Review

Digital literacy: An analysis of the contemporary paradigms

Allah Nawaz and Ghulam Muhammad Kundi*

Department of Public Administration, Gomal University, Dera Ismail Khan, Khyber Pakhtoon Khwa, Pakistan.

Digital (computer) literacy is the new title for 'educated'. Both teachers and students have no option but to acquire a level of computer-literacy to catch up with the growing digital societies. Governments and higher education institutions (mHEIs) are making all out efforts by providing e-Learning environments to gain some levels of digital literacy of the masses at large and the university-constituents. Both developed and developing states are trying to figure out a required digital literacy curriculum for the training of teachers and the students. However, given that there are several meanings of computer-literacy therefore; research is going on about the contents of the curriculum and the pedagogical requirements of ICT-education. Furthermore, the concepts of global-village, globalization, information or knowledge society, ePedagogy, eStudents and eCourses – all are casting increasing pressures on the academicians, HEIs and governments to take digital opportunity initiatives (DOI) for digital-literacy of the masses to generate workforce for the eGovernment, eCommerce and e-Learning. Research reveals that learners hold different perceptions about the nature and role of ICTs such as: instrumental and substantive. Some consider it just like any other technology with no value-implications for the learner and society. Substantive theorists however, believe in the determinist role of technologies for changing the society. Whatever the paradigm, learners are facing several hurdles in acquiring digital command like perceptual differences, demographic diversities, resistance to change, training issues and so on. However, most of the researchers are coming up with the findings that, perceptions, theories, teaching/learning styles of the teachers, students and other stakeholders play decisive and determinist role in determining the speed and quality of computer-literacy. It is well-documented that the contents and dynamics of computer-literacy in any state depend on the objectives to be realized through ICTs. Depending on the perceptions about e-Learning, technologies are either used to achieve immediate objectives for instant contributions (instrumental-view) or long-term and broader objectives (substantive or liberal-view). It is argued that none of the instrumental or substantive views are good or bad rather two stages or steps in the evolution of e-Learning from objectivist thinking to social constructivist digital platforms. Almost every country and HEI is first experimenting with the instrumental benefits of ICTs and this practice is more rampant in the developing countries. This paper is an effort to draw a picturesque (a scenario) of digital-literacy in the background of HEIs.

Key words: Digital/computer-literacy, educational technologies, paradigm, instrumental, substantive, objectivist, cognitive and social constructivist, ePedagogy, eStudent, eCourse, digital opportunity initiatives, higher education institutions.

INTRODUCTION

The universal demand for 'computer-literacy' emanates from the dominance of ICTs in different aspects of contemporary life (Oliver, 2002). The supporters of 'social inclusion through ICTs', emphasize 'electronic-literacy' as

a key to bridge digital-divide (Macleod, 2005). Digital literacy is deemed necessary for "mindful learning in the information society (Aviram and Eshet-Alkalai, 2006)." Students, teachers and employees define computer literacy differently (Johnson et al., 2006) however, common people acquire their 'technology-literacy' either formally through formal courses or informally at home, from friends or by themselves (Ezziane, 2007).

The indispensability of digital literacy is evident from the findings and arguments of researchers around the globe. For example, ICTs (connectivity-tools) have been found helpful in reducing the problems of 'isolation' (Tinio, 2002; Abrami et al., 2006; Vrana, 2007) and 'dis-empowerment' (Macleod, 2005; Wims and Lawler, 2007) for the developing countries and marginalized groups. Digital opportunity initiatives (DOI) are proving powerful tools for 'poverty-alleviation' and 'economic-development' in developing states (Macleod, 2005; Hameed, 2007; HEC, 2008). Developing countries like Pakistan are entering into 'international and national' partnerships to capitalize on global ICT-resources (Tinio, 2002; Mathur, 2006; Baumeister, 2006; Kopyc, 2007). Furthermore, within university environment, e-Learning tools create 'leaner-centric' and 'collaborative-learning environments' where they are empowered to self-control their learning processes (Mejias, 2006).

The expectations of employers, parents and educators from the graduates (about digital literacy) are changing (Johnson et al., 2006). Therefore, most of the universities have started compulsory computer literacy courses. How-ever, to provide required command over computers, it is important to determine a 'customized digital curriculum and ePedagogy' (Martin and Dunsworth, 2007). Unfortunately, very little research has been published about students' perceptions of their computer literacy in third world countries (Bataineh and Abdel-Rahman, 2006).

Thus, digital literacy is not only shifting power bases in the developing countries from "elites to masses (Macleod, 2005)", but is increasingly "perceived as a survival skill (Aviram and Eshet-Alkalai, 2006)." However, acquisition of computer-literacy knowledge and skills is neither automatic nor simple. It is rather dependent on a variety of personal (teacher, students, administrators), organizational (higher education institution – HEI) and broader political and social factors (local, national and international) within which e-Learning occurs. The

following analysis and discussion spells out the concept, learning paradigms and barriers in digitizing the communities inhabiting modern 'information and knowledge societies'.

DIGITAL LITERACY

The illiterate of the 21st century are not those who cannot read and write, but those who cannot learn, unlearn, and relearn (Tinio, 2002). The definition of computer literacy has evolved overtime as technology improved and society became more dependent on computers. Some 50 years ago when a computer nearly filled a room, computer literacy meant being able to program a computer (Johnson et al., 2006). Today, when every user holds a computer, computer literacy is defined as an understanding of computer characteristics, capabilities, and applications, as well as an ability to implement this knowledge in the skillful, productive use of computers in a personalized manner (Martin and Dunsworth, 2007). Terms such as computer competency, computer proficiency and computer literacy are used interchangeably (Johnson et al., 2006).

With today's technological society, basic computer literacy is emphasized in every institution (Ezziane, 2007). Digital literacy is a combination of technical-procedural, cognitive and emotional-social skills, for example, using a computer involves procedural skills (file-management), cognitive skills (intuitively reading the visual messages in graphic user interfaces) (Aviram and Eshet-Alkalai, 2006). With the changes in technology, the elements of computer literacy are constantly changing and thus, educators must constantly revise the course to include the latest technological trends (Martin and Dunsworth, 2007).

E-learning

E-Learning is widely researched in the perspectives of "higher education as well as corporate training (Tinio, 2002)" and explained as the 'application of electronic technologies' in enhancing and delivering education (Gray et al., 2003). ICTs represent computers, networks, software, internet, wireless and mobile technologies to access, analyze, create, distribute, exchange and use facts and figures in a manner that has been unimaginable hitherto (Beebe, 2004). A variety of concepts is interchangeably used to represent e-Learning including: computer-based instruction, computer-assisted instruction, web-based learning, electronic learning,

*Corresponding author. E-mail: kundi@gu.edu.pk. Tel: 92-300-579-1705, 92-966-750122.

distance education, online instruction, multimedia instruction and networked learning are a few (Tinio, 2002; Abrami et al., 2006; Baumeister, 2006; Manochehr, 2007; Sife et al., 2007; Wikipedia, 2009).

In e-Learning the data-networks such as, internet, intranet and extranet are used to deliver course contents and facilitate teachers, students and administrators interaction (Tinio, 2002). The term networked learning is also used as a synonym for e-Learning (Baumeister, 2006). Internet and web-based applications are most widely used educational technologies in the e-Learning systems (Luck and Norton, 2005) therefore; teachers, students and education managers are using the web for a variety of purposes (Manochehr, 2007). The concept of e-Learning also has non-educational conceptions. Hans-Peter Baumeister (2006) notes that the meaning of e-Learning varies with a change in the context: Political dimension denotes the modernization of whole education system, but economic view defines e-Learning as a sector of eBusiness. In a nutshell, e-Learning begins with a partial or supplementary use of ICTs in classroom then steps into a blended or hybrid use and finally offers online synchronous and asynchronous virtual learning environments serving physically dispersed learners (Sife et al., 2007).

Educational technologies

ICTs refer not only to modern hi-tech computers and networks rather. There are old and new ICTs. Radio, television, telephone, fax, telegram, etc. are now old, while computer-networks, internet, e-mail and mobile learning are new tools (Hameed, 2007). At the same time, e-Learning technologies are burgeoning in terms of hardware, software and a variety of applications in education for teachers, students and administrators. Educational technologies come in variety (Sife et al., 2007) however, computers, networking and hypermedias are the core paradigms for different roles of e-Learning (Ezziane, 2007).

Computer

The primary tool for e-Learning is the computer, which has traveled a long way since 1960s when UNIVAC in USA and Baby-Computer in UK emerged as the pioneers of a technology, which is now controlling almost every aspect of human life. The transformation from XT (extended-technology) to AT (advanced-technology) or personal computer (PC) in 1980 was the second big

innovation making computers 'a personal gadget' for everybody and anybody. A computer is an intelligent-machine and a powerhouse for users in terms of its processing capabilities and speed (that is, user command is executed on a click), storage capacity (hard-disk and from floppy to flash and XDrives) and graphic interfaces (that is, graphical-user-interface GUI) to interact with different parts of the machine, like, activating a software, using CD-drive, printing a document or picture, copying a file from hard disk on a 'data-traveler.'

Networking

When computers are wired together for communication and resource-sharing, it is called a digital network. Networking has elevated the role of ICTs and a huge body of research is underway to make connectivity more and more powerful. Networking is evolving from simple networks into complicated forms of internet, intranet and extranet along with web-technologies thereby converting the world into a 'global-village'. Networking eliminates the geographical and physical constraints through a multitude of tools and techniques based on the communication-protocol of TCP/IP, onto which internet is anchored. According to Glogoff (2005) a network is a platform (internet, intranets and extranets) decorated with web-based tools of hypermedia and multimedia applications managed through learning and content management systems (LMS, LCMS). It is therefore evident that Internet is becoming an indispensable tool for learning and social life (Barnes et al., 2007).

It is reported that that many of the e-Learning facilities in HEIs offer traditional print syllabus through internet. Many researchers however, assert that innovative applications of Web are diverse (Wood, 2004). Likewise, John Thompson (2007) notes that accessing the internet is like going to the library for a book however, internet offers opportunities which need to be explored the technologies are designed well and used as intended (Wijekumar, 2005). Internet technologies (now offering Web 2.0, such as blogs, wikis, RSS, podcasting etc.), virtual reality applications, videogames and mobile devices are some of the many innovations, which are common in daily life for communication and entertainment and are equally helpful in learning and emerging as such (Chan and Lee, 2007). Through Web 2.0 technologies, users can communicate and interact globally through internet in an environment of open communication, decentralization of authority, and freedom to share and re-use online resources (Wikipedia, 2009).

Curricula for digital literacy

The 'curricula' of any country are viewed as "a snapshot of the current state of knowledge (Ezer, 2006)." Therefore, the debate about whether education should be focused on the current job market (instrumental) or intellectual attainment (liberal) is ongoing. It is reported that most of the current computer-training and education is ineffective because it is more technical and less concerned with the contexts and real world problems (Ezer, 2006). Due to increased demand for ICT-professionals, the universities across the world have responded by developing programs without "an existing model for guidance (Ekstrom et al., 2006)." However, Stephen (2006) warns that "the gap between what we teach and what we do is widening … academic programs should acknowledge the widening gap between theory and practice, especially since it has enormous implications for their graduates' ability to find work."

Despite some similarities in the computing curricula there are clear distinctions of being developed and developing countries. In a comparative study of the computing curricula in India and America, the researcher found that there are similarities in terms of offering fundamental courses in IT, system development, basics of operating systems, hardware architecture, web technologies and programming fundamentals. However, the differences are more obvious, for example India education is more instrumental while American's is more liberal in computing curricula with less emphasis on hard sciences than Indian curriculum (Ezer, 2006).

PARADIGMS FOR DIGITAL LITERACY

It has been found that the use of ICTs is dependent on the perceptions of developers and users about the nature of technologies and their role in different ways of life (Aviram and Tami, 2004). Bastien Sasseville (2004) have found that ICT-related changes are "not perceived as a collective experience or social change rather, personal challenge." The literature analysis suggests that two broader theories, according to which ICTs can play either "instrumental" or "substantive" role in the learning process, are discussed over and over (Macleod, 2005). Jonathan Ezer (2006) classifies this issue into 'instrumental' and 'liberal' conceptions of e-Learning. Instrumental view asserts that ICTs are just technologies and their role depends on their use while substantive view posits that these technologies have the power to change the society and their mere existence can make the difference (Mehra and Mital, 2007). Tinio (2002) has

suggested three roles of ICTs and digital literacy:

1. Learning about ICTs, where digital literacy is the end goal.
2. Learning with ICTs where technologies facilitates learning.
3. Learning through technologies thereby integrating it into curriculum.

Another researcher (Sahay, 2004) identifies four dimensions of computer literacy:

1. ICTs as an Object: Learning about the technology itself. Courses are offered to get knowledge and develop skills about different tools. This prepares students for the use of ICTs in education, future occupation and social life.
2. Assisting tool: ICT is used as a tool for learning, for example, preparing lectures or assignments, collecting data and documentation, communicating and conducting research. ICTs are applied independently from the subject matter.
3. Medium for teaching and learning: This refers to ICT as a tool for teaching and learning itself, the medium through which teachers can teach and learners can learn. Technology based instructional delivery appears in many different forms, such as drill and practice exercises, in simulations and educational networks.
4. ICTs for education management: The most common and wider application of ICTs is in the organizational and logistic functions of the higher education institutions in the form of transaction processing systems (TPS) and management information systems (MIS).

Given these scenarios, ICTs are either simply a tool (neutral) like any other technology or more than a tool, which can change the people way of life by transforming the education culture (Young, 2003). Research however, reports that ICTs have the potential and flexibility to be used in either ways but as the ICTs become increasingly available to the masses (like internet accessibility) the ICTs begin to affect beyond technical impacts of a tool (Aviram and Tami, 2004). For example, daily 'checking email' has become a common norm even in developing countries. The departure from 'stand-alone' use of computers to 'network' applications have increased access to so far inaccessible data sources thereby changing the 'user-expectations' and thus attitudes to 'learning-process' itself (Ezziane, 2007).

From paradigmatic point of view instrumental vs. substantive reflect the 'behaviorist vs. constructivist' (Boundourides, 2003) modes of teaching and learning.

Behavioral or objectivist approach (instrumental) to teaching and learning ICTs believes more in physical activities and outcomes with the assumption that 'use makes anything important or otherwise' (Macleod, 2005). On the other extreme, constructivist (substantive) mode of teaching and learning is ideological and cultural with the belief and conviction that ICTs should be integrated into the very core of teaching and learning with mega changes in pedagogy and knowledge-acquisition (Mehra and Mital, 2007). The technological advancements in e-Learning are linked with the theories of learning like behaviorism, objectivism, constructivism and cognitive and social constructivism (Wikipedia, 2009)."

Instrumental/behaviorist

Instrumental view of technology is the most commonly held belief, which considers technology as a 'tool' without any inherent value (neutral) and its impact lies in how is it used so a 'one-size-fits-all' policy of universal employ-ment is used (Macleod, 2005; Radosevich and Kahn, 2006). The logic of this first sentence is hard to get at. If technology is considered a tool, with its impact depending on how it is used, the conclusion cannot be "one-size-fits-all". There is room for plurality of approaches, and different uses in different contexts. There are clearly some "instrumentalists ", (big top-bottom planners) who adhere to the "one-size-fits-all" policy but it is not inherent to the instrumental approach to technology. Instrumental education is based on the premise that education *serves* society so focus is on the utility and usefulness of education to the economy. The underlying philosophy behind the instrumental point of view is the objectivist approach wherein instructor presents the learner with the required stimuli along with the required behavioral responses within an effective reinforcement regime. The degree of learning is assessed through observable measures such as tests, assignments and examinations (Ward et al., 2006)."

Objectivism believes that everything related to learning is predictable therefore one learning-model fits all. Likewise, behaviorism give priority to the stimulus-response relationship in learning and underplays cognitive role therefore sees the learning environment as in objectivism (Young, 2003). This is exactly like behavior of scientific management where worker is taken as a part of a big machine called organization. The objectivist teaching gives complete control of materials to the teacher who manages the pace and direction of learning thereby making learning a sequential process where there is a single reality about which the "learners display

an understanding through declarative, procedural and conditional knowledge (Phillips et al., 2008)." It is difficult to agree with such an over-simplification, it looks like the "Pavlovian debate of the beginning of the 20th century.

Substantive/ Constructivist

The ICTs can play a supplemental as well as central role in learning by providing digital cognitive or adaptive tools or systems to support constructivist learning (Sirkemaa, 2001). Contrary to instrumental, substantive view of ICTs is a determinist or autonomous approach, which argues that technology, is not neutral and has positive or negative impacts. Technological determinism encourages the idea that: the mere presence of technology leads to familiar and standard applications of that technology, which in turn bring about social change (Macleod, 2005; Radosevich and Kahn, 2006). The substantive theory matches with the 'liberal theory' of education (Ezer, 2006), which views learning as active and interconnected experience and not simply a recollection of facts. This paradigm suggests using ICTs beyond their 'supplemental (instrumental)' role to broader.

Constructivists contend that ICTs should not be guided by a technologically deterministic approach. The social, cultural, political, and economic dimensions of technology use have to be taken into consideration so that by facilitating the development of electronic literacy, culturally relevant online content, interfaces and multimedia, the process of social inclusion can be achieved within developing countries (Macleod, 2005). The effectiveness of the behavioral approach is questionable in areas that require comprehension, creativity and 'gray' answers (Ward et al., 2006). The moves towards constructivism in higher education have been pushed by the emergence of universal connectivity through ICTs (Wims and Lawler, 2007), which enabled the masses to globally communicate and most importantly access to the world knowledge resources through the advent of internet after 1990s. Given the access to broader sources of knowledge, contemporary theory suggests that collaborative learning is the most effective means of facilitating teaching and learning in digital environments (Phillips et al., 2008).

Furthermore, a new version of this kind of thinking is 'social constructivism', which is gaining foothold in higher education because teaching and learning can now easily be undertaken as a social and community activity through social software (Bondarouk, 2006). Social software enables collective learning (social) along with individual (cognitive) with the help of traditional email/chatting and
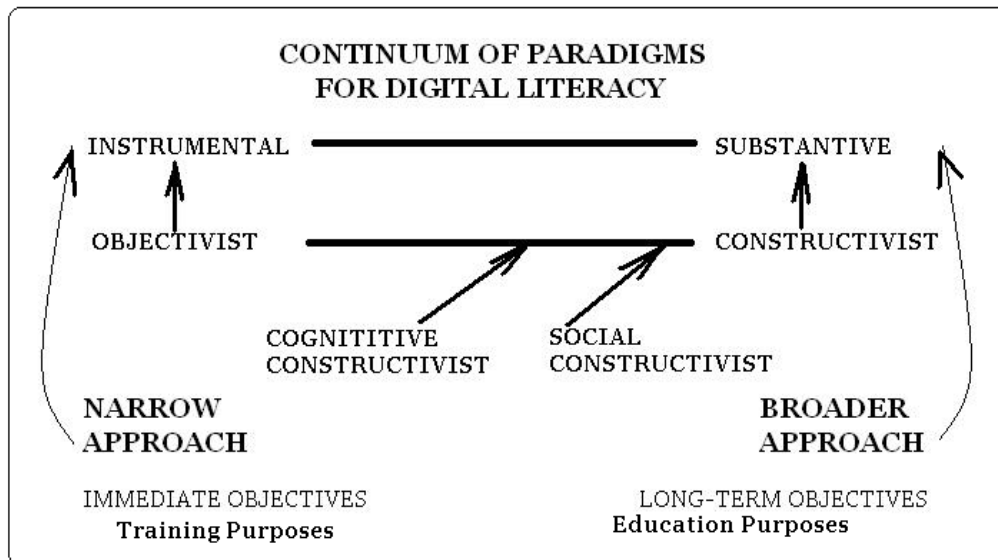
Figure 1. Continuum of paradigms for digital literacy.

modern wikis, blogs, vblogs, RSS feeds and the list continues(Klamma et al., 2007). For example, RSS is a format used to publish frequently updated works like blog-entries, new headlines, audio and video (Wikipedia, 2009). As shown in this graph (Figure 1), instrumental and substantive are two distinct moments in the learning process. Both are essential for successful mastering of any technology, art, science, etc.

BARRIERS TO GETTING DIGITALLY LITERATE

Given the differences of perceptions (Young, 2003) users behave differently to e-Learning tools and techniques for teaching and learning purposes. A key challenge for institutions is overcoming the cultural mindset whereby departments and individuals act as silos, keeping information and control to themselves (LaCour, 2005). Moreover, the training that educators do receive does not always match with their educational needs, because the faculty is rarely involved in the decisions about technology and design of new strategies for technology-integration (Juniu, 2005). In developing countries, "ICTs have not permeated to a great extent in many higher learning institutions in most developing countries due to many socio-economic and technological circumstances (Sife et al., 2007)."

The greatest challenge in learning environments is to adapt the computer-based system to differently skilled learners. If the environment is too complex the user will be lost, confused or frustrated. On the other hand, too simple or non-systematic environments cause motivational problems (Sirkemaa, 2001). Technology is by nature disruptive and so, demands new investments of time, money, space and skills and changes in the way people do things (Aaron et al., 2004). Furthermore, face-to-face communication is critical for classroom social relationships and interpersonal processes while, online technologies have reduced support for social interaction. Although, emotions can be conveyed through e-mail or chatting, it does not replace "the fundamentals of our socio-emotional well-being (Russell, 2005)." Thus, "barriers can make technology use frustrating for the technologically perceptive, let alone the many teachers who may be somewhat techno-phobic (Ezziane, 2007)."

Individual perceptions about ICTs

One way to assess an individual's approach to computer use for instruction is by testing an individual's attitudes to this (Graff et al., 2001). Understanding learner perceptions of technology and its impact on their practice will help in addressing technology-training of the user (Zhao and Bryant, 2006). Learner attitudes are reportedly strongly related to their success in using technology (Bataineh and Abdel-Rahman, 2006). Students' use of computer and Internet depends on their perceived

Table 1. Perception about the organizational roles of ICTs.

1	Administrative	The availability of technology is the progress and an important aim, so focus is on the quantity and quality of equipment.
2	Curricular	The use of ICTs with a specific curricular aim. Technology is conceived as a neutral tool in the service of prevailing subject matters.
3	Didactic	Didactic approach dictates the inevitable or desirable change that can be brought through ICT in pedagogy.
4	Organizational	ICTs can help creating viable, flexible and robust organizational structures to teach, learn and administer effectively.
5	Systemic	ICTs have to be used systematically. All the changes must be preplanned and predefined.
6	Cultural	Cultural approach recognizes that the ICT revolution has powerful defining impact our culture and thus lives.
7	Ideological	Philosophical or critical social thinkers believe that whatever the change, it should be in tune with the Social-values of the society.

Adapted from: Aviram and Tami (2004).

usefulness in terms of effective communication and access to information to complete projects and assignments efficiently (Gay et al., 2006). However, limited research has been published about students' perceptions of their computer literacy, particularly, in developing states (Bataineh and Abdel-Rahman, 2006).Technology paradigm shifts changed not only the way of computing but also how the technology itself is perceived by society (Ezziane, 2007)

Educational technologies are generally perceived as a welcome addition to the pedagogical and learning tools (Sasseville, 2004). However, by compelling instructors to collaborate with people outside the classroom (government agencies, university administrators, technical support staff etc); technology can be perceived as a threat to the private practice of pedagogy (Aaron et al., 2004). The relevant concern, then, is how well teachers perceive and address the challenges for education (Knight et al., 2006). Based on the perceptual differences, Mehra and Mital (2007) have categorized learners into:

1. Cynics: Those with negative perceptions about e-Learning but strong pedagogical beliefs therefore unwilling to change beyond instrumental use of ICTs.
2. Moderates: They like ICTs and are ready to change

and adapt to new pedagogical practices with some guidance and training.
3. Adaptors: These are the intellectual leaders who use e-Learning for inner progress and external enhancements by continuously enriching their teaching and learning with leading-edge technologies.

Organizational perceptions/ approaches

Aviram and Tami (2004) have extracted seven approaches: administrative, curricular, didactic, organizational, systemic, cultural and ideological and five attitudes: agnostic, conservative, moderate, radical and extreme radical attitude towards the application of ICTs in HEIs (Table 1 show details on these approaches). Administrative, Curricular, Didactic and Organizational approaches are more 'instrumental' than Systemic, Cultural and Ideological approaches, which emphasize broader and substantive view/role of ICTs in higher education. The instrumental view is mostly supported by the administrators, bureaucrats and politicians (Baumeister, 2006). While substantive approaches are possessed mostly by the academics and intellectuals who maintain that e-Learning technologies must systematically change the educational culture according

to the ideological requirements of a particular context (Mehra and Mital, 2007).

Administrative, Curricular, Didactic and Organizational approaches are more 'instrumental' than Systemic, Cultural and Ideological approaches, which emphasize broader 'substantive view' or role of ICTs in higher education.

The instrumental view is mostly supported by the administrators, bureaucrats and politicians (Baumeister, 2006). While substantive approaches are possessed mostly by the academics and intellectuals who maintain that e-Learning technologies must systematically change the educational culture according to the ideological requirements of a particular context.

Demographic diversities

Due to the demographic disparities, users hold different conceptions of ICTs and e-Learning therefore express varying attitudes in the development and use of these tools. Given that the perceptions of every developer and user of ICTs vary (Sasseville, 2004), there is a multiplicity of user-theories forming a continuum of approaches about the nature and role of ICTs and attitudes about the extent of change required (Kopyc, 2007). Teachers, students and any other users of ICTs, behave according to their demographic characteristics of age, educational level, cultural background, physical and learning disabilities, experience, personal goals and attitudes, preferences, learning styles, motivation, reading and writing skills, computer skills, ability to work with diverse cultures, familiarity with differing instructional methods and previous experience with e-learning (Moolman and Blignaut, 2008).

For example, male students prefer using computers in their learning than females. Individual differences are evident in terms of attitudes to computer-based learning and internet use and that these differences exist principally on two levels, which are nationality and cognitive learning style (Graff et al., 2001). "Net Generation" is a force for educational transformation. They process information differently than previous generations, learn best in highly customizable environments and look to teachers to create and structure their learning experience (Dinevski and Kokol, 2005); furthermore, male students have more positive perceptions about computers and information technology than female students. Older students may have a somewhat more positive perception of computers (Gay et al., 2006). Students bring prior knowledge to their learning experiences. This prior knowledge is known to affect how students encode and later retrieve new information learned (DiCerbo, 2007).

Resistance to change

The user-resistance and reluctance to change is widely investigated topic in e-Learning (for example, Jager and Lokman, 1999; Sasseville, 2004; Loing, 2005; Vrana, 2007; Kanuka, 2007; Mehra and Mital, 2007). Since, teachers decide about what happens in the classroom; therefore their acceptance plays a dominant role in the successful use of computers in the classroom (Aaron et al., 2004). Although, most of the teachers have adopted ICTs like power point slides and internet into their teaching, they are still unwilling to adopt more sophisticated computer-based teaching innovations (Mehra and Mital, 2007)." It has been found that new things are intimidating and cause resistance (Jager and Lokman, 1999). For example, if teachers refuse to use ICTs in their classrooms, then e-Learning can never progress except limited benefits. Furthermore, due to the innovative nature of ICT-enabled projects, the developers must have a keen understanding of the innovation process, identify the corresponding requirements for successful adoption and harmonize plans and actions accordingly (Tinio, 2002). In Canada, teachers are reluctant to integrate technological innovations into their daily scholarly activities and, at least in Quebec, this situation has not really changed over the past few years (Sasseville, 2004).

Within universities the decision makers and academics are sometimes reluctant to change curricula and pedagogic approaches, teaching staff and instructors lack incentive and rewards in a system where professional status and career trajectories are based on research results rather than pedagogic innovation (Loing, 2005). There are many obstacles for implementation of the ICT in universities. Some of them are classical, as are e.g. inertia of behavior of people, their resistance to changes, etc. If the ICT should serve properly, it should enforce an order in all folds of the university life. People who loose their advantage of the better access to information have a fear from order. Regrettably, managers sometimes belong to this category (Vrana, 2007).

Technological change is not perceived as a collective experience rather a personal challenge therefore, solutions to the problem of integrating technological innovations into the pedagogy are more focused on the individual teachers (Sasseville, 2004). Some teachers strongly advocate the technological innovation but may resist in accepting technology as an integral part of the

learning process. These divergent reactions and concerns have thus created a continuum that represents various attitudes towards technology (Juniu, 2005). Similarly, "inexperience may lead to developing learners' anxiety (Moolman and Blignaut, 2008)."

Training ineffectiveness

The gap between user and ICTs is possible if user-training is not undertaken effectively. Almost every research recording the perceptions and attitudes of e-Learning-users reports the dissatisfaction from the training facilities, contents and duration with regard to e-Learning tools for teaching, learning and administrative purposes (for example, Gray et al., 2003; Loing, 2005; Johnson et al., 2006; Wells, 2007; Mehra and Mital, 2007). Albion (1999) noted this some 18 years ago that "as community expectations for integration of information technology into the daily practices of teaching grow, it will become increasingly important that all teachers are adequately prepared for this dimension of their professional practice."

User training includes the training of both the developers or ICT-professionals and Non-ICT users. Both the groups need computer literacy of the levels of their requirements. "A large body of literature supports the idea that technology training is the major factor that could help teachers develop positive attitudes toward technology and integrating technology into curriculum (Zhao and Bryant, 2006). Teachers need training for technology-integration "in curriculum areas that can be replicated in their own classrooms not training that focuses on software applications and skill development (Schou, 2006)." The developers need such 'computing-curriculum' which covers not only the technological aspects of computer hardware and software but also the human and organizational dimensions of these tools when placed in use.

CONCLUSIONS

Digital literacy is a universal issue for HEIs and researchers. The new ICTs are forcing academicians to postulate refined theories for learning. Our culture is no longer literary and artistic only, it is also technological and scientific. The paradigm shift in HEIs refers not only to the departure from the traditional pedagogy, learning and education-management; it also features changes within e-Learning environments for teaching, learning and administrative purposes. This paradigm shift is described in terms of the progress in digital literacy from old-ICTs to new-ICTs in three stages of traditional e-Learning, blended e-Learning and contemporary virtual e-Learning.

Furthermore, digital literacy of students is squarely mounted on the computer competencies of the teachers and academicians because students cannot acquire computer literacy without a computer literate faculty. Thus, computer literacy is one of the most important skills in today's competitive environment therefore government and HEIs are required to provide technical and political support to the faculty for successfully passing on digital knowledge and skills.

REFERENCES

Aaron M, Dicks D, Ives C, Montgomery B (2004). "Planning for Integrating Teaching Technologies", Canadian J. Learning Technol., 30(2), Spring. [Online]. Available from: http://www.cjlt.ca/ (accessed 14 May, 2007).

Abrami PC, Bernard RM, Wade A, Schmid RF, Borokhovski E, Tamim R, Surke, MA, Lowerison G, Zhang D, Nicolaidou I, Newman S, Wozney I, Peretiatkowicz A (2006). "A Review of e-Learning in Canada: A Rough Sketch of the Evidence, Gaps and Promising Directions", Canadian J. Learning Technol., 32(3), Fall/Autumn. [Online]. Available from: http://www.cjlt.ca/ (accessed 14 May, 2007).

Albion PR (1999), "Self-Efficacy Beliefs as an Indicator of Teachers' Preparedness for Teaching with Technology", [Online]. Available from: http://www.usq.edu.au/users/albion/papers /site99/1345.html (accessed 10 May, 2007).

Aviram A, Eshet-Alkalai Y (2006). "Towards a Theory of Digital Literacy: Three Scenarios for the Next Steps", Eur. J. Open, Distance E-Learning. [Online]. Available from: http://www.eurodl.org/ (accessed 11 May, 2007).

Aviram R, Tami D (2004). "The impact of ICT on education: the three opposed paradigms, the lacking discourse", [Online]. Available from: http://www.informatik.uni-bremen.de/~mueller/kr-004/ressources/ict_impact.pdf (accessed 13 July, 2007).

Barnes K, Marateo RC, Ferris SP (2007). "Teaching and Learning with the Net Generation", Innovate J. Online Edu., 3(4). Available from: http://Innovateonline.info (accessed 10 April, 2007).

Bataineh RF, Bani-Abdel-Rahman AA (2006). "Jordanian EFL students' perceptions of their computer literacy: An exploratory case study", Intern. J.Edu. Develop. using ICT, 2(2). Available from: http://ijedict.dec.uwi.edu//viewarticle.php?id=169&layout=html) accessed 10 April, 2007).

Baumeister H (2006). "Networked Learning in the Knowledge Economy - A Systemic Challenge for Universities", Eur. J. Open, Distance E-Learning. [Online]. Available from: http://www.eurodl.org/ (accessed 10 April, 2007).

Beebe MA (2004). "Impact of ICT Revolution on the African Academic Landscape", In Proceedings of CODESRIA Conference on Electronic Publishing and Dissemination. Dakar, Senegal. 1 -2 September 2004. [Online]. Available from: http://www.codesria.org/Links/conferences/el_publ/beebe.pdf (accessed 5 April, 2007).

Bondarouk TV (2006). "Action-oriented group learning in the implementation of information technologies: results from three case studies", Eur. J. Info. Syst., 15: 42–53. [Online] Available from: http://www.palgrave-journals.com/ejis/ (accessed 10 April, 2007).

Chan A, Lee MJW (2007). "We Want to be Teachers, Not Programmers: In Pursuit of Relevance and Authenticity for Initial Teacher Education Students Studying an Information Technology

Subject at an Australian University", Elect. J. Integrat. Technol. in Edu., 6: 79. [Online] Available from: http://ejite.isu.edu/Volume3No1/ (accessed 9 April, 2007).

DiCerbo KE (2007). "Knowledge Structures of Entering Computer Networking Students and Their Instructors", J. Inf. Technol. Edu., 6. [Online] Available from: http://jite.org/documents/Vol6/ (accessed 13 July, 2007).

Dinevski D, Kokol DP (2005), "ICT and Lifelong Learning", Euro. J. Open, Distance and E-Learning, [Online] Available from: http://www.eurodl.org/ (accessed 12 April, 2007).

Ekstrom JJ, Gorka S, Kamali R, Lawson E, Lunt B, Miller J, Reichgelt H (2006), "The Information Technology Model Curriculum", J. Info. Technol. Edu., 5. [Online] Available from: http://jite.org/documents/Vol5/ (accessed 13 July, 2007).

Ezer J (2006). "India and the USA: A Comparison through the Lens of Model IT Curricula", J. Info. Technol. Edu., 5. [Online] Available from: http://jite.org/documents/Vol5/ (accessed 13 July, 2007).

Ezziane Z (2007). "Information Technology Literacy: Implications on Teaching and Learning", J. Edu. Technol. Soc., 10(3): 175-191. [Online] Available from: http://www.ask4research.info/ (accessed April 10, 2007).

Gay G, Mahon S, Devonish D, Alleyne P, Alleyne PG (2006). "Perceptions of information and communication technology among undergraduate management students in Barbados", Int. J. Edu. Develop., using ICT, 2(4). [Online] Available from: http://ijedict.dec.uwi.edu// accessed 11 May, 2007.

Glogoff S (2005). "Instructional Blogging: Promoting Interactivity, Student-Centered Learning, and Peer Input", Innovate J. Online Edu., 1(5), June/July. [Online] Available from: http://Innovateonline.info (accessed 10 April, 2007).

Graff M, Davies J, McNorton M (2001). "Cognitive Style and Cross Cultural Differences in Internet Use and Computer Attitudes", Eur. J. Open, Distance and E-Learning, [Online] Available from: http://www.eurodl.org/ (accessed 10 April, 2007).

Gray DE, Ryan M, Coulon A (2003). "The Training of Teachers and Trainers: Innovative Practices, Skills and Competencies in the use of eLearning", Eur. J. Open, Distance and E-Learning. [Online] Available from: http://www.eurodl.org/ (accessed 9 April, 2007).

Hameed T (2007). "ICT as an enabler of socio-economic development", [Online] Available from: http://www.itu.int/osg/spu/digitalbridges/materials/hameed-paper.pdf (accessed 24 June, 2007).

Higher Education Commission (HEC) (2008). "eReforms: PERN, PRR, eLearning, CMS and Digital Library", [Online] Available from: http://www.hec.gov.pk/new/eReforms/ eReforms.htm (accessed 14 July, 2007).

Jager A K, Lokman AH (1999). "Impacts of ICT in education. The role of the teacher and teacher training", In Proceedings of The European Conference on Educational Research, Lahti, Finland 22 - 25 September. Stoas Research Wageningen, The Netherlands. Retrieved April 10, 2007.

Johnson DW, Bartholomew KW, Miller D (2006). "Improving Computer Literacy of Business Management Majors: A Case Study", J. Info. Technol. Edu., 5. [Online] Available from: http://jite.org/documents/Vol5/ (accessed 14 July, 2007).

Juniu S (2005). "Digital Democracy in Higher Education Bridging the Digital Divide", Innov. J. Online Educ., 2(1), October/November. [Online] Available from: http://Innovateonline.info (accessed 10 April, 2007).

Kanuka H (2007). "Instructional Design and eLearning: A Discussion of Pedagogical Content Knowledge as a Missing Construct", e-J. of Instructional Sci. Technol., 9(2). [Online] Available from: http://www.usq.edu.au/electpub/e-jist/docs/vol9_no2/default.htm (accessed 18 July, 2007).

Klamma R, Chatti MA, Duval E, Hummel H, Hvannberg EH, Kravcik M,

Law E, Naeve A, Scott P (2007). "Social Software for Life-long Learning", J. Edu. Technol. Soc. 10(3): 72-83. [Online] Available from: http://www.ask4research.info/ (accessed June 24, 2007).

Knight C, Knight BA, Teghe D (2006). "Releasing the pedagogical power of information and communication technology for learners: A case study", Int. J. Edu. Dev. using ICT, 2(2). [Online] Available from: http://ijedict.dec.uwi.edu// (accessed 11 May, 2007).

Kopyc S (2007). "Enhancing Teaching with Technology: Are We There Yet?", Innovate J. Online Edu., 3(2), December 2006/January 2007. [Online] Available from: http://Innovateonline.info (accessed 10 April, 2007).

LaCour S (2005), "The future of integration, personalization, and ePortfolio technologies", Innov. J. Online Edu., 1(4), April/May. [Online] Available from: http://Innovateonline.info (accessed 10 April, 2007).

Loing B (2005). "ICT and Higher Education. General delegate of ICDE at UNESCO", In Processing of 9th UNESCO/NGO Collective Consultation on Higher Education, 6-8 April 2005. [Online] Available from: http://ong-comite-liaison.unesco.org/ongpho/acti/3/11/rendu/20/pdfen.pdf (accessed 24 June, 2007).

Luck P, Norton B (2005). "Problem Based Management Learning-Better Online?", Eur. J. Open, Distance E-Learning. [Online] Available from: http://www.eurodl.org/ (accessed 10 April, 2007).

Macleod H (2005). "What role can educational multimedia play in narrowing the digital divide?", Int. J. Edu. Dev. using ICT, 1(4). [Online] Available from: http://ijedict.dec.uwi.edu// (accessed 11 May, 2007).

Manochehr N (2007). "The Influence of Learning Styles on Learners in E-Learning Environments: An Empirical Study", Computers in Higher Educ. Econ. Rev. 18. [Online] Available from: http://www.economicsnetwork.ac.uk/cheer.htm (accessed 11 April, 2007).

Martin F, Dunsworth Q (2007). "A Methodical Formative Evaluation of Computer Literacy Course: What and How to Teach", J. Inf. Technol. Edu., 6. [Online] Available from: http://jite.org/documents/Vol6/ (accessed 10 October, 2007).

Mathur SK (2006). "Indian Information Technology Industry: Past, Present and Future A Tool for National Development", J. Theor. Appl. Info. Technol., [Online] Available from: http://www.jatit.org (accessed 6 October, 2007).

Mehra P, Mital M (2007). "Integrating technology into the teaching-learning transaction: Pedagogical and technological perceptions of management faculty", Int. J. Edu. Dev. using ICT, 3(1). [Online] Available from: http://ijedict.dec.uwi.edu// (accessed 10 October, 2007).

Mejias U (2006). "Teaching Social Software with Social Software", Innovate J. Online Educ., 2(5), June/July. [Online] Available from: http://Innovateonline.info (accessed 9 April, 2007).

Moolman HB, Blignaut S (2008). "Get set! e-Ready, … e-Learn! The e-Readiness of Warehouse Workers", J. Educ. Technol. Soc., 11(1), pp. 168-182. [Online] Available from: http://www.ask4research.info/ (accessed 10 April, 2007).

Oliver R (2002). "The role of ICT in higher education for the 21st century: ICT as a change agent for education", [Online] Available from: http://elrond.scam.ecu.edu.au/oliver/2002/ he21.pdf (accessed 13 April, 2007).

Phillips P, Wells J, Ice P, Curtis R, Kennedy R (2008). "A Case Study of the Relationship Between Socio-Epistemological Teaching Orientations and Instructor Perceptions of Pedagogy in Online Environments", Elect. J. Integra. Technol. Educ., 6: 3-27. [Online] Available from: http://ejite.isu.edu/ 6(1)/ (accessed 7 April, 2007).

Radosevich D, Kahn P (2006). "Using Tablet Technology and Recording Software to Enhance Pedagogy", Innov. J. Online Educ., 2(6), Aug/Sep. [Online] Available from: http://Innovateonline.info (accessed 8 April, 2007).

Russell G (2005). "The Distancing Question in Online Education. Innov. J. Online Educ., 1(4), April/May. [Online] Available from: http://Innovateonline.info (accessed 8 April, 2007).

Sahay S (2004), "Beyond utopian and nostalgic views of information technology and education: Implications for research and practice", J. Associa. Info. Syst., 5(7): 282-313. [Online] Available from: (accessed 7 April, 2007).

Sasseville B (2004). "Integrating Information and Communication Technology in the Classroom: A Comparative Discourse Analysis",

Canadian J. Learn. Technol., 30(2), Spring. [Online] Available from: http://www.cjlt.ca/ (accessed 14 May, 2007).

Schou SB (2006). "A Study of Student Attitudes and Performance in an

Online Introductory Business Statistics Class", Elect. J. Integra. Technol. in Edu., 6: 71-78. [Online] Available from: http://ejite.isu.edu/3(1)/ (accessed 9 April, 2007).

Sife AS, Lwoga ET, Sanga C (2007). "New technologies for teaching and learning: Challenges for higher learning institutions in developing countries", Int. J. Educ. Dev. using ICT, 3(1). [Online] Available from: http://ijedict.dec.uwi.edu// (accessed 21 July, 2007).

Sirkemaa S (2001), "Information technology in developing a meta-learning environment", Eur. J. Open, Distance and E-Learning. [Online] Available from: http://www.eurodl.org/ (accessed 10 April, 2007).

Thompson J (2007). "Is Education 1.0 Ready for Web 2.0 Students?", Innov. J. Online Educ., 3(4), April/May. [Online] Available from: http://Innovateonline.info (accessed 22 October, 2007).

Tinio VL (2002). "ICT in education", In Proceedings of UNDP for the benefit of participants to the World Summit on the Information Society, UNDP's regional project, the Asia-Pacific Development Information Program (APDIP), in association with the secretariat of the Association of Southeast Asian Nations (ASEAN). [Online] Available from: http://www.apdip.net/publications/iespprimers/eprimer-edu.pdf (accessed 14 July, 2007).

Vrana I (2007). "Changes required by ICT era are painful sometimes", In Proceedings of CAUSE98, an EDUCAUSE conference, [Online] Available from: http://www.educause.edu/copyright.html (accessed 10 October, 2007).

Ward T, Monaghan K, Villing R (2006). "MyVLE: A case study in building a universal telematic education environment for a small university", Eur. J. Open, Distance E-Learning. [Online] Available from: http://www.eurodl.org/ (accessed 10 April, 2007).

Wells R (2007). "Challenges and opportunities in ICT educational development: A Ugandan case study", Int. J. Educ. Dev. using ICT, 3(2). [Online] Available from: http://ijedict.dec.uwi.edu// (accessed 21 July, 2007).

Wijekumar K (2005). "Creating Effective Web-Based Learning Environments: Relevant Research and Practice", Innov. J. Online Educ., 1(5), June/July. [Online] Available from: http://Innovateonline.info (accessed 10 April, 2007).

Wikipedia (2009). "eLearning", [Online] Available from: http://www.Wikipedia.org/ (accessed 10 February, 2009).

Wims P, Lawler M (2007). "Investing in ICTs in educational institutions in developing countries: An evaluation of their impact in Kenya", Int. J. Educ. Dev., using ICT, 3(1). [Online] Available from: http://ijedict.dec.uwi.edu// (accessed 21 July, 2007).

Wood RE (2004). "Scaling Up: From Web-Enhanced Courses to a Web-Enhanced Curriculum", Innov. J. Online Educ., 1(1), Oct/Nov. [Online] Available from: http://Innovateonline.info (accessed 6 April, 2007).

Young LD (2003). "Bridging Theory and Practice: Developing Guidelines to Facilitate the Design of Computer-based Learning Environments", Canadian J. Learn. Technol., 29(3), Fall/Autumn. [Online] Available from: http://www.cjlt.ca/ (accessed 13 May, 2007).

Zhao Y, LeAnna Bryant F (2006). "Can Teacher Technology Integration Training Alone Lead to High Levels of Technology Integration? A Qualitative Look at Teachers' Technology Integration after State Mandated Technology Training", Elect. J. Integra. Technol. Educ., 5: 53-62. [Online] Available from: http://ejite.isu.edu/5(1)/ (accessed 9 April, 2007).