AN EXPLORATORY STUDY OF ICT INCLUSION IN TEACHING-LEARNING PROCESS

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Abstract

Digital Technologies have drastically changed the mindset of communities and compelled them to function smartly. It is must for everyone to keep itself updated and acquire the technical know-how for sustenance. Information and Communication Technology (ICT) and its capability to impact teaching-learning processes have enforced the educational institutions to apply it in Pre-primary education to Higher Education and Research. Such technologies have been explored as beneficial in variety of situations. Government is also investing a smart amount of funds to support institutions for creating appropriate ICT environment. The present study attempts to explore the factors responsible for successful integration of Information and Communication Technology in teaching-learning process. Keeping in view the explored factors emerged from the study, it suggests the Government and policymakers – how to design and develop the training programs in the area of ICT incorporation in teaching-learning process?

Keywords:Digital Technology, Information & Communication Technology, Teaching, Learning, ICT in Education, Education

INTRODUCTION

Today, Information and communication technology has become an important part of most of the enterprises (Zhang et al., 2007, Bamrara, A., 2012). Computers began to be placed in schools in the early 1980s, and several researchers suggest that ICT will also be an important part of education for the following generations (Bransford et al., 2000; Grimus, 2000; Yelland, 2001). Modern technology offers many means to improve teaching and learning in the classroom (Lefebvre et al., 2006). Dawes (2001) believes that new technologies have the potential to support education across the curriculum and provide opportunities for effective communication between teachers and students which was not possible in past. ICT in education has the potential to be influential in improving teaching processes. However, this potential can not be easily achieved. Given the importance of ICT in society and possibly in the future of education, the discovery of possible obstacles to the inclusion of these technologies in schools would represent an important step to improve the quality of teaching and learning. Balanskat et al. (2006) pointed out that problems will be continued to be encountered, although teachers adopt the power of digital technology and apply it too.

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REVIEW OF LITERATURE

Several studies studied the applications of novel technologies in the classroom and explored it as indispensable to provide opportunities for students to learn to work in an information age (Buabeng-Andoh, C. et al., 2012; Al-Alwani, 2005; Gomes, 2005; Osborne et al., 2003; Ozden, 2007, Tondeur et al., 2012). It is evident, as Yelland (2001) argued that traditional educational environments do not seem to be suitable for preparing learners to function or be productive in the workplaces of today's society. She claimed that organizations that do not incorporate the use of new technologies in schools cannot seriously claim to prepare their students for next generations. This fact is supported by Grimus (2000), who pointed out that "by teaching ICT skills in primary schools the pupils are prepared to face future developments based on proper understanding". Similarly, Bransford et al. (2000) reported the use of technologies at "what is now known about learning provides important guidelines for uses of technology by teachers for 21st Century. A primary barrier to teachers' readiness and confidence in using ICT, despite general enthusiasm and belief in benefits for learners, is their lack of relevant preparation, either initially or in-service. Training opportunities have remained limited in accessibility and contradictory in quality (Hennessy et al., 2010).

ICT can play various roles in learning and teaching processes. Bransford et al. (2000) concluded that it has great potential to enhance student achievement and teacher learning. Wong et al. (2006) pointed out that technology can play a part in supporting face-to-face teaching and learning in the classroom. A pool of researchers identified that such technologies are helpful in inclusive education, reducing teachers' work load, helpful in teaching to students with special needs and develops a conducive environment for teaching-learning (Iding et al., 2002; Shamatha et al., 2004; Romeo, 2006). While new

technologies can help teachers enhance their pedagogical practice, they can also assist students in their learning. According to Grabe et al. (2007), technologies can play a role in developing learner skills, enthusiasm, and understanding. Becta (2003) opined that five factors influence the likelihood that good ICT learning opportunities will develop in schools: ICT resourcing, ICT leadership, ICT teaching, school leadership, and general teaching. He indicated that the success of ICT inclusion of new technology into education varies in various spectrums in which it has been used. Osborne et al. (2003) emphasized that along with the modifications in perception on the nature of science and the role of science education, the integration of ICT tools will pose a new challenge in Science Teaching. Numerous classifications have been done by researchers and practitioners to categorize the barriers to use of ICT tools during teaching-learning process. Few classified it in two categories, i.e., extrinsic and intrinsic barriers. In one study, Ertmer (1999) referred to extrinsic barriers as first-order and claimed it as access, time, support, resources and training, whereas extrinsic barriers as second order and cited it as attitudes, resistance, beliefs; whereas Bingimlas, K. A. (2009) claimed extrinsic barriers as pertaining to organizations rather than individuals

and intrinsic barriers as pertaining to teachers, administrators and individuals.

Another classification found in the literature is with respect to teacher level and organization level. Becta (2004) grouped the barriers according to whether they relate to individual such as lack of time, lack of confidence and resistance to change and to the organization such as lack of effective training in solving technical problems and lack of access to resources. Similarly, Balaskat et al. (2006) divided them into micro-level barriers including those related to teachers' attitudes and approach to ICT and meso level barriers including those related to the institutional context. Another perspective presents the obstacles as pertaining to two kinds of conditions – material and non-material (Pelgrum, 2001). Several researchers indicate that one barrier that prevents teachers from using ICT in their teaching is lack of confidence. Dawes (2001) sees this as contextual factor which can act as a barrier. Sang et al. (2010) pointed out that that prospective ICT integration significantly correlates with all teacher related variables, except for gender.

Beggs (2000) asserted that teachers' fear of failure caused a lack of confidence. On the other hand Balanskat et al. (2006) found the limitations in teachers' ICT familiarity makes them feel anxious about applying ICT tools in the classroom and thus not confident to use it in teaching. Lack of confidence and experience with technology sway teachers' motivation to use ICT in the classroom

(Cox et al., 1999; Osborne et al., 2003; Wastiau, P. et al., 2013). Newhouse (2002) explored that many teachers lacked the confidence as well as skills to apply computers and were not enthusiastic about the changes and integration of supplementary learning associated with bringing computers into their teaching-learning practices.

In the developing countries, research reported that teachers' lack of technological competence is a chief barrier to their acceptance and adoption of ICT (Pelgrum, 2001; Al-Oteawi, 2002). In Syria, teachers' lack of technological competence has been carried out as the main barrier (Albirini, 2006). Empirica (2006) produced a report on the use of ICT in European schools which showed that teachers who don't use computers in the classrooms claim that 'lack of skills' are a constraining factor preventing teachers from using ICT for teaching. Pelgrum (2001) conducted a worldwide survey and found that teachers' lack of knowledge and skills is a serious obstacle in using ICT in primary and secondary schools. In Silica's study (2005), teachers complained about how difficult it was to always have access to computers. Drent et al. (2008) pointed out that teacher as important for the integration of ICT in teacher education. School level factors turn out to be of limited importance for innovative use of ICT.

Korte et al. (2007) found infrastructure barriers such as broadband access not yet being available. Toprakci (2006) found that low number of computers, oldness or slowness of ICT systems and scarcity of educational software in the school were barriers to the successful implementation of ICT into Science education in Turkish Schools. Similarly, Al-Alwani (2005) found that having no access to the internet during the school day and lack of hardware

were impeding technology integration in Saudi schools. Gomes (2005) found a lack of appropriate infrastructure and lack of appropriate material resources to the barriers. On the basis of various studies, I pointed out the major barriers as lack of confidence, lack of competence and lack of access to resources.

OBJECTIVES

- To study the teachers' Confidence to apply the ICT tools in teaching-learning process
- To analyze the status of teachers' Access to ICT resources
- To study the teachers' Competence to apply the ICT tools in teaching-learning process

RESEARCH METHODOLOGY

The present study analyzes the barriers which obstruct the path of applying ICT tools in a classroom. For the purpose, a representative sample of 570 (Out of which, 519 Responded) Primary School teachers has been interviewed using a questionnaire in ninety-five blocks of Uttarakhand (using Systematic Random Sampling) to rate their views on various dimensions of ICT usage in a classroom. The collected data has been analyzed using SPSS to calculate correlation coefficients and χ^2 statistic. What emerged from the review of literature was individual's Confidence, Competence, and Access to ICT resources has a significant impact on ICT usage in the classroom. The occurrence of all components enhances the probability of exceptional integration of ICT tools in learning and teaching opportunities.

ANALYSIS AND DISCUSSION

Hypothesis 1 H_0: Teachers' Confidence to apply the ICT tools in teaching-learning process does not differ significantly

To study the teachers' Confidence to apply the ICT tools in teaching learning process, a set of questions have been developed using UNESCO ICT Competency Framework for Teachers. The Confidence has been rated with 12 variables which include computer skill level, computing, use of keyboard, Use of mouse, task performance, Use of - MS Word, Paint, Power-point, Excel, Access, Internet and E-Mail.

SN	Proposed Relationship	Karl Pearson's Coefficient of Correlation	Chi Square Estimates	
			Value	df
1	Experience - Computer Skill Level (Confidence)	-0.010	13.68	9
2	Experience - Computing (Confidence)	0.118	17.60	9
3	Experience – Use of Keyboard (Confidence)	0.044	26.59	9
4	Experience – Use of Mouse/ Touchpad (Confidence)	0.003	25.12	9
5	Experience – Task Performance (Confidence)	0.059	37.32	9
6	Experience – Using MS Word (Confidence)	0.043	25.69	9
7	Experience – Using MS Paint (Confidence)	0.050	25.34	9
8	Experience – Using MS PowerPoint (Confidence)	0.065	37.94	9
9	Experience – Using MS Excel (Confidence)	0.047	26.91	9
10	Experience – Using MS Access (Confidence)	0.067	21.55	9
11	Experience – Using Internet (Confidence)	0.027	28.69	9
12	Experience – Using E-Mail (Confidence)	0.047	37.65	9

Table 2 Summary of results for Hypothesis 2

Table 1 Summary of results for Hypothesis 1

It has been observed that computer skill level is negatively correlated to experience of the teachers, whereas rest of the variables has a positive correlation. The calculated values of χ^2 at 95% confidence level are 13.68 and 17.60 which are less than the tabulated value (χ^2_{cal} = 16.92) for nine degrees of freedom and it shows that there is no significant relation between computing and computer skill level with the experience of teachers. Further, the calculated values of χ^2 at 95% confidence level are 26.59, 25.12, 37.32, 25.69, 25.34, 37.94, 26.91, 21.55, 28.69 and 37.65, which are greater than the tabulated value (χ^2_{cal} = 16.92) for nine degrees of freedom and which show that null hypothesis is rejected. Hence, Teachers' Confidence to apply the ICT tools in teaching-learning process differs significantly.

Hypothesis 2 H_0: Teachers' Competence to apply the ICT tools in teaching-learning process does not differ significantly.

To study the teachers' Competence to apply the ICT tools in teaching learning process, a set of questions have been developed using UNESCO ICT Competency Framework for Teachers. The Competence has been rated with 9 variables which include applying ICT tools, Use of Computers in TLP, Use of Smart Phones in TLP, Use of Mobile Apps in TLP, Evaluation Using ICT Tools, use of - MS Word, MS Power-point, MS Excel and Internet.

S N	Proposed Relationship	Karl Pearson's Coefficient of Correlation	Chi Square Estimates	
			Value	df
1	Experience – Applying ICT Tools (Competence)	0.017	25.21	12
2	Experience – Use of Computers in TLP (Competence)	0.012	29.23	12
3	Experience – Use of Smart Phones in TLP (Competence)	-0.049	19.72	12
4	Experience – Use of Mobile Apps in TLP (Competence)	-0.005	31.32	12
5	Experience – Evaluation Using ICT Tools (Competence)	0.060	50.90	12
6	Experience – Use of MS Word (Competence)	0.005	37.49	12
7	Experience – Use of MS PowerPoint (Competence)	-0.122	55.39	12
8	Experience – Use of MS Excel (Competence)	0.226	80.23	12
9	Experience – Use of Internet (Competence)	-0.055	22.09	12

It has been observed that Use of MS Power-point, Internet, Smart Phones and Mobile Apps in TLP are negatively correlated with experience of teachers; whereas rest of the variables is positively correlated. The calculated values of χ^2 at 95% confidence level is 19.72 which is less than the tabulated value (χ^2_{cal} = 21.03) for twelve degrees of freedom and it shows that there is no significant relation between use of Smart Phones in Teaching Learning Process with the experience of teachers. Further, the calculated values of χ^2 at 95% confidence level are 25.21, 29.23, 31.32, 50.90, 37.49, 55.39, 80.23 and 22.09, which are greater than the tabulated value (χ^2_{cal} = 21.03) for twelve degrees of freedom and which

show that null hypothesis is rejected. Hence, Teachers' Competence to apply the ICT tools in teaching-learning process differs significantly.

Hypothesis 3 H$_0$: Teachers' Access to ICT resources does not vary significantly

To study the teachers' Access to ICT resources and apply it in teaching learning process, a set of questions have been developed using UNESCO ICT Competency Framework for Teachers. The Access has been rated with 11 variables which include Computer Ownership, Use of Computers, computer ownership by School, use of MS Word, MS Excel, MS Access, MS Paint, Internet for TLP, use of internet on smart phone and helping others to use ICT.

Table3: Summary of Results for Hypothesis 3

SN	Proposed Relationship	Karl Pearson's Coefficient of Correlation	Chi Square Estimates	
			Value	df
1	Experience - Computer Ownership (Access)	-0.039	17.12	6
2	Experience - Use of Computers (Access)	-0.024	25.69	6
3	Experience - Computer Ownership by School (Access)	0.043	27.25	6
4	Experience - MS Word for TLP (Access)	-0.017	24.02	6
5	Experience - MS PowerPoint for TLP (Access)	0.004	13.02	6
6	Experience - MS Excel for TLP (Access)	-0.173	19.57	6
7	Experience - MS Access for TLP (Access)	0.120	21.09	6
8	Experience - MS Paint for TLP (Access)	-0.014	28.88	6
9	Experience - Internet for TLP (Access)	0.058	35.98	6
10	Experience - Use of internet on smart phone (Access)	0.007	21.01	6
11	Experience - Helping Others (Access)	-0.052	24.10	6

It has been observed that Computer Ownership, Use of Computers, MS Word, MS Excel, MS Paint and Helping others to use ICT resources are negatively correlated with experience of teachers; whereas rest of the variables is positively correlated. The calculated values of χ^2 at 95% confidence level is 13.02 which is less than the tabulated value (χ^2_{cal} = 16.92) for six degrees of freedom and it shows that there is no significant relation between use of MS PowerPoint for Teaching Learning Process with the experience of teachers. Further, the calculated values of χ^2 at 95% confidence level are 17.12, 25.69, 27.25, 24.02, 19.57, 21.09, 28.88, 35.98,21.01 and 24.10 which are greater than the tabulated value (χ^2_{cal} = 16.92) for six degrees of freedom and which show that null hypothesis is rejected. Hence, Teachers' Access to apply the ICT tools in teaching-learning process differs significantly.

CONCLUSION AND SUGGESTIONS

Since Confidence, Competence and Access 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. No one component in itself is sufficient to produce good teaching. However, the presence of all components increases the likelihood of excellent integration of ICT in learning and teaching opportunities.

STRENGTHS	WEAKNESSES	OPPORTUNITIS	THREATS
Smart Phones' Availability among Teachers	Non-Availability of Computers in Schools	Effective Digital environment of the Nation	Poor Infrastructure
Internet Usage on Smart Phones	Lack of Confidence and Competence among teachers to apply computers/ ICT Tools	Interest among teachers to apply A/V learning material for TLP	Financial Barriers
Availability of Easy-to-use apps for TLP	Lack of access to ICT Resources (Computers/ Online Tools)	Internet access on Smart Phones	Cyber Threats
	Lack of Appropriate Training Facilities	Power of Digital Learning over Traditional Methods	Lack of technical support

Table 3 SWOT Analysis

Further, effective digital environment of the country, interest among teaching fraternity to apply Audio-Visual media for teaching learning processes, internet penetration and its usability and power of digital learning over traditional methods are the areas where Government and Educational agencies need to focus and catalyze the digital culture in education. School Education Department must work in sync with State and Central Governments along with the Non Government Organizations to ensure the access of computers and ICT resources in Schools and strengthen the capability of teachers to develop their confidence and competence to use ICT Tools in teaching learning process.

Future Research Possibilities

The present study has been conducted over 519 Government Primary School Teachers of Uttarakhand, whereas the future studies can focus on larger samples including the Government Secondary and other Private Schools operating in the State. Experience of the teachers has been considered as a factor to correlate Competency, Confidence and Accessibility to ICT resources, whereas other factors, i.e., age, gender, mental aptitude and technical aptitude can also highlight more relevant issues associated to challenges incorporated in Use of ICT tools for TLP.

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