literacy has become pertinent because of the increasing use of computer in our daily communication and work. This situation has affected the way present day students learn research and communicate. Their educators, especially, at the tertiary level, should therefore learn to adapt to these changing times. Such educators should acquire ICT literacy, particularly the skill to operate computer systems to enable them share their works of knowledge like books, articles and other research publications with their students. There is no doubt that element of ICT literacy such as ability to work with word processing, spreadsheet packages, data management and data analysis programs and others have become essential requirements for the 21st century educators.

In recent times, assessing the level of ICT integration into teaching and the ICT competencies of teachers has constituted the quantum of research in ICT literacy (Barton, 1998). Majority of such researches have revolved around what teachers are able to do and/or what they cannot do with the computer system. However, several attempts have been made in a couple of researches as to what, *ab initio*, are ICT skills which researchers assess their possessions by persons (Higher Education, 2004; Wen & Shih, 2008). In the light of this, it is imperative that tertiary education teachers be presented with a comprehensive analysis of various ICT skills, from the basic skills to the advanced levels, so that they can understand at a glance what ICT skills qualify a teacher to become ICT literate. This analysis is shown in Tables 1 and 2.

**Table 1:Basic ICT Literacy Skills for Tertiary Education Teachers**

| |
|---|
| ***Using the computer*** |
| Turning a computer on and off |
| Opening and closing applications and programmes |
| Using the mouse to select and move items on a screen |
| Printing out documents |
| Saving and filing a document |
| Setting up ICT equipment including projectors |
| ***Word processing*** |
| Using basic Word functions (e.g. spell check) |
| Using the tool bar for editing documents by selecting font size and style, etc. |
| Using programmes to design layouts for a poster or flyer |
| Creating cells and tables to display information within a document |
| Adding links to internet pages and websites within a document |
| Incorporating data or charts into a document |
| Saving a document or file in different formats (JPEG,etc.) |
| ***Spreadsheets and databases*** |
| Creating a spreadsheet (e.g. Microsoft Excel) |
| Entering numerical data into cells |
| Using Excel tools to add up totals on a spreadsheet |
| Creating and entering formulas within a spreadsheet |
| Using Excel to create graphs and charts |
| Using a spreadsheet to create a database |
| Using filters to display data within a spreadsheet |
| ***Handling files*** |
| Creating and managing files and folders |
| Copying and moving files into different folders for storage |
| Locating a file or folder |
| Storing information on a CD or DVD |
| Storing files using a USB device or a memory stick |
| ***Creating presentations*** |
| Creating slides for a presentation using PowerPoint |
| Using a computer connected to a digital projector to deliver a PowerPoint Presentation |
| Using an overhead projector to deliver a presentation |
| ***Using the internet*** |
| Logging onto the internet |
| Searching for information using search engines such as Google |
| Downloading files from the internet |
| Organising websites, bookmarks and favourites |
| Composing, sending and receiving e-mails |
| Using your address book and contacts list |
| Navigating local intranet sites to access information |
| Communicating with others via discussion forums and blogs |

*Adapted from Teaching Agency (2012).*

In the international scene, tertiary education teachers are mandatorily required to possess more than fifty percent of the ICT skills displayed in Tables 1 and 2 (Teaching Agency, 2012). The basic skills are compulsory and cannot be compromised. The skills do not only constitute what qualifies a teacher to be ICT literate but also forms a model

training syllabi for tertiary education teachers who want to undertake ICT training. Besides, these skills naturally form the indices for every balanced ICT skills audit. The entirety of the ICT skills outlined so far constitutes all that is required of every tertiary education teacher to make effective and efficient use of ICT in teaching, learning and research.

**Table 2:Advanced ICT Literacy Skills for Tertiary Education Teachers**

| *ICT application in the classroom* |
| --- |
| Using ICT in lesson planning and preparation |
| Using ICT in administrative tasks such as students' course registration, etc. |
| Using ICT for monitoring, recording, and assessing pupils' attainment, progress, and needs |
| Using correct procedures and terminology during lessons |
| Teaching whole class lessons using ICT |
| Using CD-ROMs to deliver a lesson |
| Evaluating the content of ICT resources in relation to age ranges, ability, and social background of pupils |
| Accessing current health and safety legislation relating to the use of Computers |
| Setting up computer login details and passwords for pupils |
| Using computer generated visual images to enrich and enhance learning in the classroom |
| *Using ICT with other media resources* |
| Using ICT to plan and prepare a lesson to be delivered on an interactive whiteboard |
| Using an interactive whiteboard to deliver a lesson |
| Using a digital camera to take photographs |
| Transferring images from a digital camera to a computer |
| Using a digital video camera for filming and recording |
| Incorporating the use of television, VCR and DVD into a lesson |
| Using a scanner to transfer images to a computer |
| Creating and editing movies via computer programmes |
| Using audio recording devices |
| Transferring sound files from a recording device to a computer |
| *Additional higher competencies* |
| Loading and running new software onto a computer |
| Compressing large files using a zip programme, and being aware of different formats when saving files (JPEG etc.) |
| Creating and maintaining web pages/a website |
| Managing large databases |
| Setting up a computer network |

*Adapted from Teaching Agency (2012).*

## Information Literacy

Information literacy, also known as information competency, refers to the aggregate of skills, abilities and competencies which information users need to possess for the utilisation of information in all its formats. It is an individual's ability to recognise information need(s), locate, evaluate and utilise accordingly the needed information. The concept has evolved in the light of changing demands in the information environment of societal members; but remains an essential ingredient lacking in the educational system of many developing countries, despite the fact that its application are landmarks in all teaching, learning and research journey (welshlibraries.org/skills/information-literacy/). In the context of tertiary education teachers, information literacy enables teachers to master content and extend their investigations, become more self-directed, and assume greater control over their own teaching and research activities (University of Auckland website: https://www.library.auckland.ac.nz/instruct/il/uoa.htm). Possession of information literacy skills implies that a teacher would not only be able to identify, access, evaluate and ethically use educational resources, but prospectively, manage tasks at workplaces, fitting perfectly in lifelong learning and other further professional development activities (Shinew & Walter, 2003).

Nowadays, learning resources are as engaging as they are complex. Learners are both users and creators of information content with a world of dynamic visual, audio, interactive, and text-based resources all within and outside the virtual library. Teachers who establish strong information literacy skills are better able to guide the development of these skills in their own students and provide resource-rich, inquiry-based learning environments. This has informed the interest of global educationists in assessment of information literacy standards for teachers, in this case tertiary education teachers. The following set of information literacy standards draws from those proposed by the American Library Association (ALA) Instruction for Educators Committee of United Kingdom on June 2010 (http://connect.ala.org/files/39851/ebssstandardsrvsdjune0610). The standards, however, are modelled on the Association of College and Research Libraries guide to Information literacy competency standards for higher education (ACRL, 2000) and mirror the stages of the research process to include: defining and articulating the need for information, plans strategies, and selects tools to find that information; locating and selecting information based on its appropriateness to the specific defined information need; organising and analysing information for appropriate use for the specific defined information need; processing, synthesising and presenting the information in a way that is appropriate for the purpose for which information is needed; evaluating individual pieces of information for appropriate use as well as the information seeking process as a whole; knowing how to ethically use and disseminate information

Comparatively, a tertiary education teacher that is information literate is one who is able to determine the extent of information needed for teaching and research; access the needed information effectively and efficiently; evaluate the information and its sources critically; incorporate selected information into his knowledge base; use information effectively to accomplish a specific purpose; and understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally.

In sum, a tertiary education teacher becomes information literate the moment he or she understands the concept of information; the various sources of information; the various information access tools; information search strategies, both in traditional libraries and on the Internet; how to evaluate information sources and be sure of their credibility and reliability; how to cite information sources using the recommended referencing methods adopted in his discipline; and, the legal issues in the use of information, such as avoidance of copyright infringement and plagiarism.

## Where and How Would Tertiary Education Teachers Obtain Digital Literacy Skills?

First and foremost, it should be noted that Information Technology (IT) and/or Information and Communications Technology (ICT) are disciplines of study. Although, the acquisition of, at least, basic skills in these areas of knowledge has become compulsory for virtually everyone and for every discipline cum profession, the totality of knowledge and expertise required to teach and learn the skills are primarily within the domain of the IT and ICT based academic disciplines of tertiary institutions. As for information literacy, its teaching and learning fall within the ambit of library and information professionals. Librarians are the foremost taxonomists of knowledge. Information literacy skills - primarily concerned with the ability to understand information needs, search for information, determine the right or reliable information, use the information ethically and legally, etc. - are imparted by librarians. The programme is embodied in the library and information science profession.

In developed societies, teachers undertake information literacy trainings from academic librarians (in tertiary institutions) or from teacher-librarians (in K-12, high schools and the likes). The programme is built into the curriculum of the teachers' education and is instructed by a librarian. For the avoidance of doubt, it should be noted that creating metadata (call it digital catalogue cards) which is the online description of information materials is one of the professional duties of librarians (digital librarians). Thus, the librarian has the professional ability to decode an information need, determine the right materials needed to research on the problem, verify their reliability, observe all ethical standards and define the legal principles (copyright, public domain, fair use, etc.) behind the use of the information material. These are facts worthy of note.

Nonetheless, taking cognizance of the rapid change conveyed in the 21st century wagon, learning to learn is paramount and is invariably turning a lot of brilliant people into teachers of technology and its science, irrespective of their professions. This has led to the establishment of several means of acquiring knowledge outside the traditional educational institution. Already, there are increasing numbers of ICT resource centres that offer short-time certificate programmes to people and indeed impart the right knowledge to them. Thus, for tertiary education teachers, acquiring technology, ICT and information literacy skills can be in any of the following:

i.   Tertiary institutions as part-time or full-time academic degree, diploma or certificate level programmes of the relevant disciplines;
ii.  Tertiary institutions as part of the required courses in the curriculum for training graduate teachers;
iii. Private training centres as extra-moral lessons or otherwise;
iv.  Professional meetings such as workshops, conferences and seminars; and,
v.   Self-tutorials.

One obvious secret to becoming digitally literate is to incorporate practice into the learning process and beyond. Digital literacy is, essentially, a skill. As such, it requires consistent practice in order to attain high level proficiency. Tertiary education teachers therefore must acquire and use some of the personal technology or ICT tools to perform hands-on-practices as they learn. Practicing to type notes or write papers directly on the laptop and palmtop, prepare and present lectures on PowerPoint, draw tables and charts on the Microsoft Excel and perform other exercises on the computer are highly recommended for teachers who are determined to become digital literates.

## Conclusion

This paper has examined the indispensability of digital literacy for tertiary education teachers. There is no gainsaying the fact that digital literacy - a broad theme subsumed in technology literacy,

ICT literacy and information literacy - is an essential skill worth possessing by all teachers in general and the tertiary education teachers in particular. The essential reason for this demand is that the world we are living in today has revolutionised into societies that are now becoming more diverse, complex, media saturated and borderless. This revolution, according to the United States Department of Education, National Centre for Education Statistics (2000), "is powered by technology, fuelled by information and driven by knowledge". The revolution is responsible for the paradigm shifts in every aspect of human endeavour, the education sector inclusive. This 21st century has been characterised by increase in the need and the demand for information resulting in the increase in its production, and the resultant explosion in the scramble for its access. As a result, there is a strong challenge for educational institutions in developing countries to shift from their traditional methods of being mere venues for the transmission of a prescribed knowledge/information from a teacher to students in a given time and place to a technology driven environment which permits the acquisition of necessary knowledge and skills for continuous and lifelong learning.

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