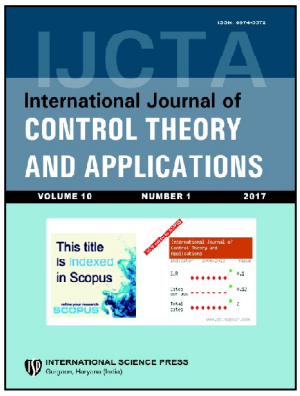

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ICT implementation in Indian Schools: An empirical Investigation

Nitin Bagga[1] and Bindu Agarwal[2]

[1] *Research scholar, Manav Rachna University*
[2] *Associate Manav Rachna University*

Abstract: Information and Communication Technologies (ICT) includes all types of electronic devises, tools and resources which help realize the goals of teaching learning and betterment of educational system. They include computers & other hardware devices, their software applications, application of web based content repositories and internet, radio & television services, Learning Management Systems (LMS) and Management Information Systems (MIS). In today's world ICT has become the need of the hour. It is more accessible and reliable and application of ICT for education has become increasingly feasible. It has led to convergence of a wide range of technology to facilitate the process of teaching learning. Quality has always been a key concern for schools in India. There is a dearth of standard parameters to measure quality in Indian schools. Against this backdrop ICT can play a critical role in disseminating knowledge .It can be a catalyst in adaptation, adoption, translation and distribution of scarce resources which are necessary for improvement of educational system in India. This paper aims at assessing the level of ICT implementation in Indian Schools.

Keywords: ICT, Indian Schools, Computers in schools.

1. INTRODUCTION

Information and Communication indeed has become an integral part of almost every organization these days. 20th century realized the importance of ICT in economic, social and educational change. ICTs have revolutionized the way people work today and are now transforming education systems [1]. The usage of ICT makes substantial difference in the teaching pedagogy and learning of students. Several studies reveal that students using ICT facilities mostly show higher learning gains than those who do not use[2]. ICT facilitates improved teaching and learning in the classroom [3]. Information and telecommunication technologies have great potential to support curriculum delivery and communication among teachers and students[4]. ICTs helps in improving relevance and quality of education. ICTs also, greatly facilitate the acquisition and absorption of knowledge[5].

The common belief says that the use of ICTs in education contributes to a more constructivist learning and an increase in activity and greater responsibility of students. This limits the role of the teacher to supporting, advising, and coaching students rather than merely transmitting knowledge. The gradual

progress in using computers changes from learning about computers, to learning computers, and finally to learning with computers [2]. ICT is expected to offer both a means to operationalise constructivist principles and to create effective constructivist learning environments [6].

2. ICT TOOLS IN TEACHING AND LEARNING

ICT enhances both the practical and theoretical aspects of teaching and learning. ICTs, offers a range of different tools for use in school activity, [7], including:

- tools for data capture, processing and interpretation – data logging systems, databases and spreadsheets, graphing tools, modelling environments
- multimedia software for simulation of processes and carrying out 'virtual experiments'
- information systems
- publishing and presentation tools
- digital recording equipment
- computer projection technology
- computer-controlled devices such as microscope.

Report of [8] listed how ICT can contribute to education key skills listening, speaking, reading and writing through various ways:

- Digital sources as the Internet, CD-ROM, database vocabulary and video clips that provide access to various kinds of information and learning opportunities.
- Students can work at their own pace as the digital resources can be slowed down and played over and over again as the needs of individuals.
- Access to authentic materials and communication with schools abroad through video conferences and e-mail discussion forum in the target language to facilitate cultural awareness
- Multimedia presentation software enables a variety of English language skills into practice and to support multiple learning styles
- Word-processing applications allow students to plan, organize and edit their work and develop skimming and scanning techniques
- Digital video can offer feedback on pupils' language performance for self-critique, teacher or peer evaluation
- Personal interest in English can be encouraged by watching movies in DVD format with subtitles and multiple audio tracks in different languages

Classified ICT tools in five main categories[9]:

- *Informative Tools* - Internet, Network Virtual Drive, Intranet systems, Homepage, etc. Students rely on the internet to help them do their homework[10]. Students consider the Internet as a virtual textbook, reference library, virtual tutor, learn to study shortcuts and virtual study groups [11].
- *Situating Tools* - CD-ROM, etc. It is a system provide contextual environment of a situation. Like simulation and virtual reality . Situating tools like CD-ROM provide hypermedia (text, audio, graphic images) application which gives better opportunities for teachers to enhance learning

environment. Hypermedia applications in learning environment enhance student autonomy and thinking[12]. A multimedia presentation topic will help students to conceptualize the ideas of the real world by integrating the theories in the practical application of real-world situations.

- *Constructive Tools* - MS Word, PowerPoint, FrontPage, Adobe Photoshop, Lego Mindstorm, etc. are used by students to manipulate information, construct their own knowledge.
- *Communicative Tools* - e-mail, SMS, electronic bulletin boards,teleconference etc. are systems that facilitate communication among teachers and students or among students outside the physical barrier classroom.
- *Collaborative Tools* - discussion boards, etc. forum. Internet is used for many collaborative activities such as meetings, discussions information dissemination etc. Interactive electronic whiteboard is not just used as tools for meeting and development, but recently became the most popular tool among teachers. Whiteboard is an electronic device that interfaces with the computer where the computer image is displayed on the board that can be manipulated interactively

Though we have seen that there are numerous studies across the globe on the ICT implementation in education sector, still there is dearth of empirical work on the same topic in India. The following are some of the work on ICT usage in education sector.

DifferentiatedICT based education will help in providinggreater reliability, efficiency and validity of data collection and analysis evaluation and interpretation at any level of education [13]. The sole responsibility of teaching and learning lies with the teachers and they play a very important role in the absence of ICT. Their job can be made easy by implementing ICT as some of the responsibilities of the teachers can be transferred to the students by customizing education as per the needs of the students[13][14].Implementation of ICT also increases the confidence level of students and they feel pride in acquiring ICT skills through the modern methods of ICT based learning[13][15].After reviewing the literature the study tried to fill the gap of lack of quantitative study on implementation of ICT based tools in Indian education system at school level.

3. RESEARCH METHODOLOGY

The research uses mixed methods research to achieve its objective of assessing the level of ICT implementation in Indian Schools. These methods are employed by numerous researchers in various diversified fields.[16][17][18][19][20]. Mixed methods consist of various strategies for carrying out the study. Out of the 12 methods [20], the study uses sequential explanatory strategy (SES) which is very popular and important strategy of conducting research. This method is preferred by researchers whose preferences are skewed towards strong quantitative analysis. The methods divide the research in two phases. Phase 1 includes collection and analyses of quantitative data and Phase 2 collects and analyses the quantitative data that built on the results of the Phase 1 research. Phase 1 is given more weightage than phase 2. This SES design helps the researcher in explaining and interpreting quantitative results by collecting and analyzing follow-up qualitative data[19][20]. The basic advantages of this method include the fact that it does not require a specific theoretical perspective, is straight forward and is easy to implement as the phases are mutually exclusive to conduct by inclusive to interpret.

3.1. Phase 1

The target population was schools (both Private and Govt.) in Delhi NCR region. Out of the list of all the schools, a sample of 20 schools was chosen randomly with the help of random number generators. The questionnaire was framed to measure the impact of ICT implementations and challenges faced by the

school authorities in implementing them at various levels. 20 teachers from each school were chosen and a total of 400 respondents filled the questionnaire. The researcher ensured that the questionnaire was complete in all respects. The period of study was 3 months.

3.2. Phase 2

Qualitative data was collected by conducting in-depth interviews of school administrative authorities including principals of the schools. They were asked about their perception of ICT implementation on schools and how its growing usage may help in improving the quality of education in schools.

All the phases were conducted separately and the following hypotheses were tested by using independent sample t test and ANOVA [21][22].

H1: The implementation of ICT in private schools is better than Govt. schools in India.

H2: ICT usage in Education sector is still limited.

H3: ICT usage in schools differs across different subjects.

3.3. Data Analysis

Table 1
Respondents Profile

Age of the Respondents	*Govt. Schools*	*Private Schools*
<30	65	63
31-40	47	74
41-50	52	42
51-60	36	21
Gender		
Male	43	57
Female	157	143
Subject Area		
Mathematics	37	45
Science	49	43
Language	34	30
Humanity/Social Studies	57	47
Technology	23	35

Source: Author's Compilation

As can be inferred from table 1, 32.5% of the respondents are below 30 years in Govt. schools and 31.5% in private schools. Maximum respondents fall in 31-40 for private schools and 40-50 for Govt. schools. Out of total 200 respondents each from private and Govt. schools 28.5% 21.5% are males respectively. The study has taken Mathematics, Science, Language, Humanity/Social Studies and Technology as the subjects taught in schools.

As can be seen in the above mentioned table private schools are having better infrastructure than Govt. schools and staff of private schools are using ICT more than the private schools. Appling independent sample t test on the data reveals that there is a significant difference in the implementation of ICT in private and Govt. schools and private schools out perform the Govt. schools. Thus first hypothesis is accepted.

Table 2
ICT Integration in School

ICT Integration	*Private*		*Govt.*	
	Yes	*No*	*Yes*	*No*
My school has a separate subject for Computers.	198	2	129	71
ICT is integrated in my subjects	156	44	112	88
ICT is used while teaching due to curriculum need	166	34	111	89
I am self motivated to use ICT while teaching	167	33	51	149

Source: Author's Compilation

Table 3
ICT Tools Availability

ICT Tool	*Private*		*Govt.*	
	Private	Govt.		
Computers without Internet	0	200	160	40
Computers with Informative Tools - Internet, Network Virtual Drive, Intranet systems.	200	0	120	80
Computers with Situating Tools such as CD-ROM, Smartboard etc. for Multimedia.	197	3	110	90
Computers with Constructive Tools such as MS Word, PowerPoint, FrontPage, Adobe Photoshop, etc.	200	0	110	90
Computers with Communicative Tools like e-mail, SMS, electronic bulletin boards, teleconference etc.	200	0	120	80
Computers with Collaborative Tools for using discussion boards and forum etc.	140	60	55	145

Source: Author's Compilation

Private schools are better placed than Govt. schools when it comes to tools availability as can be seen from the table. All the respondents of private schools have ICT tools available to them to a certain extent but the Govt. school teachers face problems as the computers don't have constructive, collaborative and communicative tools in most of the computers available with them.

3.4. ICT Usage for Teaching

Table 4
Extent of usage (combined for Private and Govt. Schools)

ICT Usage in school	*Mean*
I use ICT tools for making my lesson presentation	3.97
I prepare assignments for students using computers	2.22
I use Internet to search material for preparing lessons	4.21
I download audio/video material to be used in class	1.99
I give homework to my students online(school's intranet/website)	1.78
I communicate with students online (school's intranet/website)	2.34
I communicate with parents online(school's intranet/website)	3.4
I use social media for communication	2.33
I use Multimedia based teaching learning aids on CD-ROM	2.57

Source: Author's Compilation

The respondents were asked to rate the following statements on a scale of 1 to 5. The above table depicts the limited usage of ICT tools in schools. Teachers mostly use internet to search materials for preparing their classroom lectures and uses tools like PPT to deliver the lectures in class. The use of tools of ICT for other reasons is minimal. After applying One sample t test on the above data, it can concluded that *ICT usage in Education sector is still limited as the p value (0.007) is less than 0.05.*

Table 5
ICT Skills among Teachers ((combined for Private and Govt. Schools)

ICT Usage	*Mean*
I am comfortable in using Computers	4.5
I am comfortable in using Smartboard	2.3
I am comfortable in using Word Processor	3.4
I am comfortable in using Spreadsheet (Excel) for making results	2.2
I am comfortable in making presentation using PowerPoint with simple animations.	1.9
I am comfortable in using Social Media Sites	2.54
I am comfortable in creating/participating Blogs and Discussion Forums	1.04
I am comfortable in downloading material from internet	3.44
I am comfortable in installing basic softwares	1.02
I am comfortable in using e-mails	4.11
I am comfortable in creating database	1.23
I am comfortable in using School website for uploading material/information	2.22
I have got formal training for using ICT .	1.34

Source: Author's Compilation

It can be seen that there is no formal training provided to the respondents to use ICT tools with mean 1.34.Though the respondents are comfortable using computers (mean :4.6) , they are not conformable in using tools like word and ppt to deliver lectures in class rooms. The private schools are using social media to communicate to the parents and students more than the Govt. schools.

After applying one way ANOVA it was found that teachers of technology and Science subjects are using ICT tools intensively while teachers of humanity mathematics and language are avoiding ICT tools' usage in classrooms. The p value obtained after analysis was 0.009 which was less than 0.05.

3.5. Analysis of Phase 2

Following finding were made on the qualitative data collected from administrators and staff on ICT implementation and usage.

1. There is an insufficient technical support for teachers in Govt. schools as compared to private schools.
2. Private schools impart technical training to their teachers time to time but Govt. schools are far behind in organizing training sessions. The skill set of private teachers are better than that of Govt. teachers. Teachers are themselves not interested in using ICT tools for teaching in classes as they feel its time consuming and cumbersome process.
3. Little content is available for teachers in national language, be in Hindi literature or mathematics.
4. There is resistance from parents of students going to Govt. schools as they complain about their incapability to use ICT tools with ease.

5. Many schools face the problem of insufficient computers or low speed of the internet. In many schools computers are there but they require repairing or are out of date.

4. CONCLUSION

Based on the above analysis all the three hypotheses are accepted. There is a dire need to help the school in digitalization and making them use the resources which are available in different languages and various formats. ICT can help in digitalizing the existing print resources like documents and books for making them more accessible to the students in lesser time. ICT can build teachers capacity and can strengthen the administrative system in schools by making them efficient. There is also a pressing need to develop new devices, applications and tools for promoting creative and problem solving capabilities among students and teachers. ICT can provide opportunities for imparting training to teachers in a convenient and flexible manner. ICT usage in education demands a paradigm shift in the way content is designed and delivered. Without making the teachers and staff aware about the fundamental shift, new technologies cannot be imposed or adopted. Ongoing training programs play a vital role in paving the way of ICT usage and implementation in education sector [18]. ICT has different benefits for different statke holders. For student it increases accessibility, flexibility and integration of teaching and learning pedagogy. For employers it leads to high quality and cost effective professional development, skill up-gradation, increased productivity and increased portability of training. For the government it increases the reach of the training sessions to targeted groups and capacity and effectiveness of these sessions.

ICT should be used in their teaching as well as for providing them training for effective delivery of lectures in the class. The management should understand the problems of the teachers and should cooperate and give them opportunities for acquisition of a new knowledge.

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