Adoption of ICT in Instructional Setup of Indian School Education Sector

Mr. Amanpartap Singh Pall[1] and Dr. Roopali Batra[2]

Abstract

The usage of Information and Communication Technology (ICT) has grown exponentially in India owing to the vast pool of IT professionals, low cost of operations and the availability of innovative delivery structure. However, the adoption of ICT in the Indian education sector is still sparse and only a few traces of it are visible in the form of digital devices and media. Nonetheless, the use of these digital devices (beyond the use of social networking applications like Facebook, WhatsApp, and Twitter etc.) is very rare for instructional purposes. A closer look into the pedagogical set up of the schools reveals the constraints and barriers in the integration of the ICT with the instructional setup of the schools. It is believed that the student learning, teacher's instructional delivery and hence the overall quality of education can be immensely enhanced through technology integration in class room teaching practices and procedures. This paper by reviewing the existing literature available studies the adoption of ICT in school education and determines how information and communication media is useful for the instructional purposes in the classrooms. It further explores the factors and key barriers to ICT implementation and discovers how ICT fosters learning, development and augments' the pedagogical perspective of instruction based on a comprehensive literature review.

Keywords: ICT, Education, Instructional set up, schools, India

1. Introduction

For almost two decades the educators want to incorporate the IT into instructional setup of the schools. They are of the view that the use of computers in the instruction setup of the schools can greatly enhance the quality of education. There cannot be a much conducive time as of today to realize this vision when the price of hardware has fallen, there is an exponential increase in computing power and the development of the broadband Internet. Information Technologies has the capability to transform many aspects of lives. The use of IT has transformed all forms of endeavors such as businesses, corporate houses, government agencies etc. and surely the education sector would see a brighter tomorrow. Education is a social activity and plays a lynchpin role in society. Education is often related to teachers having higher degree qualifications but with the ICTs it would be more of a student centered learning (Tusubira and Kyeyune, 2001). ICT (information and communications technology - or technologies) is a broad term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. Quality of education has been issue of concern in the absence of standard parameters of to measure the quality. Information technology and communication technology started moving together and hence a convergence of the two gave rise to ICT (Dogra, 2005). The

[1] Assistant Professor, School of Information Technology, Apeejay Institute of Management, Jalandhar.
[2] Assistant Professor (Senior Scale), School of Management Studies, Apeejay Institute of Management, Jalandhar.

education can be disseminated in a formal and non-formal ways at all levels of education systems. Education is imparting of knowledge, skill and learning is acquisition of these skills. Through the use of ICT the quality of education and delivery of education services can be widely enhanced (Arora, 2007).

In India, the most common mode of education is what is termed as 'passive learning' wherein the teacher delivers lectures through the use of blackboard and the students generally take notes of the delivered lecture using pencil, pens and notebooks. However, ICT promotes the 'active learning' methodology. Firstly, the learning is divided into three phases input, operations and feedback. The student is actively involved in all three phases of the learning process. The active learning stimulates higher cognitive processes and deeper critical thinking amongst the students (Arora, 2007).

In a passive learning the teacher plays a pivotal role in unleashing the student's needs, abilities, interests, and learning whereas in active learning approach the student has to an active responsible participant and the ICT would supplement the teaching-learning process. The ICT injects interests among the students.

In the past few years there has been a paradigm shift in curriculum where teacher acts as a facilitator in a student centered learning. In Student centered learning focus is on the student's needs styles with the teacher as a facilitator of learning. Here students have to be active responsible participants in learning process. Teacher has key role in the whole process whereas in case of ICT based education, various ICT tools are supplemented to make the teaching-learning process effective. ICT has the potential to remove the barriers that are causing the problems of low rate of education in any country. ICT as a tool can overcome the issues of cost, less number of teachers, and poor quality of education as well as to overcome time and distance barriers (Hattangdi & Ghosh, 2008).

2. Need and Objective of the Study

We are well aware of the significance of Internet in our life. The education sector too is influenced with the bloom of technology. The education authorities should be wise enough in adopting ICT in support of the teachers for the teaching and learning process in the classroom. There is a need to study the adoption of ICT in the schools as there is a need to reorient and reformulate the learning activities in the schools. The ICT implementation has primarily not been a trend in the public and government schools of India hence, an active participation, initiative and sharing of information is required.

The present study reviews the existing literature to study the adoption of ICT in school education and determine how information and communication media is useful for the instructional purposes in the classrooms. It also explores how ICT fosters learning, development and augments' the pedagogical perspective of instruction based on a comprehensive literature review. It further identifies the key barriers to ICT implementation in Indian school education system.

3. Literature Review

The introduction of ICT in higher education would have deep implications on the education process ranging from use of technology to access, management, efficiency and most importantly n the pedagogy of teaching structure(García et al.,2006). The implementation of ICT in the schools would shift the studies to a more student centered learning and would not only promote the capacitive earning but would also encourage the students to use the ICT tools in

their studies (Oliver, 2002: Loing, 2005: Toro & Joshi, 2012). Peeraer and Petegem (2010) in their paper has talked about the factors that influence the integration of ICT in the teaching practices in the higher education in Vietnam. He has highlighted ICT skills, confidence to use computer, infrastructure and availability in hardware and software as the key factors that hinder in the integration of the ICT in the instructional setup of the schools. The enthusiasm of the teacher, the budget allocated to the ICT and skill training plays an important role in the integration of ICT in schools. The top management is not always very supportive of the ICT and a systematic method to implement it is often required however, infrastructural requirements have to be met. Wee & Zaitun (2006) presented the obstacles towards the use of ICT Tools in Teaching and Learning of Information Systems in Malaysian Universities and found that rapid change of technology, poor networking and connectivity and improper evaluation of the evaluation tools are the major obstacles for ICT implementation. Lopes (2007) prepared a model to evaluate the e-learning readiness in Porto's Allied Health Sciences Higher Education Institution which highlighted the importance of usage of ICT for medical students and faculties for teaching-learning purpose. Quality of lectures has to be improved by imparting learning and skills developments to the academic staff (Mostert & Quinn, 2009). The transformation of higher education in the India in terms of access, equity and quality can be seen through the use of ICT in education. No doubt challenges are immense but they can be overcome (Snehi, 2009). Encouraging ICT and self-learning, ability to address complex problems, encourages team work and allows critical thinking (Watson, 2001: Schoepp, K. (2005). Qudais et al. (2010) identified the main factors which affect the attitudes of senior faculty members in Jordanian Universities towards using ICT in their teaching activities. Factors identified are lack of motivation to use ICT in teaching - learning purpose, lack of technical skills, insufficient availability of hardware and software, inadequate infrastructure etc. and it is necessary to remove these barriers. He further stated that to succeed utilizing technology in a pedagogically meaningful way, there must be reorganizations in different levels like individual actions, attitudes and at pedagogical levels.

Allah Nawaz et al. (2010)] highlights demographic factors such as age, gender, qualification, perceptions, experience, organizational characteristics and research activities that play key role in implementation of ICT in teaching and learning. ICT can be used in administration in terms of general administration, payroll and financial accounting, administration of students data, personnel records maintenance and library system (Vajargah et al., 2010: Krishnaveni & Meenakumari, 2010). Factors that influence the teaching are uses of ICT and the implementation of pedagogical strategies in the classroom. To support ICT in teaching, pedagogical model is implemented related to new teaching-learning opportunities in the classrooms at Colombian universities (Said, 2011). The paper Study of satisfaction and usability of the Internet on student's performance, throws the light to examine satisfaction and usability of internet usage on students' assignment completion tasks and their performance and prepared extended task technology fit model to consider technology resistance and technology usage factors. Author further indicate that technology satisfaction and the internet usage significantly explains the variance on students' performance (Purohit & Bhaga, 2011). In the paper Challenges of e- Learning in Nigerian University Education Based on the Experience of Developed Countries", author highlighted the importance of governments role to increase funds for education in order to face challenges of e-learning in Nigerian university education and explore the strategy to increase training, motivation and awareness programs for successful

implementation of e-learning in higher education (Salleh & Iahad, 2011). Roy (2012) studied the role of ICT in improving the quality of school education integrated within pedagogical approaches in rural India. Hannatu Abdullahi (2013) in the paper discussed the role of ICT in schools and how both the teaching and learning can be effective from the use of it. Patra (2014) discussed how the use of various multimedia devices such as computer application, OHP, videos, television e. t. c. offer more challenging and engaging learning and how teaching learning system and the administrative system can be improved by the use of ICT. Manisha and Anju (2014) highlights the various impacts of ICT on higher education and explores various potential future developments. Gebremeskel et al. (2016) investigate the paradigm role of ICT for education as the case of learners and educator's behavioral and educational psychology's perspectives. I.e., ICT based education is an essential for new emerging information and then after knowledge societies, facilitating large-scale learning needs for social and economic development.

4. ICT Application in School Education

In India, education is regarded as a social, economic and political mileage (Amutabi & Oketch, 2003). According to the UNESCO (2002) report there are a lot of hurdles in the education system all over the world including India. Thus the overall position of higher education in India is depressed. There are numbers of barriers exist for people who inclination to pursue higher education such as socio-economic, cultural, time and geographical (Bhattacharya & Sharma, 2007). ICT has the approaching to remove the hurdles that are roots the problems of low rate of education in any country like India. It can be used as an instrument to hit the issues of poor quality of education, less number of teachers, cost, and time and distance barriers (McGorry, 2002). According to Hawkridge et. al. (1990) ICT might advance teaching, performance and administration and have a positive impact on education as facilitate in liberation and transformation.

The conventional teaching emphasizes on the content that is generally based around the prescribed textbooks. Teachers teach through the lectures and consolidate their knowledge on the syllabi. ICT in schools and classrooms tends to attract school learner's interest and motivation (Lafferiere, 1999). ICT in the education sector would provide a strong support for all the requirements needed in the instructional setup of the schools. Some outstanding class settings can be achieved that can boost the competency and performance of the curricula based setup through an affordable technology (Oliver, 2000). However, the resources have not always been plenty for the ICT to be implemented, but with the proliferation and widespread availability of contemporary ICTs, many a students and teachers gain access to higher bandwidths, more direct forms of communication and access to sharable resources, the capability to support these quality learning settings will continue to grow.

5. Efficacy of ICT in Indian School Education

ICT greatly facilitates the absorption of knowledge, offering unprecedented opportunities to enhance educational system. ICTs have revolutionized the way people work today and are now transforming education systems. As a result, if schools train children in yesterday's skills and technologies they may not be effective and fit in tomorrow's world. This is a sufficient

reason for ICTs to win global recognition and attention (Watson's (2001). The role and objective of ICT are:

1. Improvement in learning achievement
2. Reduction of adult illiteracy rate, with sufficient emphasis on female literacy
3. Expansion of provisions of basic education and training in other essential skills required by youth and adults
4. Increased acquisition by individuals and families of the knowledge, skills and values required for better living and sound and sustainable development
5. To increase variety of educational services & medium
6. To promote equal opportunities to obtain education & information.
7. To develop a system of collecting & disseminating educational information.
8. To promote technology literacy.
9. To support "Distance Learning".
10. To support sharing experience & information with others.

Computers have been introduced in schools in India but the education system has not been so influenced by the potentiality of the ICT. ICTs have demonstrated potential to increase the options, access, participation, and achievement for all students. The MHRD of India has extended the budget to a whopping Rs. 6000 crore for the ICT in the 10th Five-Year Plan. ICTs in India have the potential to enhance the education experience for children who 1) have dropped out and/or have kept themselves out of school for various reasons 2) have physical disabilities constraining their access to schools.

6. Impact of ICT on the Instructional Setup and Learning System

Technology and Internet in the education sector can be the most effective way to impart knowledge to the students and eliminate the negative impact of ICT in schools. The use of ICT gives rise to different types of learnings:

E learning: - is a learning program that makes use of an information network- such as the internet, for the delivery and interaction through web-based learning (e.g MOODLE) (Tinio,2002).

Blended Learning: - refers to learning models that combines the face-to-face classroom practice with e-learning solutions.

Constructivism: - is a paradigm of learning that assumes learning as a process individuals ''construct'' meaning or new knowledge based on their prior knowledge and experience (Jonassen, 1991). Educators also call it the emerging pedagogy in contrast to the long existing behaviorism view of learning.

Student learner- centered learning environment: - is a learning environment that pays attention to knowledge, skills, attitudes, and beliefs that learners bring with them to the learning process where its impetus is derived from a paradigm of learning called constructivism. In the context of this article, it means students personal engagement to the learning task using the computer and or the internet connection.

Active learning: - ICT-enhanced learning mobilizes tools for examination, calculation and analysis of information in order to provide a platform for student inquiry, analysis and construction of new information. The learners therefore, learn as they do and, whenever appropriate work on real-life problems in-depth. Moreover, ICT makes the learning less abstract

and more relevant to their life situations. In contrast to memorization-based or rote learning, that is the feature of traditional pedagogy; ICT-enhanced learning promotes increased learner engagement. ICT-enhanced learning can also be 'just-in time' learning that the learners choose what to learn when they need.

Collaborative learning: - ICT-supported learning encourages interaction and cooperation among students, teachers, and experts regardless of where they are. Apart from modelling real world interactions, CT-supported learning provides opportunity to work with students from different cultures, thereby helping to enhance learners teaming and Communication skills as well as their global awareness. It models learning done throughout the learner's lifetime by expanding the learning pace to include not just peers but also mentors and experts from different fields.

Creative learning: - ICT-supported learning promotes the manipulation of existing information and the creation of real-world products rather than the duplication of received information.

Integrative learning: - ICT-enhanced learning promotes a thematic integrative approach to teaching and learning. This approach eliminates the artificial separation between the different disciplines and between theory and practice, which characterizes the traditional approach

Evaluative learning: - ICT-enhanced learning is student-directed and diagnostic. Unlike static, text or print-based education, ICT-enhanced learning recognizes the presence of different learning pathways to explore and discover rather than merely listen and remember.

7. Key Barriers to ICT Implementation in Schools

Technology in education would continue to be adopted incrementally. The integration of ICT into teaching and learning is a complex process posed with a number of difficulties. These difficulties are termed as "barriers" (Schoepp, 2005). Change and restructuration of teaching and learning process with ICT poses immense challenges for the ICT implementation in the schools. It is generally required of a teacher to change according to the requirements and be able to incorporate the ICT skill set with the course curriculum. Therefore, resistance to change in ICT integration in teaching and learning process cannot be ruled out as the foremost barrier in adoption of ICT in schools.

Our analysis of the literature review shows that researchers and educators have classified these barriers into different categories. These are summed as following:

Extrinsic and intrinsic barriers: According to Ertmer (1999) extrinsic barriers are of first order and cited them as access, time, support, resources and training and intrinsic barriers as second-order and cited attitudes, beliefs, practices and resistance; whereas, Hendren (2000) saw extrinsic barriers as pertaining to organizations rather than individuals and intrinsic barriers as pertaining to teachers, administrators, and individuals.

Teacher level and school level barriers: Several recent studies indicate that many teachers want to use computers in the classroom, but they still make little use of technologies because they do not have enough time. Other teacher level barriers are lack of teacher confidence and competence, resistance to change and negative attitudes of the teacher to adopt the technology. The school level barriers are lack of time, lack of effective training, lack of accessibility and lack of technical support (Al-Alwani, 2005; Beggs, 2000; Schoepp, 2005; Sicilia, 2005: Özden, 2007: Korte and Hüsing, 2007). Since confidence, competence and accessibility have been found to be critical components for technology integration in schools, ICT resources including software and hardware, effective professional development, sufficient time, and technical support need to be provided for teachers.

Macro Level and Meso Level Barriers: Balanskat et al. (2006) divided them into micro level barriers, meso level barriers and macro level barriers. The micro level barriers are related to the

teacher's attitudes while the meso level are related to the ICT and technology. The author categorized the system level barriers as macro level barriers.

Infrastructural Barriers: Studies done by researchers clearly indicate that the issues related to ICT equipment is the most important determiner of integration of ICT into teaching practice. the teachers who could not use the ICT due to the non-availability of the infrastructure(lack of computers and other presentation equipment in classrooms, lack of computer laboratories) have a positive attitude of using them (*Unal and Ozturk (2012)*.

Social Barriers: The study by Hung (2011) also states that cooperation and collaboration among teachers are important factors for a successful integration of ICT to learning environment. Moreover, The study by *Unal and Ozturk (2012)* done in Turkey revealed Lack of ICT Equipment in Classrooms, Lack of the ICT-Based Teaching Resources, Teachers' Beliefs and Practices; lack of motivation of the prospective teachers concerning the use of ICTs in their courses and their future classes, lack of good role models for prospective teachers lack of motivation of the prospective teachers concerning the use of ICTs in their courses and their future and lack of good role models for prospective teachers.

In India, the barriers are the same but are presented with an additional flavor. The education system in India is divided into three sections pre-primary level, primary level, elementary and secondary level. The education is provided by public as well as private sector. The schools seek affiliation from one of the following bodies: The Central Board of Secondary Education (CBSE), The Council for the Indian School Certificate Examinations (CISCE), AISSE (Class/Grade 10) and the All India Senior School Certificate Examination, AISSCE (Class/Grade 12) and The National Institute of Open Schooling (NIOS). The District Education Revitalization Programme (DERP) was launched in 1994 with an aim to Universalize Primary Education in India by reforming and vitalizing the existing primary education system. 85% of the DERP was funded by the central government and the remaining 15 percent was funded by the state (Patra, 2014). The current scheme for Universalization of Education for All is the Sarva Shiksha Abhiyan which is one of the largest education initiatives in the world. Enrollment has been enhanced, but the levels of quality remain low (Patra, 2014).

The success of ICT integration cannot happen unless five key issues are addressed pertained to India. These five key issues are power, Internet connectivity and bandwidth, quality teacher training, respect and better pay for teachers, and the sustainability of implementations.

8. Pedagogical Shift in Procedures to Adoption of ICT

It is not adequate to force the partaking schools to adhere to a particular educational model, since different schools and the teachers within these schools practice and enhance their skill levels pertained to a certain set of considerations. The children of today grow up having information and communication technologies (ICTs) as essential and natural parts of their daily life. As they grow, they are expected to become active and self-directed members in their own local communities and also in the information society at large. Technology creates versatile possibilities for the acquisition and creation of information, for self-expression, and for communication and interaction with other people locally, nationally, and worldwide. Active participation in the information society presumes novel knowledge, skills, and work approaches from children and teachers alike. Even though ICTs are nowadays widely utilized in education around the world as tools for instruction, there are tremendous challenges for developing pedagogically innovative and quality practices for technology-enhanced education (Kankaanranta, 2004; Kozma, 2003). It has also become apparent that technology as such is not ready for use in instruction. It is essential to take the knowledge of human development and

learning as a basis for understanding the needs for which diverse technologies of learning should be developed and how they can be better designed to satisfy diverse learners, learning environments, and communities.

There is a need for a pedagogical shift in the education system. The adoption of ICT from the basic level to the most advanced level requires a change in four fundamental areas. The idea being the entire education system pedagogical innovation uses ICT.

Role of teachers and students: The scenario of today demands a shift from the conventional teaching to a more information technology oriented dissemination of knowledge. The digitalization of the curriculum, availability and access of the lectures and study material on the cloud. The students need to be motivated and encouraged to access the educational material available on the websites more often.

Technology as an add-on to the teaching pedagogy: The ICT in education does not eliminate and can never diminish the prominence of the teacher-student interaction in the instructional setup. The use of ICT in teaching stand as an aide which injects interest for the subject in the student.

Education policies comprising ICT: Emphasis on investments in the education reforms comprising technology. The major factors that influence the social growth and development of the student is initiated from the grass root level from the pre-primary school. A framework of national policies on the use of ICT in the curriculum of pre-primary, primary and secondary schools would develop novel competencies and capabilities amongst the students which otherwise cannot be achieved following the traditional approach.

ICT supporting infrastructure: Constraining teachers to the mere use of blackboard and chalk confines their cognitive intellectual learning. Teachers can continually learn conceptual frameworks and artefacts from eBooks and material available online. However, an infrastructure that meets the requirements shall be in place in the schools for teachers to carry out these activities.

Student-centered learning and outcomes: Efforts should be made to transform the school from teacher-centered learning to a student-centered learning environment with keen focus on the positive academic outcomes of the students' results. This transformation can well achieved through use of internet as resource, selecting experts from whom they can learn and proliferation of capability, competency and outcomes oriented curricula.

9. Conclusion and Implications of the Study

The Information and Communication Technology (ICT) plays an important role in the education sector, especially, in the process of empowering the technology into educational activities. The education sector can tremendously benefitted with the use of ICT. Students immerse themselves in the learning process if teaching is induced through ICT. If only the teachers and students become aware of the potential of ICT, beyond the familiarity of one or two applications of it, ICT can promote critical thinking, knowledge and boost confidence of the student. The key barriers to adoption of ICT in the education sector of India are lack of ICT equipment in classrooms, lack of the ICT-based teaching resources, teachers' beliefs and practices. A pedagogical shift is needed where role of teachers and students are defined and the technology is just an add-on in the teaching pedagogy. The student-teacher interaction retains its value. Education policies need to be laid down for the seamless integration of ICT in the instructional setup of the education sector. Besides the provision of a supportive infrastructure a shift from teacher-centered learning to student-centered learning is needed. This suggests a substantial support for the ICT to be integrated in education sector.

The learning and schooling can be enormously transformed through the use of ICT. ICT gives the freedom to the learners to locate relevant information, judge the credibility of their sources, engage in collaborative problem solving, and take responsibility for how and what they learn. Young learners want to think for themselves and come up with their own complex questions and provides students the space to do this in school time. Multimedia can effectively demonstrate and develop the understanding of the concepts, the syllabi curricula alone is not the only medium to develop learning amongst the students. In the school of tomorrow, teachers become learning companions; they accompany students on their learning journey. The borders between home and school will increasingly disappear. Schools will become community learning hubs. Hence, it is recommended that academicians must understand today's students' perspective and embrace social technology to foster digital citizenship in the schools.

There is plenty that the ICT is capable of, hence, provision of computer, Internet facilities and teachers who are well acquainted with the ICT is required for the instructional setup in the Indian schools. This can be inculcated as top priority and strategy for getting favorable outcomes from the education system.

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