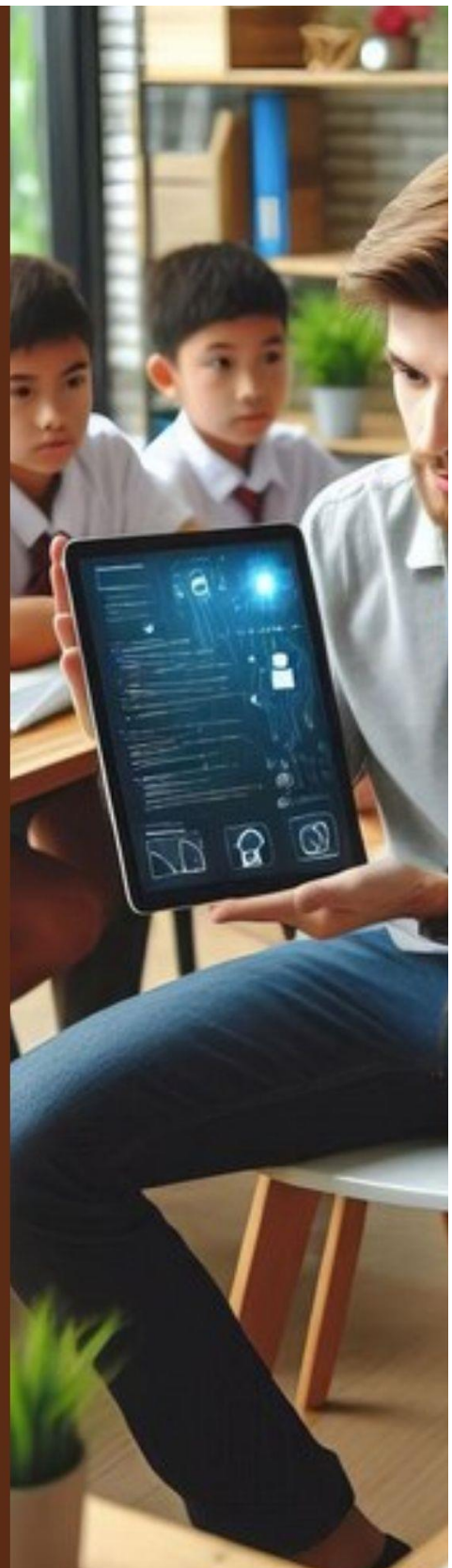


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Trends and Issues to integrate ICT in Teaching Learning for the Future World of Education

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Abstract—In a classroom, the emphasis is on the students' own learning. Efforts to improve the quality of learning experiences for students have long been a focus of educational theory and practice. The ongoing interest among educators to understand the elements, processes, and contexts that contribute to learning has led to the development of several learning theories. Teaching and learning practices have continuously evolved in response to the application of prominent theories of learning. There is an astounding pattern to the research done on youth. These results show that kids remember 20% of what they hear, 40% of what they see and hear, and 75% of what they do and see. That's why it's so important to use modern educational technologies to teach people. They provide students with an immersive, real-world learning experience by integrating various information and communication technologies (ICTs), such as the internet, video, audio, graphics, text, photos, etc. The purpose of this study is to examine the current state of affairs with the goal of identifying the opportunities and limitations of using ICT in the teaching profession.

Keywords—ICT,Education,Teaching-Learning.

I. INTRODUCTION

The process of teaching and learning and creation of knowledge is carried on from the very first day of human history. As the body of knowledge grew bigger and bigger with varied dimensions the process of teaching and learning became formal and systematic. Need for methods and strategies to enhance the quality of learning originated. Over centuries educators have been concerned with the issue of increasing the efficiency of learning experience.

Globalization and technological change – processes that have accelerated in tandem over the past fifteen years – have created a new global economy “powered by technology, fuelled by information and driven by knowledge” [1]. The emergence of this new global economy has serious implications for the nature and purpose of educational institutions. As the access to information continues to grow exponentially, schools cannot remain mere venues for the tra-

nsmission of a prescribed set of information from teacher to student over a fixed period of time. Rather, schools must promote the acquisition of knowledge and skills that make possible continuous learning over lifetime [2].

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When used appropriately, different ICTs are said to help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to all life. However, the experience of introducing different ICTs

in the classroom and other educational settings all over the world over the past several decades suggests that the full realization of the potential educational benefits of ICT is not automatic. The effective integration of ICTs into the educational

system is a complex, multifaceted process that involves not just technology – indeed, given enough initial capital getting the technology is the easiest part –

but also curriculum and pedagogy, institutional readiness, teacher competencies, and long-term financing, among others.

II. BACKGROUND

With the advent of ICTs the definition of Teaching-Learning is changed. ICT has the potential to enhance information distribution, learning, teaching and managing of educational services and make them affordable and available anytime, anywhere. So educational institutions should profoundly revise present teaching practices and resources to create more effective learning environments and improve life-long learning skills and habits in their students.

ICTs are resourceful and powerful tools that can help in this purpose and should therefore be present in every educational place. The OLPC (One Laptop per Child) program developed by John Negroponte, a researcher in MIT, USA may be a glowing example in this respect.

The need and urgency for developing technological literacy, although not a new idea, emerged with greater emphasis in the early 1980's. With this increasing awareness and interest, technology quickly was recognized as a powerful vehicle for offering educators innovative ways to enhance student learning. In the early 1990's the International Society for Technology in Education, ISTE established standards defining technological literacy for teacher education. The ISTE standards recommend that all teachers should be prepared in the following areas:

A. Basic Computer/Technology Operations and Concepts:

Teachers should use computer systems to access, generate and manipulate data; and to publish results. They should also evaluate performance of both hardware and software components of computer systems and apply basic troubleshooting strategies as needed.

B. Personal and Professional Use of Technology

Teachers should apply tools for enhancing their own professional growth and productivity. They should use technology in communicating, collaborating, conducting research, and solving problems. In addition, they will plan and participate in activities that encourage lifelong learning and will promote equitable, ethical and legal uses of computer technology resources.

C. Application of Technology in Instruction

Teachers should apply computers and related technologies to support in their grade level and subject areas. They must plan and deliver instructional units that integrate a variety of software, application, and learning tools. Lessons developed must reflect effective grouping and assessment strategies for diverse populations.

This paper is intended to help policymakers in developing countries define a framework for the appropriate and effective use of ICTs in their educational systems by first providing a brief overview of the trends of modern education and the use of ICT. Second, it addresses the four broad issues in the use of ICTs in education—effectiveness, cost, equity, and sustainability. The paper concludes with recommendations that policymakers in developing countries may reckon with when making decisions about the integration of ICTs in education.

III. ICTS AND TEACHING LEARNING

The ICTs stand for information and communication technologies and are defined as a “diverse set of technological tools and resources used to communicate, and to create, disseminate, store and manage information.” [3] These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony.

Teaching-learning process is a means through which the teacher, the learner, the curriculum and other variables are organized in a systematic manner to attain predetermined goals and objectives. Structure of a standard teaching-learning process includes:

A. Teacher as independent variable

The teacher plans the role of an independent variable. Students are dependent on him in the teaching process. The teacher does the planning, organizing, leading and controlling of teaching for bringing about behavioural changes in the students. He is free to perform various activities for providing learning experiences to students.

B. Student as the dependent variable

The student is required to act according to the planning and organization of the teacher. Teaching activities of the teacher influence the student's learning.

C. Content and the strategy of presentation as intervening variables

The intervening variables lead to interaction between the teachers and the students. The content determines the mode of presentation—telling, showing and doing etc.

ICT is used worldwide to facilitate the teaching learning process but it can no way replace the traditional system of teaching learning. The teaching-learning activities which are varied and complex have to be harmonized. So it is very important for an ideal and updated professional teacher to integrate effectively all the various elements of the teaching-learning situation and more importantly these should be brought into an intelligible whole [4].

IV. THEORETICAL FRAMEWORK FOR INTEGRATING ICT IN EDUCATION

The main consideration in ICT-based education is the improved and quality learning. There are many theories that lead the scientists and educationists in developing ICT-based teaching/learning/training system. The theory of neural network or learning in human brain is one of the most prominent ones in his regard. According to this theory, learning is the neurobiological process and it takes place in the brain. It works through genetically set neuronal networks. Terms of the neural network should be clarified before knowing how learning occurs in the human brain and where the scopes of improvement lie. The components of human brain are:

1. *Neuron*: Basic unit of brain. Human brain contains 1010 (ten thousand million) neurons, each of them are connected to 104 others.

2. *Dendrites*: Act as input channel through which all input to neuron arrive. Each & every input channel is assigned a weight. If total weight of all input exceeds a certain threshold value, then the cell is fired and it produces an output on axon channel.

3. *Axon*: Act as output channel of neuron. Electrically active filaments that produce a voltage pulse called action potentials (lasts about 1 millisecond).

4. *Synapse*: Axon terminates in a specialized contact called synapse.

When axon hits synapse with action potential, synapse releases chemicals (neurotransmitters) across the gap. These chemicals diffuse across the gap and chemically activate gates on the dendrites which, when open, allow charged ions to flow. The more gates on the dendrite open, the more ions will flow and more learning will be achieved. It means that if the number of inputs can be increased, the learning will be higher.

We know that ICT-based education gives a learner more opportunities to assimilate the concept through auditory and visual memory of human brain. So in ICT-based education, the number of inputs will be higher than the traditional one. Thus, it provides better output as well.

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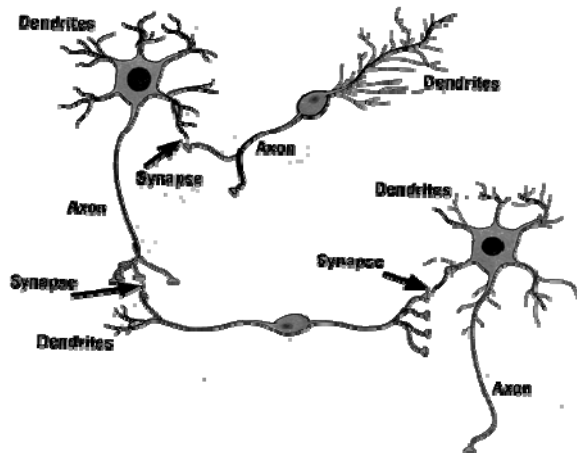


Fig 1: Neural network in human brain

V. TRENDS OF MODERN EDUCATION AND THE USE OF ICT
 Technological developments (figure 2) in ICT are very rapid and also become obsolete requiring new skills and knowledge to be mastered frequently. Adaptation is only possible when based on a sound understanding of the principles and concept of ICT. Keeping in pace with these technological developments and the changing competencies required for both the students and their teachers. Shifting from traditional learning to ICT-based learning is badly needed.

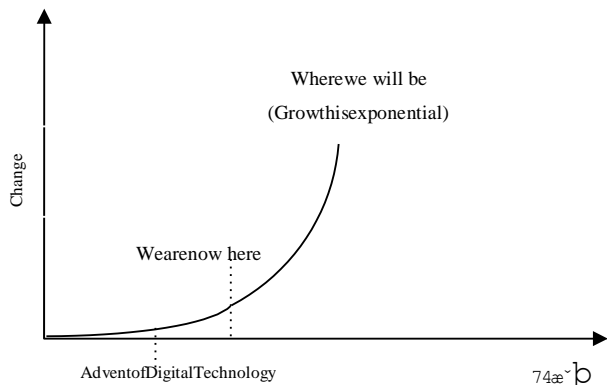


Fig 2: Technological development overtime

“The potential events of the coming decade are likely to surpass those of all of human history put together. - Bill Gates is the current chairman and chief software architect of Microsoft. Education in developing nations might be made more accessible, relevant, and high-quality with the use of information and communication technologies. So, it may be a way for them to level the playing field. Information and communication technologies have opened up previously unimaginable avenues for improvement in educational institutions, policymaking, and the economic prospects of the poor and middle class in emerging nations. Isolation is a major problem for the impoverished and many other people in the world's poorest nations. A lessening of that feeling of isolation and an expansion of access to information in ways that were previously unthinkable are both promised by the new communications technology [5]. Technology in the service of information and communication has the ability to greatly expand access to formal and informal education for underprivileged communities, including those living in remote areas, members of historically marginalised groups (such as women and girls, people with disabilities, and ethnic minorities), and those who are unable to attend classes on campus due to financial or time restrictions. With the help of ICTs, learning may take place at any time and in any place. Transcendence of physical space and time is a hallmark of information and communication technologies. Asynchronous learning, in which there is a delay between the transmission of information and its receipt by students, is made feasible by ICTs. One example is the accessibility of online course materials, which are available at all times. There is no longer any need for the teacher and all students to be present in the same physical place when educational programming is delivered via ICT (e.g., educational radio or television). Additionally, synchronous learning is made possible by certain forms of ICTs, including teleconferencing technology, which allow for several learners to receive instruction at the same time, regardless of their physical location. Electronic means of communication facilitate the use of distant educational materials. Printed books and other tangible media held in libraries (and accessible in restricted numbers) are no longer the exclusive means of instruction and learning. A limitless number of individuals, at any time of day or night, may now access an abundance of educational resources across a wide range of subjects and media types thanks to the Internet and the World Wide Web. The importance of this cannot be overstated for several schools in poor nations, and even

some in developed countries, that have limited and outdated library resources. ICTs also facilitate access to resource persons – experts, researchers, professionals, business leaders, and peers – all over the world.

ICTs prepare individuals for the workplace. ICTs enhance the students' learning and make them adjust in their job places. One of the most commonly cited reasons for using ICTs in the classroom has been to better prepare the current generation of students for a workplace where ICTs, particularly computers, the Internet and related technologies, are becoming more and more ubiquitous. Technological literacy, or the ability to use ICTs effectively and efficiently, is thus seen as representing a competitive edge in an increasingly globalizing job market. Technological literacy, however, is not the only skill well-paying job in the new global economy will require? EnGauge of the North Central Regional Educational Laboratory (U.S.) has identified what it calls “21st Century Skills,” which includes digital age literacy (consisting of functional literacy, visual literacy, scientific literacy, technological literacy, information literacy, cultural literacy, and global awareness), inventiveness, higher-order thinking and sound reasoning, effective communication, and high productivity [6].

ICTs improve the quality of education. Improving the quality of education and training is a critical issue, particularly at a time of educational expansion. ICTs can enhance the quality of education in several ways; by increasing learner motivation and engagement, by facilitating the acquisition of basic skills, and by enhancing teacher training [7].

ICTs such as videos, television and multimedia computers software that combine text, sound, and colourful, moving images can be used to provide challenging and authentic content that will engage the student in the learning process and also provide the opportunity to connect with real people and to participate in real world events.

The transmission of basic skills and concepts that are the foundation of higher order thinking skills and creativity can be facilitated by ICTs through drill and practice.

ICTs have also been used to improve the quality of teacher training. For example, institutions like the Cyber Teacher Training Centre (CTTC) in South Korea are taking advantage of the Internet to provide better teacher professional development opportunities to in-service teachers. The government-funded CTTC, established in 1997, offers self-directed, self-paced Web-based courses for primary and secondary school teachers. Courses include “Computers in the Information Society,” “Education Reform,” and “Future Society and Education.” Online tutorials are also offered, with some courses requiring occasional face-to-face meetings. [8]

ICTs transform learning environment into learner centered. Research has shown that the appropriate use of ICTs can catalyze the paradigmatic shift in both content and pedagogy

that is at the heart of education reform in the 21st century [9]. If designed and implemented properly, ICT-supported education can promote the acquisition of the knowledge and skills that will empower students for lifelong learning.

When used appropriately, ICTs – especially computers and Internet technologies – enable new ways of teaching and learning rather than simply allow teachers and students to do what they have done before in a better way. These new ways of teaching and learning are underpinned by constructivist theories of learning and constitute a shift from a teacher-centered pedagogy – in its worst form characterized by memorization and rote learning – to one that is learner-centered.

VI. ISSUES IN THE USE OF ICTS IN

EDUCATION Effectiveness, cost, equity, and sustainability are fo

ur intertwined issues which must be addressed when considering the overall impact of the use of ICTs in education.

A. Does ICT-enhanced learning effectively work?

The educational effectiveness of ICTs depends on how they are used and for what purpose. And like any other educational tool or mode of educational delivery, ICTs do not work for everyone, everywhere in the same way.

In higher education and adult training, there is some evidence that educational opportunities are being opened to individuals and groups who are constrained from attending traditional universities. Each of the 11 so-called mega-universities, the biggest and most well-established open and distance institutions in the world (which include the Open University of the United Kingdom, the Indira Gandhi National Open University of India, and the China TV University System, among others) has an annual enrollment of more than 100,000, and together they serve approximately 2.8 million. Compare that with the 14 million combined enrollments of the 3,500 colleges and universities in the United States [10].

In contrast, assessments of the use of computers, the Internet and related technologies for distance learning have been equivocal. Russel, in his comprehensive review of research, claims that there is “no significant differences” between the test scores of learners taking ICT-based distance learning courses and those receiving face-to-face instruction [11].

B. How much does it cost?

A common mistake in estimating the cost of a particular ICT educational application is to focus too much on initial fixed costs – purchase of equipment, construction or retrofitting of physical facilities, initial materials production, and the like. But studies of the use of computers in classrooms, for example, show that installation of hardware and retrofitting of physical facilities account for only between 40% to 60% of the full cost of using the computers over their

lifetime, or its total cost of ownership.[12] In fact, while at first glance it may seem that the initial purchase of hardware and software is the costliest part of the process, the bulk of the total cost of ownership is spread out over time, with annual maintenance and support costs (known as variable or recurrent costs) constituting between 30% to 50% of the total cost of hardware and software. The cost of professional development, another variable cost, also accumulates over time.

C. Is there equity of access to ICTs in education?

The introduction of ICTs in education, when done without careful deliberation, can result in the further marginalization of those who are already underserved and/or disadvantaged. For example, women have less access to ICTs and fewer opportunities for ICT-related training compared to men because of illiteracy and lack of education, lack of time, lack of mobility, and poverty.[13] Boys are more likely than girls to have access to computers in school and at home.[14] Not surprisingly, boys tend to enjoy working with computers more than girls.[14] As the American Association of University Women reports, "Girls have narrowed some significant gender gaps, but technology is now the new 'boys' club' in our nation's public school. While boys program and problemsolve with computers, girls use computers for word processing." [15].

D. Are ICT-enhanced educational projects sustainable?

One aspect of development programs that is often neglected is sustainability. The long history of development aid has shown that too many projects and programs start with a bang but all too soon fade out with a whimper, to be quickly forgotten. This is true for many ICT-based educational projects as well. In many instances, these projects are initiated by third party donors – such as international aid agencies or corporations – and not enough attention is paid to establishing a mechanism by which the educational institution or community involved can pursue the project on its own or in partnership with other stakeholders after the initiating donor exits. But cost and financing are not the only barriers to sustainability. According to Cisler, the sustainability of ICT-enabled programs has four components: social, political, technological, and economic.[16].

- *Economic sustainability* refers to the ability of a school and community to finance an ICT-enabled program over the long term.
- *Social sustainability* is a function of community involvement. The school does not exist in a vacuum. Innovation can happen only when all those who will be affected by it, whether directly or indirectly, know exactly why such an innovation is being introduced, what the implications are on their lives, and what part they can play in ensuring its success. ICT-enabled programs ultimately serve the needs of the community.
- *Political sustainability* refers to issues of policy and leadership. One of the biggest threats to ICT-enabled projects is resistance to change. If, for instance, teachers refuse to use

ICTs in their classrooms, then the use of ICTs can hardly take off, much less be sustained over the long term.

- *Technological sustainability* involves choosing technology that will be effective over the long term. In a rapidly changing technology environment, this becomes a particularly tricky issue as planners must contend with the threat of technological obsolescence. At the same time, there is the tendency to acquire only the latest technologies (which is understandable in part because these are the models which vendors are likely to push aggressively) generally, however, planners should go with tried and tested systems; stability issues plague many of the latest technologies.

VII. RECOMMENDATIONS

A rigorous analysis of the present state of the educational system. ICT-based interventions must take into account current institutional practices and arrangements. Specifically, drivers and barriers to ICT use need to be identified, including those related to curriculum and pedagogy, infrastructure, capacity building, language and content, and financing.

The specification of educational goals at different education and training levels as well as the different modalities of use of ICTs that can best be employed in pursuit of these goals. This requires of the policymaker an understanding of the potentials of different ICTs when applied in different contexts for different purposes, and an awareness of priority education needs and financial and human resource capacity and constraints within the country or locality, as well as best practices around the world and how these practices can be adapted for specific country requirements.

The piloting of the chosen ICT-based model. Even the best designed models or those that have already been proven to work in other contexts need to be tested on a small scale. Such pilots are essential to identify, and correct, potential glitches in instructional design, implementability, effectiveness, and the like.

The specification of existing sources of financing and the development of strategies for generating financial resources to support ICT over the long term.

Development of an ICT based Curriculum that is helpful for keeping in pace with technological development and the changing competencies required by the students as well as the teachers.

VIII. CONCLUSION

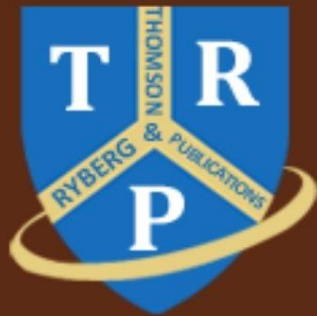
This is the age of technology. Everyone and everything seem to have something to do with computers and communications. Our future generation is already showing signs of becoming totally computer and technology dependent. It is a fact that over the years, education has become increasingly complex, with more and more information communicated to the student. In this environment it is

important for students to have an interesting, interactive and experimental mode of instruction that will make learning enjoyable and easy. ICT based education is definitely the direction towards which the whole world is progressing.

ICT use in the classroom in developing countries is still in its infancy. Its overall effectiveness needs to be enhanced by better software and hardware as well as greatly increased availability of each. The rate at which ICTs will be used to enhance education, in TVE, science and in other fields, depends mainly upon state and national monetary commitment, followed by the willingness of individual institutions to provide good in-service programs. Though there is no one formula for determining the optimal level of ICT integration in the educational system, creative teachers at all levels of education have always found ways to incorporate innovative teaching aids and strategies in their classes. However, ICTs should be used currently in conjunction with well planned classroom teaching.

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