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Educational Technology: Pedagogical Lessons from a Study in the Persian Gulf States

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Abstract: Since the dawn of early human civilization, new found tools and technology were constantly being used and innovated in the quest for propagating and preserving knowledge and to improve the overall edification process of society. The use of sticks being used as pens on sand, gave way to colored stones and dyes used on cave walls and cliffs and, soon after, leather to write and to write on. Later, as technology improved in the middle ages, man started using quills and liquid ink leading to fountain and ball-point pens by the Twentieth century. Film, television, projection and the recent addition of computer assisted education have all been important steps in this long saga of integrating technology in improving the propagation of knowledge. While Information Technology remains a relatively recent phenomenon, the promotion of educational reform resulting directly from classroom use of new tools and equipment has been around for more than a century. Efforts to reform education through computer infusion and the histories of deploying earlier audio-visual technologies such as film, radio and television have been applied in many parts of the world. "The question is no longer whether to use technology in education institutions but how to use technology to change practice to reach new goals—as a catalyst for change and as a tool in creating, implementing, managing and communicating a new conception of teaching and learning, as well as the system that supports it" (Cradler and Bridgforth, 1996). A close look at technologically leading nations clearly shows that Educational Technology (ET) is considered to be an indispensable part of the education delivery process. This paper aims to assess the present status of ET's implementation in schools, by analyzing the current requirement for ET, discussing the dichotomy between traditional education and ET, understanding the importance of funding for ET and detailing issues of timely and appropriate training and development for teaching staff.

Keywords: Educational Technology, Traditional Education, e-Learning, Learning, Information Technology

Introduction

TECHNOLOGY IN SCHOOLS has been cited as a means to improve learning, increase accountability, power school reform, decrease the digital divide and provide the tools needed by today's students to become tomorrow's knowledge workers (US Department of Education Office of Educational Technology, 2000; Puma et al, 2000; Thornburg, 1999; Bozeman, 1998; Conte, 1997; Sandholtz et al, 1997; Glennan and Melmed, 1996; Gooden, 1996; Kerr, 1996; Mehlinger, 1995; Reich, 1991).

A close look at technologically leading nations clearly shows that Educational Technology (ET) is considered to be an indispensable part of the education delivery process. A 1998

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study in the US concluded that implementing technology in schools was a top priority of the American public (Milken Exchange on Educational Technology, 1998). This is reinforced by the 2000 Phi Delta Kappa/Gallup poll findings that "69% of the American public believed technology has improved instruction in their local schools and 82% indicated more should be invested in technology" (Rose and Meyer, 2001).

This paper provides a literature based study on challenges facing schools in their implementation of ET in a contemporary setting. The paper further outlines strategies to aid technology realization in the learning environment. The research supports earlier findings that better results can be achieved when schools have clear and timely ET implementation plans and are not confronted by high levels of resistance.

Moving Ahead of Traditional Education

"Traditional Education" has been defined as teacher centered classrooms where students are matched by age and, as much as possible, by ability. Students learn through listening and observation. The teaching material is based on text books, lectures and individual written assignments and there is a respected distance between the teacher and the students (Randeree, 2006a).

Countering this traditional approach, critics recently have been advocating "alternate approaches" which emphasize student centered classes where teaching methods employ hands-on activities, student-led discovery and group activities; instead of having independent subjects, "alternate teaching methods" use integrated, interdisciplinary subjects or theme-based units. These methods also pay significant attention to social development, including teamwork, interpersonal relationships and self-awareness with a teacher working more as a collaborator rather than an authoritarian figure.

Educators have been battling for the supremacy of one or the other mode of education since the early part of the twentieth century. Strong points in favor and against have been put forward by intellectual on both sides of the debate. As early as 1932, the Communist intellectual Antonio Gramsci, favored the traditional style to teaching against the, "paradoxical consequences of the new 'democratic' education that stressed naturalistic approaches over hard work and the transmission of knowledge." Gramsci wrote from jail (where he had been imprisoned by Mussolini) that "Previously pupils at least acquired a certain baggage of concrete facts. Now there will no longer be any baggage to put in order…. The most paradoxical aspect of it all is that this new type of school is advocated as being democratic, while in fact it is destined not merely to perpetuate social differences but to crystallize them in Chinese complexities" (Gramsci, 1971).

On the other hand, another prominent educational theorist of the era, Paulo Freire, who like Gramsci was interested in methods of educating the poor, but unlike Gramsci, rejected traditional subject matter and derided the "banking theory of schooling," which, in his contention, only provided children with a lot of "rote-learned" information (Freire, 1970). This conservative approach, according to Freire, numbed the critical faculties of students and preserved the oppressor class. Freire, not only demanded a change in the teaching content, but also in the methodology.

More recently, E.D. Hirsch, Jr. a strong advocate of the traditional style of teaching and highly successful in reintroducing the traditional style of education in the USA, observed, "History has proved Gramsci a better prophet than Freire. Modern nations that have followed

Gramscian principles have improved the condition and heightened the political, social and economic power of their lower classes. By contrast, nations that have adopted the principles of Freire have failed to elevate the economic and social status of their most underprivileged citizens" (Hirsch, 2007).

Whatever way of edification process is ultimately deemed paramount; the fact remains that in this increasingly technologically dependent world, the education sector cannot fulfill its role if it is denied technological support in achieving its objectives. If there is a mandate to rethink the relationship between education and technology, it is not because technology – by itself – makes people smarter and anyone who presents such an argument is simply hawking "the new thing." The real reason to rethink education around the question of technology is that the technology is here and here to stay – it is embedded in modern life: in appliances, communications systems and transportation systems. As a result, we simply cannot enjoy all of the opportunities afforded to us unless we are literate in the ideas of our time and the technologies used to express them.

This study does not concentrate on the method (traditional or alternate) of education, but rather, it looks at the role technology plays in helping any teaching method reach its full potential in furthering man's quest of equally and competently disseminating knowledge to all members of the society. This paper is part of a broader study which deals with a special focus on the Persian Gulf, with particular emphasis on the United Arab Emirates (UAE) (Randeree and Randeree, 2009; Randeree, 2007). It becomes evident in the broader study that the introduction of ET in the Persian Gulf has been a recent phenomenon, unlike in other parts of the world which have a long tradition of experiments with the dispensation of education. "The introduction of Educational Technology, unquestionably an important segment of the overall knowledge dissemination process in developed nations, is a new and unchartered territory in the Gulf particularly in the UAE" (Ebrahim, 2000). Though a regionally specific study is not the intention of this paper, the understanding that different regions and cultural environments have paced the implementation of ET differently, is of value.

E-Learning

The purpose of education is not just limited to bringing alphabetic and numeric literacy to students, but to developing well-rounded, literate citizens. For the healthy growth of a society it is imperative that its citizens develop a fluent understanding of the history of ideas. Referred to as "the spirit of the age", in the eighteenth century, education must make students strive to become fluent in the ideas of their own time. To succeed in becoming fluent in these ideas, learners must – as Apple Computer's Alan Kay suggests – understand and be able to manipulate the systems of representation that bring them to life. To achieve this, learners must be social creatures, because learning only takes place when there is an exchange of ideas (Kay, 1991). As far as ET is concerned e-learning is facilitating the exchange of ideas on a global basis. When education is discussed, the conversation frequently turns to modern technological advances and specifically to e-learning, but like everything else associated with the Internet, the term e-learning is subject to much mystification and hype (Randeree, 2002).

E-learning is the use of network technology to design, deliver, select, administer and extend learning. Simply put, it is a means of becoming literate, involving new mechanisms for communication: computer networks, multimedia, content portals, search engines, electronic libraries, distance learning and web-enabled classrooms. E-learning is characterized by speed,

technological transformation and mediated human interactions. E-learning has literally taken the class out of the school, through the virtual world of the Internet and into the bedroom of every potential student, connecting learners, educators and the community on a global scale and has forced us to rethink the purpose and architecture of our educational infrastructures in very fundamental ways.

Moreover, because of the mobility that is characteristic of e-learning, it has become embedded in many daily activities and has the potential to completely revolutionize our understanding of the time and place for learning. In the accelerated new world where 'knowledge workers' are frequently called upon to add to new skills, e-learning offers us new ways to think about designing and delivering education – not just between the ages of 5 and 18, but across a lifetime. E-learning has the capacity, as Merrill Lynch analyst Michael Moe has said, to replace "just-in-case" learning with "just-in-time" learning (Moe, 1998). Admittedly, e-learning is not expected to replace the traditional classroom but it has considerable potential to change the purpose and function of the classroom (Randeree and Narwani, 2009; Randeree, 2006b).

Our fascination with e-learning and how it is transforming our ways of communication should not lead us to ignore the fact that e-learning is merely a tool made possible by advancement in technology and is not to be confused with ET itself. Human beings have been using technology, however primitive it may have been, to improve their learning and to preserve knowledge for a long time. Technology is thus simply a tool in our continuous struggle to find new and ever more efficient ways of propagating education. Computers and information technology only happen to be the latest, albeit a considerable, addition to the long list of educational tools, with e-learning being just one further addition to this vast and varied historic arsenal. If there were no information technology, there would be no Internet and if there were no Internet, there would be no e-learning. E-learning is merely a part of this vast field called Educational Technology**.**

Educational Technology

The absolute domination of IT on the current communication network has led to a complete transformation of the way humans interact with each other and gain knowledge (Uline, 1996). On the other hand, underlining the debate on ET's influence on education, Clark (1994) emphatically declared, "media will never influence learning" demonstrating the contentious division of opinion on the efficacy of ET.

However, the reality is that like other modes of technology, ET, especially computers and computer-related peripherals, has grown tremendously and permeated all areas of education. Just as it is incomprehensible that anyone today would argue that banks, hospitals, or any industry should use less technology, similarly it is unfathomable for most young people in particular, to understand the common argument that schools in modern times can exist without technology. For them, use of the Internet plays a major role in their relationships with their friends, their families and their schools. "One thing teens and their parents agree is the enormous influence the Internet has had on teen life, but whereas parents emphasize its academic benefits, teens prefer to focus on the Internet's social aspects" (Abd Al Aziz, 2003).

Having realized that society cannot have significant and meaningful progress without a technologically assisted education system since the success of any nation depends on the

quality of its education, it is easy to realize how important the role technological advancement in education can play for the developing Arab World.

Educational (or instructional) Technology (ET) has been defined in many ways. According to the Association for Educational Communications and Technology (AECT), "the theory and practice of design, development, utilization, management and evaluation of processes and resources for learning" constitute instructional technology (Saettler, 1998). This definition corresponds to an earlier one of Saettler (1968), who proposed a definition that combined both the physical science (tool) concept with behavioral science ideas which include techniques for design, implementation and assessment. However, "because such definitions are focused on instruction, critics have suggested they narrow the perspective of those seeking to understand the context of instructional materials in ways that preclude broader organizational, social and systemic questions" (Kearsley, 1998).

Others have defined ET as "a physical tool specifically referring to digital technologies separate from the methodology of its use in education or the social value given to it" (Lerman et al, 1997). Such a separation narrows the focus but allows research on the interplay between object design and its social construction.

This study takes its inspiration from both (Saettler, 1998) and (Kearsley, 1998) in defining ET as digital information technologies in education, including workstations and servers, multimedia components, computer-controlled instruments, networking and telecommunications infrastructure, networked information and tools accessed through computers using specialized software and hardware.

Teaching, Learning and ET

It is very difficult to measure what constitutes good technology or good teaching. As far as good technology is concerned, one encounters many publications extolling high quality computers and the cost of obtaining them as measurement of technological brilliance; "however, the parameters for both these measures vary from subject area to subject area and, in any case, reflect past achievement rather than current performance" (Herman, 1994). However, these tangible measures do have some credence when assessing technological value. The quality of teaching is, however, much more difficult to assess. Most often, reliance is placed on feedback from students, "which may reflect the style of the teacher rather than the substance of learning" (Herman, 1994). "Although there might not yet be a definitive conclusion since it is becoming apparent that the type of learning that technology best enhances is difficult to quantify" (Johnson, 1996).

Increasingly it has been contented that attempts to find correlations between measures of teaching and measures of technology are futile. Experts assert that the stress on teaching is misplaced. The relationship suggested by Humboldt (2001) is between technology and learning. His emphasis is on the shared experience of the instructor and the student in exploring new material, not the transfer of a body of knowledge from one to the other. Elton (2001) has suggested that student-centered approaches to learning, such as problem-based learning, are the most likely to show a marked improvement in learning through technology, but this has still to be demonstrated empirically. If Elton is correct, it is particularly important for schools that are involved in student-centered learning be also involved in using technology in education.

ET and Traditional Education

The function and utility of ET and traditional education are not adversarial. Traditional education is dispensation of education in the traditional setting, i.e. a teacher dictating to eager learners. The role of technology is to supplement that role by allowing the teacher to offer more knowledge and awareness – through computer, Internet and other communication facilities – so that the student is not only dependent on what is taught in the class but, with greater accessibility to information, is able to ask questions and, perhaps, even question or critique what is being taught. Therefore it transpires that the role of ET is to assist the teaching process and, as such, its relationship with traditional education is more of a supplementary and cooperative one rather than a competitive one. "Traditional education cannot be replaced but it can and should be streamlined with the use of up-to-date ET tools" (Mohammed, 1992).

Evaluating past literature on the influence of technology on education one finds evidence to support the contention that technology is an integral and vital part of imparting education. Further, technology should not be separated from the traditional way of teaching, rather it should complement it. An example of this view is Hattie and Marsh (1996) who conducted a meta-analysis of studies of the technological/teaching link and were able to demonstrate a comprehensive relationship. From this and similar findings, it is now being argued that ET cannot and should not be separated from traditional education.

Social Impact and Interest in ET

The business community has been at the forefront of embracing technological innovation and development. Businesses clearly realize that the Internet is indispensable to their survival, because it empowers employees and allows more efficient information flow, which leads to increased productivity.

In contrast, ET's reception, at least in the beginning, was not as warm. The education community based on bitter past ET experiences of adopting and integrating other products, namely, radio, film and television, viewed ET and its effectiveness in education with distrust. These technologies which were inducted with great fanfare, but the promised revolutionary changes did not live up to expectation. Since the education system has typically used technology in a rather non-systematic manner and in some cases has been quite resistant to the implementation of technology (Kerr, 1996), it should not be surprising to find that there is still some controversy surrounding the quantification of technology's impact (Swan and Mitrani, 1993).

Even as late as 1993, underscoring the large gulf between the business and the education community in embracing computer aided technology, D'Ignazio (1995) states, "businesses have been building electronic highways while education has been creating an electronic dirt road." Peck and Dorricott (1994) describe schools as "rumbling along, virtually unchanged by the presence of computers." Paving the "dirt road" will take effort but once properly done will become the "super highway" education needs.

Besides the above mentioned "bitter experience" there have been a number of reasons for this slow or cautious approach of the education community towards ET. The reasons "include the lack of time and resources required to conduct the necessary research as well as the lack of an understanding of how such research findings could be used beneficially, for instance,

to inform future implementations" (McKenzie, 1994). McKenzie (1994) also laments that "the most substantial research into student learning with technologies has examined performance on lower order tasks and basic skills. Too little work has been done measuring gains in higher order skills." He and many others who have written on this topic (Culp et al, 1999; Ehrmann, 1995; Riel, 1992) talk about large scale change and the accompanying need for careful planning (including the provision of professional development opportunities related to technology) to enable the maximum benefits for learners to occur.

It is encouraging that that the education community has grown increasingly fond of, and comfortable with, the use of ET. Leading researchers are gushing on the importance of ET. "Computers have become the most sought after electronic devices in both homes and schools. They have captured the interest of the general public and many parents believe they will improve their children's chances for success in school and in life" (Kook, 1997). Just as the general society has embraced technology, education is finally reciprocating in the same way. It is believed and hoped that the same enthusiasm will translate in the classroom and assist teachers in better and efficient dispensation of their duties.

In addition to the positive ET forecasts enumerated above, some analysts even go as far as to predict that ET will revolutionize the concept of the traditional single classroom, by bringing people and classrooms together on a global level. Computers connected to communication networks provide convenient access to vast amounts of data from essentially any field of study. According to Kook (1997), "The growth of communication networks will change the image of the classroom for the Twenty-first century. The global classroom will be connected by networks that reach around the world and across subject areas" (Kook, 1997). This seems increasingly plausible, with the validity of the argument demonstrated by the increasing and already accepted use of video conferencing. Things are changing at such a rapid pace that everything seems possible. The idea of computer technology dramatically changing the nature of schooling may sound exaggerated, until one realizes that computer technology has already dramatically changed the nature of work - "Computers have revolutionized such diverse workplaces as offices, stores, airlines, steel plants, hospitals and the military" (Tyack & Cuban, 1995).

Admittedly, the education community has not turned to technology to the same degree as has the business community and it can be argued that the education system has not done an exemplary job of evaluating the impact of the technology it has implemented. However, based on the literature cited, it is reasonable to presuppose that this trend has recently changed. It will simply not be possible for educational institutions to resist the increasing influence of computer technology in society. The market will grow increasingly insistent that schools prepare students to be workers and consumers within a networked society. Educators and educational institutions will have to rise to this challenge or risk becoming outdated or irrelevant.

Examining the Need of ET: Defining the Requirements

Infrastructure Requirements

One cannot expect the computer to work by itself. Expensive electronic equipment acquisition is only the first step towards attaining ET integration; a host of supplementary accessories when put together make ET a truly revolutionary experience. Through the years, as technology

has developed, the requirements for its proper use and function have also multiplied. Individually every computer needs power, software and Internet connectivity. In schools, with many more people involved, the complexity naturally multiplies, with the additional need for Local Area Networks and audio-visual aids. Good infrastructure is also vital for housing and operating the equipment to its optimum level. It includes installing good quality cables, crucial for fast information flow – better quality twisted pair wiring or the best "fiber-optic cables – suitable lab or class construction to house the equipment, convenient and ergonomically designed furniture and an updated electricity infrastructure. Further, the infrastructure needs adaptability - "the school's telecommunications infrastructure must be designed to allow expansion and change in response to future technological needs" (Mohammed, 2003). "Environmental factors must also be considered as technology infrastructure is being planned. Proper circulation of clean air and temperature control are essential" (Caruba, 1984). When deciding where to locate hardware, student traffic patterns should be considered, for example, avoiding placing equipment in congested areas (Mohammed, 2003).

It is obvious from the requirements described above that having ET in a school from installation to proper utilization with regular upgrades and maintenance entails a sizable price tag. It is very important that not only the initial cost of buying and installation is kept in mind but the more important running, up keep and, if need arises, repair costs should also not be ignored. Equipment once installed needs constant upgrade and care. Even a small problem can stall the entire infrastructure and consequently shut down the education process.

As part of this infrastructure, software browsers with suitably fast Internet connections are a vital and integral part of ET. Having a slow Internet connection can negatively impact the progress of realtime classroom activity. This potential lack of productivity can result in student boredom and apathy.

Skills Requirements

Having state-of-the-art equipment and infrastructure does not guarantee success. The question remains whether or not technology increases student achievement. The answer to this question, as Viadero (1997) says, "It depends on what you are going to do with it." According to Ted Hasselbring, a co-director of Vanderbilt University's Learning and Technology Center in Nashville, USA, "It's kind of like asking, 'Are pencils effective?"' There is a greater chance of misuse and waste of time and equipment than any possible benefit if the operators, i.e. teachers, are not trained. Therefore teachers having a technological background and sound training are as indispensable as the technology infrastructure.

"In the past, new classroom technologies seemed to go through a cycle of high expectation - limited success - disappointment - and blame. The blame was sometimes assigned to logistical problems, but more often it was credited to teachers. Earlier reformers underestimated the importance of the teacher's role in the classroom and tried to impose change from the top down. Little formal effort was made to support teachers who tried to implement new technologies. Teacher preparation programs are described by Kook (1997) as "the crucial issue to be addressed". The teacher of the future will depend on the computer for both personal productivity and for instructional activities. Kook (1997) lists thirty-three primary computer skills for teachers, such as navigating the desktop environment and using aids such as Microsoft PowerPoint. He suggests that these skills should be part of the required courses for prospective teachers and insists that in the new century "teacher education will be forced

to accommodate a considerable amount of transformation to allow teachers to function effectively in the Information Age" (Kook, 1997).

Furthermore, training should be done before and not after the installation of the equipment. Later training will only be a drain on resources, as whilst teachers are going through their training, equipment will lie dormant. This is problematic for many reasons, especially as new technology is replacing old at a tremendous rate, with equipment potentially becoming obsolete shorty after staff and teachers are ready to use it fully.

Technology success in schools is directly related to its successful integration in the classroom. "Technology is integrated when it is used in a seamless manner to support and extend curriculum objectives and to engage students in meaningful learning. Thus "the use of technology in the classroom necessarily depends on the ability of the teacher to integrate it" (Kent and McNergney, 1999). "It is not something one does separately; it is part of the daily activities taking place in the classroom….The primary goal is not to use the technology; rather, the goals are to engage students in meaningful learning and assess their understanding" (Dias, 1999).

The Learning Environment

The learning environment consists of physical as well as relationship environments. Learning environments in schools characteristically involve one or more adult teachers connected with a number of students, usually in well defined physical settings, i.e. it may be in a room, full of particular furniture and equipment. Curriculum materials such as books, videotapes, etc. may also be present. All these people interact and form a variety of relationships, creating "a system of interrelated factors that jointly affect learning in interaction with (but separately from) relevant individual and cultural differences" (Salomon, 1994). This is what Wubbels et al (1991) term the "relationship dimension" in learning environments at school.

The curriculum is concurrently a part of the physical dimension and the relationship dimension of the learning environment. Physical, because students and teachers are focused on certain processes and content in the curriculum and have a relationship with that curriculum and the methodologies that are associated with conveying the curriculum. Students and teachers may have very different relationships with different components of the curriculum. For the majority of children, the place of computers in learning is most likely to occur in the classroom and at home. Just like curriculum, computer is characterized as interactive and thus in addition to being a part of the physical aspect of the learning environment constitutes an important position in the relationship context as well (Yamagata-Lynch, 2003; Rieber, 1994).

The classroom learning environment provides a structure to describe the setting in schools within which learning is organized and the roles of the teacher and students are determined. However, only constructing a particular setting cannot help achieve better learning if the aim, for which it was constructed, is ignored. This is dependent on the beliefs and actions of those responsible for setting up the environment, particularly the underlying pedagogical philosophy of the teacher. Available literature leaves little doubt that the educational philosophy to which most educational leaders and researchers subscribe is that of "constructivism".

Although there is no single definition of constructivism, a common element found is that knowledge is constructed out of personal sets of meaning or conceptual frameworks based on individual experiences encountered in relevant environments. People interact with their

environment and as a result develop meanings to explain these interactions and to assist in negotiating future interactions.

According to Perkins (1992) "central to the vision of constructivism is the notion of the organism as "active" - not just responding to stimuli, as in the behaviorist rubric, but engaging, grappling and seeking to make sense of things... an often misguided constructivism belief held among teachers is that all learning must be achieved entirely by discovery and that the teacher and curriculum materials have no place." Perkins (1992) further describes two constructivist positions on teaching/learning paradigms as constructivism without the information and constructivism beyond the information. He advocates that a blend of both approaches be employed. Unless a balance is kept, the chance of quality of learning diminishes. In the context of using ET in schools, DeCorte, (1990) says, "a powerful computer learning environment is characterized by a good balance between discovery learning and personal exploration on one hand and systematic instruction and guidance on the other, always taking into account the individual differences in abilities, needs and motivation between students."

Conclusion

Every school has the right and the capability to benefit from the full range of educational advantages that flow from the effective use of technology with strategic planning, adequate funding and clear aims (Brush, 1998; Byrom, 1998).

This literature based study reports on current ET challenges facing schools and has outlined successful implementation strategies to further efforts to infuse technology into learning and teaching. While examined within varied contexts, ET implementation was shown to be effective when supported by school administration and teachers. Better results can be achieved when schools focus on purchasing and implementing ET equipment according to their needs and capabilities and training their staff appropriately and in a timely fashion. ET implementation plans are shown to be less effective when confronted by high levels of resistance.

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