Information Technology in Education

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Abstract: Latest advances in the Information Technology (IT) opened up a new era, "The Digital Age", in which every business had to adapt promptly to these advances or lose the competition. Education systems, lying in the heart of all businesses, must also be upgraded so as to supply the personnel demanded by the industry. Here, we discuss the influence of Information Technology (IT) and Instructional Technology on the current education system and the adaptation procedures to the future.

1. INTRODUCTION

Tod Maffin, in the article "Enabling Learning in Digital Age" [1] says *what society needs in today's hyper-accelerated world, are stones with sharper edges*. Today's employers want originality, speciality and multitasking workers in order to enhance productivity. How do we use the tools available to us to support young people who want to benefit from the advanced IT in order to develop these sharper edges? The answer is obtained by elaborating the concepts of teaching and learning.

IT is becoming the largest industry in today's world, even larger than the automotive, construction and food industries. Therefore, students must be prepared to take their functional role in the new economy. Societies must discover their information resources, from media to technology, to networking, to global information highway, in order to find out how education will evolve over the next decade. Educational policy makers and school administrators should create systems that reward the integration of technology into the curriculum. Corporations and local businesses should collaborate with the education community to help ensure that today's students will graduate with 21-st century workplace skills. In USA, the Secretary of Labour's Commission on Achieving Necessary Skills articulated five areas in which students must be competent and therefore schools must teach for the future. These are [2] a) identify, organize, plan and allocate resources, b) work with others, c) acquire, organize, use, maintain, interpret, communicate as well as use technology to process information, d) understand complex interrelationships and systems, e) work with and apply a variety of technologies to complete tasks.

Current education systems must be designed in order to help students gain the above five skills. It will be a kind of "fits will survive" role as the students are helped to gain the necessary skills rather than giving them these skills.

2. NEW MEDIA: THE DIGITAL WORLD

The new media, obviously, will change the way children will approach the world around them and the way they reason in this digital world. The best and the worst parts of the digital world are both, there is just too much information (*content*) available at the on-line resource centres or knowledge bases such as libraries, museums, data banks, galleries, weather forecasting stations, space stations, research centres, Internet Service Providers, telecom utilities and language centres. A recent research at the California Berkley University suggests that, more information will be produced in the next three years than the last 300,000 years. Rather than memorising all these information, students/people must have the ability to use electronic means to find information they require, from the new media at the time they need it. We must teach young persons how to separate good and bad information. In doing this, the characteristic features (good and bad habits) of the youngsters, towards education and learning, must be identified and the curriculum must be designed such that they will benefit from both their strong and weak points in learning.

Some of the habits young persons have when using Information Technology are, they like a) to click around, b) to see the computer do something based on their input, c) to see their name or work being posted, d) crazy and simple animations, e) loud and colourful layouts, f) to find out about other young persons, g) to compete and finally h) to create their own (password protected) secret world inside the computer. However, young people do not like a) to wait, b) to get lost, c) too much information, d) longer than 30 seconds reading, e) small prints and f) to be aware that they are actually learning. In developing the new media, the habits of young persons will aid to improve perception and learning rate without boring them.

3. TEACHING AND LEARNING IN THE DIGITAL WORLD

Recent research and findings in Instructional Technology revealed a number of important concepts in describing learning and teaching in the digital age as the world is becoming a big global village by the means of Internet connectivity [3]. These principles are exploration, expression, experience, multi-cultural, multi-lingual, multi-modal, content-driven learning, learning rather than memorising, coaching and feedback and finally simulations. These principles should be analysed in order to have a thorough understanding of the influence of IT on education and training.

3.1 Exploration

Newborn babies learn about the world directly by crawling, touching, chewing etc. until preschool. But then they need to be told more advanced ideas. Education system must aim to use IT that enable children to continue learning more advanced ideas by direct exploration and experimentation. The

teachers/lecturers role is to lead students only when they get stuck or get lost in the digital world.

3.2 Direct Expression

Contrary to the traditional view that, children should absorb ideas from adults, new IT enable children to relate/create their own stories and ideas rather than having adults do the talking for them. Hence, children must use advanced technologies to empower and express themselves through story telling, communicating, designing, inventing and direct expression.

In the future, students will experience the big world out there through their own personal contacts with other people around the globe. They will be able to see how other sides of the world looks and sounds like through electronic eyes and ears, the organs of the digital world.

3.3 Multi-Cultural

Today most technologies such as housing, entertainment, cooking and dressing, support a limited set of styles and approaches. With the Internet comes, both a need and an opportunity for more encompassing approach, encouraging participation by children from different cultures. In time, IT developers will develop new ways to encourage children around the world to share and learn about another's culture and traditions. Of course, success of the students in the multi-cultural digital world will be related to the ability to communicate with other children from different cultures.

3.4 Multi-Lingual

The biggest obstacle to the development of a global community is the variety of languages spoken around the globe. Tools are being developed to enable people to communicate with one another across linguistic boundaries while supporting their learning of other languages and enhancing the value of their own. Electronic translators and the virtual reality tools will aid students to communicate and establish new contacts without getting stuck in the language problem.

3.5 Multi-Modal

There is a considerable amount of work going on towards developing man-machine interface systems such as those to be used in cars, in houses and other premises to ease human life. In particular, the man-machine-interface systems designed for IT will make a big impact on digital teaching and learning techniques. By enabling machines to understand and produce gestures and other forms of nonverbal communications, the nature of interaction between humans and machines will be enriched. Machines that understand verbal and nonverbal communication can open up Instructional Technology to a broader range of ages and cultural traditions (including non-literate people). Children, who can't yet type, can speak and gesture in the direction of their computer and understand the speech and gestures the computer returns.

3.6 Content Driven Learning

The success of Instructional Technology is, among other things, strongly dependent on the material delivered to the students. Hence, the teaching staff must be highly selective about what content is served to the students in order to acquire the necessary skills. Hence, instructors should teach tacit (expressed without being spoken or written), heuristic (by experience or own personal discovery) knowledge as well as textbook knowledge.

3.7 Learning Rather Than Memorizing

The difficult question of how to distinguish learning and memorizing can be eased by elaborating the process of learning and remembering [4]. Simply, learning involves the manipulation of information in some way, and so, learning cannot take place without an input-information, which can be obtained in the following three ways:

a) *Long-term memory*: When involved in arguments, problem solving or discussions, the individual uses the information, which is already in memory but which may form a part of a different semantic network (a knowledge construction in memory in which information is held in 'nodes' linked to form a network).

b) *Primary information sources (external environment)*: These are experienced directly from observation, experimentation and so on.

c) *Secondary information sources (external environment)*: This represent information, which is processed by other individuals and presented to the learner. e.g. teachers, books, TV programs, conversations and so on.

Much of the current education system is based on secondary information sources. The future education systems must attempt to compensate for the lack of primary knowledge acquisition and also concentrate on information acquisition and processing skills rather than just learning. Computer simulations and on-line experimentation systems can also be treated as sources of primary information. One way to ensure that learners are interested in the material is to teach knowledge and skills in context that reflects the way knowledge will be useful in real life.

3.8 Coaching and Feedback

Learning in the digital world must be a sort of do-it-yourself task. Instructors must observe students as they try to complete tasks and provide hints and help when needed. The only external support required is the set of instructions given by the instructor and the support given to the learners by performing parts of the task they cannot perform, gradually shifting more and more of the control to the learner.

3.9 Simulations

Before computer, technology used in teaching was limited to audiovisual equipment such as radio-tapes and overhead projectors. Computer changed the complete education system by enabling fast and error-free data processing, mass storage capabilities, use of telecommunications facilities and the ability to perform simulations.

The idea behind simulation is to realize a virtual reality world created by computer programs and supported by multi-

media tools in order to provide an opportunity for the learner to act on realistic scenarios without attendant dangers and inefficiency of the real world (time and money). Flight simulators have been used for years to train pilots in a wide array of flight conditions (e.g. fog, cross winds, down drafts, engine flare out).

4. THE NEED FOR INSTRUCTIONAL DESIGN

When IT is introduced into the education system, Instructional Service Centres will be required to create the *contents* in databases and deliver these instructional contents to the education and training centres. Instruction is a word introduced to describe both technical training and education where technical training is said to be skill based and education is knowledge based [5]. During learning process both knowledge and skills are acquired. Instructional Design (ID) as a discipline rests on the two foundations of 1) a *system design* model for managing the instructional development process (which is a service currently provided by Internet Service Providers) and 2) *theories* that specify what *high-quality instruction* should look like (which validates the need for a Content Provider). Sophisticated computer-based tools have been developed to automate the ID process.

It is important to note that, much of the early *educational software* was written by programmers, rather than teachers and often lack, educational principles. In the future teachers will/must have a much greater contribution to the design of educational software and instructional contents. Similarly, marketing people have been ignorant about the Internet and they defended themselves that Internet is a technology issue not a marketing issue. However, lately, the contribution of marketing people to e-business and e-trade has been significantly increased. In the near future, Internet in particular and IT in general will be an inevitable and necessary issue in all parts of business and industry.

Increased access to the Internet has removed many of the constraints on publishing that existed in the past. Today, anyone with a computer and Internet access can publish anything world-wide and there is no one to check the accuracy or value of the material. Therefore, it is ever more important that students validate the information they obtain by collecting materials from different sources and selecting the majority. As more information will be available in machine-readable form, students will adopt new methods of working. It will be possible for students to complete a very long assignment or term project without writing a word; all they have to do is cut and paste. When using IT, it must also be born on the mind that knowledge is being generated at an ever-increasing rate and information has an increasingly short useful life. Therefore, the publication date of the information must be checked before referring to it.

5. REDEFINING THE ROLE OF TECHNOLOGY IN EDUCATION

Technology is a tool not a solution. Hence, it is important to remember that IT aids us in learning, but can't do the teaching. In this respect, even a good teacher doesn't really do the teaching but actually enable students to teach themselves by exploration. In other words, as more and more knowledge becomes available, teacher's main task will be to enable students to get and manipulate the information they require.

In the Computer Based Instruction system, schools may be by-passed by the adoption of Information Technology into education. Computer companies might concentrate on home market rather than the educational one. While a large high school might buy 10 new computers a year, there could be children at the school from a thousand homes, each one being a potential customer and so the home market is potentially much larger than the educational market. Hence, children would go to school for only part of the day to take part in the social activities and then return home to work on the Computer Based Instruction system. Hence, naturally establishing, a distant education system.

The use of appropriate technology is strictly necessary in a distant education system. However, the preparation of all the instructional materials in the web page or on-line resources, updating and improving the contents continually requires an Instructional Design expert. So, technology enables learning while teachers do the teaching. It is critical to remember that technology for technology's sake is not the key. The key is creating a plan that will enable teachers to use technology and the expansive resources it makes available to improve students performance and achievement.

The influence of IT in education can be observed after a rather long time and therefore requires a long-term investment plan. A student enrolled in an IT based education (Computer Based Instruction) system in the primary school today will graduate from university after 16 (5+6+5) years. If another 4 years is needed to gain the necessary experience in the work place, as much as 20 years is needed to observe the effect on the societal development.

Performance problems in Computer Based Instruction can result from a lack of skills or knowledge, lack of motivation or an inadequate environment (physical, administrative or logistical). Motivational problems may be solved by changing the work incentives or by methods aimed at increasing student's cooperation, feelings of ownership, confidence in their ability to perform or validation of the tasks. Environmental problems may be solved, by re-engineering the environment. It is important to have the description of how and why the material will be used, characteristics of the learners who will use them, characteristics of the administrators of the material and important logistical factors such as the production, storage and delivery services and the resources available to support their use [6].

The effectiveness of IT in education is enhanced not only by the underlying digital technology but also the quality of instructors that actually (do the teaching) enable learning. There are three major predictors of the success of Internet use in education (instruction) systems [7,8]. These are:

a) **Teacher's level of classroom connectivity**: Internet use is higher in classrooms with LAN based direct Internet connections feeding multiple numbers of connections [7,8]. This is due to different subjects being taught in classrooms with more Internet connectivity. Lecturers/students using the telecommunications facilities can establish interactive connections with any online resource around the globe to

enhance interest and improve effectiveness of teaching/learning.

b) Teacher's computer expertise: This predictor effects how likely a teacher was to say that classroom Internet resources (e-mail and web) were essential to good teaching. Although the Internet is often presented as a novice-friendly area of computer use, still a relevant prior computer knowledge may be an important pre-requisite for a teacher to make the Internet a valued resource in the classroom and valuable in teacher's lesson preparation activities.

c) Constructivist pedagogy-teachers pedagogical beliefs and practices: Scaling up Internet use to higher numbers of teachers may depend in part on changing the relevance that teachers perceive the Internet holding for their primary instructional goals, which in turn require changing teacher's instructional priorities. Teacher who regard education as primarily the distribution of facts and skills to students according to a fixed curriculum sequence are much less likely to exploit the Internet than more "constructivist" teachers.

6. CONCLUSION

Many argue about the funds needed to computerize all schools are out of reach of the principals. Some news collected from the Internet claim that Federal Government spared a $50 million to connect all schools in USA to the SchoolNet and Japanese government will wire all schools and homes with fibre optic cables by 2015. A similar work is being carried out in Canada and many other developed countries, all to create a Computer Based Instruction system in order to integrate IT into education.

Computer Based Instruction consists of two parts, namely the Service Providing part and the Content Providing part. Service providing problems will be mostly solved when all the computers are networked through the Internet. However, the content providing part is a highly challenging issue that can never be solved completely as the teaching methods and the technology used in teaching will be subject to a continuous change. Computer Based Instruction, greatly facilitated by computers, the on-line resources and Internet Service Providers, aim to make the processes of teaching and learning more efficient and flexible.

Classical education systems consider the lecturer as server and the students as clients, where the server must periodically send information to the clients and the clients must store and process this information in a predetermined period of time, usually the exam week. Here, the server and the client are bridged through a channel, the classroom.

Future education systems will aim to educate self-learning students and it will make the most effective use of technology, especially Information Technology. Future education systems, being student-driven, will/should aim to enable collection and processing of data by the students in order to produce the required information to solve real life problems. The teacher's role is merely to ensure that the correct data have been collected and processed in the proper way to produce the required information. In this cyber education system the autonomy and independence of students will be strongly accentuated.

In the future teacher-centred instruction will be replaced by student-centred learning; single-media (classroom) education by multimedia education; information delivery by information exchange; passive learning by active, exploratory, inquiry-based learning and finally artificial-context by real-world context.

It is still an unanswered question how the students will gain such sound self confidence to acquire the kind of independent and self driving attitudes so as the effective use of technology will be possible. In particular, in a multilingual, multicultural cyber-world, the severe cultural differences in a group of students will remain to a certain extent for the near future and these boundaries must be bridged by a reinforcement of a psychological foundation built starting from the childhood.

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