



ICT, Instructions and Reforms: Case Study of Four Educational Institutions

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Abstract

The increasing dependence on Information and Communication Technology (ICT) and globalization are intertwined trends. Together, they are integrating societies and homogenizing cultures. Consequently educational systems of different societies are aspiring for similar practices and attainments. One such aspiration is to integrate ICT into the instructional system. This aspiration is based on the argument that ICT can reform instructional practices. The descriptive case study undertaken aimed to critically assess the nature of ICT use in the classrooms of four educational institutions of India - a government and a private senior secondary school, a coaching center and a nursery school and determine whether the emerging pattern of ICT use could lead to instructional reforms. Interpretation of information was done by anchoring it into a rubric developed with arguments in favour of ICT use for delivering instructions and frameworks for technology integration in instructional processes extrapolated from published literature. It was found that although in keeping with the global trend, ICT had been introduced into classrooms but the nature of ICT use in none of the institutions could usher reforms in instructional practices.

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"A critique of imposition of a technocentric culture on schools is long overdue."

Deryn M. Watson (2001)

Introduction

Information and communication technologies (ICT) have been a core driver of the phenomenon of globalization (Lanvin, 2002, Schaeffer, 2003) and now these interdependent forces are leading to the homogenization of cultures (Barnet & Cavanagh, 1996; Firouzeh, 2004). No wonder even in the field of education, similarity in aspirations and trends are apparent. One such clearly perceptible trend is the growing use of ICT in classrooms. UNESCO is according a high priority to ICT use for more equitable and pluralistic development in education. It is urged that to live, learn, and work successfully in an increasingly complex, information-rich and knowledge-based society, students and teachers must utilize technology effectively (UNESCO, 2008). With this conviction, in several nations including developing ones, for instructional practices, technology integration in standard curricula has been expanding (Garcia, 1994; Han, 2002; Tsitouridou & Vryzas, 2004). In India, since the National Policy on Education (1986) proposed the need for educational technology, several measures have been adopted to ensure the use of ICT in schools. The centrally sponsored schemes 'Computer Literacy and Studies in Schools' in the eighties and thereafter 'ICT in School' launched in December 2004 and the current National Policy on ICT in School Education, 2009 endeavour to optimize the use of ICT in school education. The present XI five year Plan of India (developmental plans for a period of five years developed by the Indian Planning Commission) has proposed a six fold increase in the spending on ICT in school education from that of the previous one. These moves reflect the urgency to harness ICT for systemic change in the education sector (Kasinathan, 2009).

There is a lot of published literature with a consensus about the value of ICT for strengthening instructional practices in schools and even in preschools. Literature extolling the potential of ICT in implementing modern theories of learning like constructivism and social constructivism is also available. However, there are also voices of concern that warn against a techno-centric approach with use of

technology sans pedagogic concerns, making technology use an end rather than the means for strengthening instructional practice. This approach, devoid of pedagogic concerns could be a random response made by educational institutions towards the state policies urging technology use in classrooms and thus leading to yet another imposition on schools. ICT is perceived as a catalyst for reforming instructional practices and its use is becoming a hallmark of raised standards of instructional practice. Yet the rhetoric for change, based on an optimism about the necessarily transformative nature of new educational technologies is both naive and historically unfounded (Watson, 2001). ICT use may just be an "add on" approach beyond which, teachers need to move by thinking and planning about how to infuse technology in instructional practice (Jacobsen et al, 2002). Harris (2005) too is of the view that the educational technology rhetoric of the past two decades demonstrates a basic confusion between technology integration and technology as a vehicle of educational reform. In operational terms, one notion does not necessarily imply or require the other. Therefore, introduction of technology per se may not necessarily imply reforms in instructional practice. Reformed instructional practice will involve engaged learning with information processing, collaborative content creation, problem solving and the like for which ICT is suggested as the effective means (UNESCO, 2008). Therefore, to critically assess the existing practice of using ICT in the classrooms of the institutions selected, and to deduce whether it is done for attaining these ends, this study was carried out.

Review of Related Literature

In the new world of education and training there is a new wisdom about the capacity of digital media to enhance learning (Inglis et al, 1999). Several studies point to the positive effects of ICT use on learning (Mumtaz, 2000; Yelland, 2001; Haddad & Jurich, 2002). ICT improves students' problem solving/critical thinking skills (Garcia, 1994) and supports students to set their own goals and plan and monitor their learning activities (Kozma, 2005). Hence, computer based educational technologies, which can address twin challenges of ensuring high educational value and creating interactive and immersive learning environment that sustains learner interest are being resorted to in educational institutions (Goldman et al, 2009).

There is also literature highlighting the role of ICT in putting into practice social constructivist theories by promoting collaborative learning. As suggested by Kozma (2005) ICT can support students' teams in gaining a deep understanding of subjects through collaborative project based knowledge creation. It is advocated that computer-supported collaborative learning with the help of Web 2.0 like wikis, blogs and podcasts has great potential to improve teaching and learning as they deepen levels of learners' engagement and collaboration within digital learning environments and enable collaborative content creation (Jarvela et al, 2001; Boulos et al, 2006; McLoughlin & Lee, 2007; Safran et al, 2007).

ICT usage is now advocated for educational purposes even in preschools. Toronto District School Board of Canada specifies Standards for ICT to be attained in preschools and spells out objectives such as understanding the ethical, cultural, and societal issues related to ICT, using ICT as a tool for accessing and processing information, communicating and collaborating using ICT, etc. to be fulfilled by the end of kindergarten. Equal opportunities for young children to familiarise themselves with the use of computers is a goal defined by the Finnish National Board of Education (1996) and it is suggested that there be sufficient access to computers and information networks in early childhood environments (Marja, 2001). There are also studies that portray the use of ICT in the development of language and mathematical thinking in early childhood education (ECE) centers and for providing a variety of ways for children to weave together words, pictures, and sounds, thereby providing a range of ways for children to communicate their ideas, thoughts, and feelings ((Marja & Marjatta, 2003; Bolstad, 2004; Wyeth, 2006; Sutton 2007; Ruben et al, 2009; John LeBaron et al, 2009). Hence, ICT can be integrated into early childhood classroom practice to create a community of learners (Schiller & Tillett, 2004) and be a major force for educational reform in achieving a more learner-centred constructivist approach to learning (Tsitouridou & Vryzas, 2004). Ramsey et al (2006), reported that ICT added another (predominantly visual) mode of communication and representation for children who have not yet learned to read and

write and enabled children to read and revisit their learning, strengthened their confidence, developed their story-telling abilities and dispositions, made learning interesting and enabled children to take responsibility in learning. The objectives of ICT use are thus similar to that in schools- collaborative and creative problem solving, engaged learning, joyful learning and as mentioned by Alexandra & O'Gara (2001) for this interactive, bright, cheerful, imaginative software may be used.

From the literature reviewed it is apparent that the aims of using ICT in schools and preschools can be summarized through those listed by the UNESCO (2008) viz. technology can enable students to become capable information technology users, information seekers, analyzers, and evaluators, problem solvers and decision makers, creative and effective users of productivity tools, communicators, collaborators, publishers, and producers, informed, responsible, and contributing citizens. This entails learning centered education resulting from learner engagement and autonomy that ensues technology integration in instructional practice (Dwyer et al. 1990; Moersch, 1995; Woodbridge, 2004; Koehler & Mishra, 2008). ICT integration is thus the prerequisite for educational reforms and this can be assessed by using the framework suggested by Dwyer et al and Moersch.

As per Dwyer et al at the entry stage, teachers with little experience of teaching with advanced ICT are nervous and excited. Traditional tools like textbook, blackboard, etc. remain important and ICT strengthens or replicates traditionally imparted instructions. Next during *adoption*, ICT supports text-based drill-and-practice instruction. Thereafter during *adaptation* ICT integration begins with greater productivity by students in terms of pace and amount of work done. Next during *appropriation*, teachers understand technology and use it effortlessly as a tool to accomplish real work. Finally in *invention* stage, teachers reflect on the use of technology and its use and project-based instructions involving interactions and collaborations are common. Moersch's framework for technology integration also involves a hierarchy of steps leading to technology integration. From *non use*, to *awareness* of ICT, to *exploration* with ICT to extend and enrich traditional teaching, there is *infusion* of technology to augment isolated instructional events, followed by integration with technology perceived as a tool to identify and solve problems. Then during *expansion* student experiences are directed at problem solving and finally there is *refinement* when technology is perceived as a tool to help students solve authentic problems. However, for effective pedagogic use of technology and its integration, the Technology Pedagogy Content Knowledge (TPCK) model (Koehler & Mishra, 2008) suggests teachers' need for a situated form of knowledge -TPCK with interplay among, three main components of learning environments- content, pedagogy, and technology.

Objectives

This study aims to:

1. Assess the pattern of ICT usage for instructional purposes in the institutions selected.
2. Critically assess whether the emerging pattern comprised activities essential for reform in instructional practice.

Scope of the study

The pattern of ICT use was determined through study of the following dimensions: type of technology available and that used, frequency of ICT use, reaction of students and teachers observed during ICT use in classrooms, skills for operating ICT and its operator, the nature of the content delivered through ICT, nature of teachers' interventions in ICT mediated teaching-learning, pedagogic utility of ICT as stated by teacher vis-à-vis that observed.

Method

Descriptive case study method for making an empirical inquiry that investigates a contemporary phenomenon within its real-life context (Stake, 1995; Yin, 2003; Zainal, 2007) was adopted. It has a narrative form that describes the data obtained through an in-depth examination of an event and is

evaluative in nature. Analysis of the data collected has been through categorical aggregation and direct interpretation, which was anchored in a rubric.

Rubric

A rubric was developed on the basis of extrapolations from the literature reviewed on the following two aspects:

- I. The propositions regarding the potential of ICT for facilitating learning centered instructions to assess the use to which it was actually put.
- II. The frameworks of Dwyer et al. (1990) and Moersch (1995) to determine the extent of technology integration and the TPCK model of Koehler & Mishra (2008) to assess whether ICT mediated instructions were based on an approach that integrated TPCK.

Sample

Four educational institutions - a government senior secondary school, a private senior secondary school, a coaching center and a private nursery school were the units of the study. In view of an emerging parallel educational system comprising coaching centers and their popularity among students and their parents in India, a popular coaching center of Delhi was selected. Coaching centers also called tutorials are neither recognized nor are their services recommended by the state but are nevertheless undergoing phenomenal growth in India. Hence one of these had been included in the sample out of curiosity about its ICT use. Classrooms of IX and X grade of the schools and the coaching center and the lower and the upper kindergarten (LKG & UKG) of the nursery school were considered. The variation in the nature of the institutions and level of students (school/coaching center and preschool) was overlooked as the aim was to study the status quo regarding the nature of ICT use in each educational institution. Selection of the units of the study, and the grades (IX, X) was through incidental sampling, which is a limitation of the study.

The nursery school with UKG (for 4-5 years old) and LKG (for 3-4 years old) aimed to develop readiness for school education. Four teachers were attached to the two sections each of LKG and UKG. The teacher-student ratio was about 1:25 in each section. Children were initiated in reading skills (for English and Hindi), numeric skills and environmental and social science, music, art and craft. The coaching center taught children from IX to XII grades, science and mathematics with the aim to prepare them for the Board examination held in the X and XII grades by the Central Board of Secondary Examination (CBSE). There were in all 3 teachers and the teacher student ratio was about 1: 50 in each class. Classes were of one and a half hour duration and held 4 times a week.

Both the schools were affiliated to the CBSE. The government one was a Central School (a system of schools under the Union government of India). The private one was aided by the government. In both the schools the teacher- student ratio was about 1:35 in each of the four sections of each grade. Seven teachers in the government school and 8 teachers in the private school taught languages, mathematics, science and social sciences.

Tools

Data was collected through non participatory observation and interview of teachers and students (students of the nursery school were not interviewed). Students were interviewed in groups. For both the tools predetermined schedules were used. During the interview open ended questions were asked to determine the frequency of ICT use, the user of ICT, possession of operational skills and the purpose of ICT use. The last question was asked only to teachers. A check list was used to determine the type of technology available and that used. The data obtained through interviews were triangulated with that from observation.

Data and Discussion

The data collected and its interpretation are presented along the following dimensions:

Type of technology available and used in the institutions for instructional purposes was as given in Table 1.

Table 1 Type of technology available and used

Institution ↓	Computer	Internet	CD/DVD/ Cassette	Television	Technology For display	
					LCD projector	Interactive White Board
Government school	√	√*	√**	√*	√	X
Private school	√	√	√**	√*	√	√*
Coaching Center	√	X	X	X	√	√
Nursery school	X	X	X	√	X	X

* Available but not involved in instructions

** Multimedia CDs were available

The schools had relatively more kinds of technology.

Frequency of using ICT and perceived reaction of students and teachers is depicted in Table 2.

Table 2 Frequency of using ICT and reaction observed

Institution ↓	Daily for teaching	Weekly	Every Month	Once in a few (2-3) months	Regular Computer use for personal reasons by teachers	Regular Computer use for personal reasons by students	Reaction of teachers & students
Government school	X	X	X	√	X	√	Excitement perceptible
Private school	X	X	X	√	X	√	Excitement perceptible
Coaching Center	√	-----	-----	-----	√	√	Habituated
Nursery school	√	-----	-----	-----	X	Not determined	Habituated

Unlike in the schools, in the nursery school and in the coaching center use of ICT in the classrooms was a routine matter. Although skills for operating a television are simpler than that for a computer nevertheless the daily use of television and a fixed timing (half an hour before the school closed) made teachers habituated and also integrated the ICT seamlessly into the routine if not in teaching. In contrast to it, teachers and students of schools appeared excited during ICT use. The movement of students and teachers to a smart class/computer lab from the normal classroom coupled with the prospective ICT use created commotion among students before the class begun. The situation matched with the entry level of the framework of Dwyer et al. and the third and fourth level of Moersch's framework. However, unlike the teachers, the students were regular users of computers and hence, their excitement could be more due to the movement to a different setting and new way of teaching but for teachers, the reasons were managing the excited children and using ICT for teaching.

Operational skills of Teachers for advanced ICT is as depicted in Table 3

Table 3 Operational skills of Teachers and Students

Institution ↓	Operational skills of Teachers for computer and Internet	Operational skills of Students for computer and Internet
Government school	√	√
Private school	√	√
Coaching Center	√	√
Nursery school	√	X*

* Determined on the basis of only teachers' perceptions as children's response could not have been validated within the preschool settings

All the teachers and all students except those of nursery schools possessed the skills to use computer and the Internet

Operator of ICT in classrooms is depicted through Table 4

Table 4 Operator of ICT

Institution ↓	Teacher as operator	Student as operator
Government school	√	X
Private school	√	X
Coaching Center	√	X
Nursery school	√	X

The technologies were operated only by the teachers. Students were passive observers of the content displayed. Even the computer was used for supporting displays of power points and multimedia CDs. The potential of multimedia to be a powerful educational tool to be used not merely for content but also for thinking and reasoning skills needed for problem solving (Garcia, 1994) remain unutilized as children only watched. Computer assisted instructions (CAI) can aid drill and practice. ICT can also facilitate activities beyond these mechanical ones by providing an immersive environment rich in content for engaged learning (Goldman et al, 2009) and such soft wares are available even for preschoolers. Moreover web 2.0 facilitates collaborative content creation and self evaluation by learners (Jarvela et al, 2001). Learners can negotiate, attain consensus and thereby solve problems (Boulos et al, 2006; Rollett et al, 2007; McLoughlin & Lee, 2007; Mitnik et al, 2009). Although multimedia CD and Internet were accessible in the schools but their potential to support interactivity, learner control, engagement, and collaboration were not used.

Objectives of using technology

Content delivered through ICT and pedagogic value of ICT stated by teachers and the pedagogic use inferred from the nature of use are tabulated in Table 5.

Unlike in the other units, teachers of the coaching center were more forthright and precise as to the objectives of using ICT. In the schools although teachers and students claimed that ICT made learning interesting but the novelty of the situation may have also contributed to it. For developing understanding, verbalization was primarily resorted to by teachers. Technology, especially the Internet can be a tool for inquiry, communication, construction, expression and thus participation (Bruce & Levin, 2001; Livingstone & Bober, 2004) but it was not used to this end. ICT in all the institutions except the nursery school was

used for supporting and supplementing traditional lectures. It amounts to technocentrism that fails to use the potential of ICT (Laurillard, 2002) mounted television sets.

Table 5 Nature of content delivered and pedagogic utility of ICT

Institution ↓	Content	Pedagogic utility stated	Pedagogic utility Observed	Teacher interventions
Government school	Subject based	Making instructions interesting, for facilitating understanding; active learning	For supplementing orally delivered lessons through power points, and CDs	Teachers explained the content during presentation with power point/CD
Private school	Same as above	Same as above and for communication with learners	Same as above; Internet used for posting assignments on school's website	Same as above
Coaching Center	Same as above	For using and enriching repositories of learning resources available, better display and support lectures	Same as stated	Teachers explained
Nursery school	Not subject based; Cartoons, fairy tales, and stories telecast	For ensuring children had rest, had exposure to other cultures, for developing listening skills, visual perceptions; learnt morals	None	No intervention

The validity of the pedagogic utilities stated by the teachers could not be ascertained as teachers though present in the classrooms and kept an eye on the children, provided no interventions as children watched programmes. Unguided instruction is normally less effective and may even have negative results as it may lead to the acquisition of misconceptions, incomplete or disorganized knowledge (Kirschner et al, 2006). Hence, except rest, claims as to the other benefits could not be ascertained.

Conclusion

When compared to the frameworks given by Dwyer et al and Moersch it is clear that technology is far from being integrated into the instructional process and instructions remain teacher-centered. Hence, ICT use is unlikely to usher reforms. In the nursery school although ICT use was regular but it had no perceptible relation with instructions. In the coaching center too the use was regular but its objective was clear and rooted in pragmatism. There was no pretension about using ICT for any idealistic reason or for implementing the state policies. In both these institutions the rationale for investment in technology had been justified. In the schools the teachers and students possessed operational skills for ICT but there was a techno-centric situation as knowledge of technology was yet to be integrated with that of content and pedagogy.

Although the international trend of using ICT in classrooms has been adopted but the potential of the ICT for reforming instructions has not yet begun in any of the institutions. It was apparent that operational

skills and infrastructure did not lead to technology integration and the educational reforms it promises. This appears to be mainly because of the policies that ensure investment in ICT and teacher training for ICT use without differentiating 'learning to use ICT' and 'using ICT to teach and learn'. Teacher training for ICT needs to be in the context of classroom and teaching and provide theoretical background and a framework with ample practical applications to enable teachers to integrate ICT in a seamless manner. These suggestions are based on the technological pedagogical content knowledge (TPCK) framework of Koehler and Mishra (2008), which advocates that blending of content and pedagogic knowledge is not enough for teachers. To this the third dimension of technology knowledge (knowledge of standard technologies and knowledge about the manner in which technology, content and pedagogy are interrelated and interdependent) needs to be blended for ICT integration. If technology integration is sought for transforming teaching and learning, then understanding the possibilities in the classroom and teacher development in this direction are required (Woodbridge, 2004).

While, coaching centers are definitely out of the bounds of the state's interventions but if studies on a wider scale generalize the findings about schools and nursery schools, there will be a need to reexamine investments in ICT, its actual use, teacher training for ICT use and integration, if reforms in instructional practices are expected.

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