ICT Integration in Teaching and Learning: Empowerment of Education with Technology

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Abstract: Information and communication technology (ICT) in teaching learning means making the effective use of ICT to teach the subject matter in a more interesting manner to make learning easy and fast for the students. It makes use of projectors, internet, multimedia, audio- visual aids and much more for teaching. The use of ICT in teaching learning have changed the whole concept of education and had proved to be of great benefit both for the teachers as well as the students. Through ICT, teachers get an opportunity to use new innovations in their teaching and present the study material in a more refined manner which is easily understood by the students and apart from this, ICT usage in teaching learning by the teachers gives an opportunity to the teacher to get acquainted with the new innovation and become contributors to its use in education. The students gain a lot by learning through ICT and they learn to seek knowledge on their own by using ICT. They also get an opportunity to share their knowledge with others through ICT. But there are certain factors which effect the successful ICT integration in teaching learning. This paper throws light on the benefits of ICT usage in teaching learning, three phases to successful ICT integration, factors influencing ICT by teachers, the barriers to successful ICT integration, implications to check barriers, and the changed role of the teachers.

Keywords: ICT, ICT integration, ICT barriers, ICT benefits, implications, teacher's role.

1. INTRODUCTION

Information and Communications Technologies (ICT) in education is basically our society's efforts to teach its current and emerging citizens, valuable

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knowledge and skills about computing and communications devices, software that operates them, applications that run on them and systems that are built with them. ICT stands for information and communication technologies and are defined, for the purposes of this primer, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." These technologies include computers, internet, broadcasting technologies (radio and television), and telephony. With the emerging trends, the use of technology in education has come up as a new revolution which has drastically changed the whole concept of education. Use of ICT in education has made the teaching learning process very interesting and easy for the teachers as well as the students, students have zeal to learn through ICT and out of curiosity and interest, they learn better. Modern technology offers many means of improving the teaching and learning process in the classroom (Lefebvre, Deaudelin & Loiselle, 2006). New technologies have provided an effective platform for the education in the present time, which has helped in the enhanced and better interaction between the teacher and the taught and this has provided new opportunities to teaching learning process. ICT in education has the potential to bring about influential changes in ways of teaching.

1.1 Benefits of using ICT in teaching and learning

There are many benefits of using ICT in teaching learning process. Some have been discussed as under:

- *ICT helps to motivate and engage learners:* The needs of every individual learner are different. ICT fulfils the needs of individual learner and also helps them in their learning by motivating them to learn and in this way the learners learn better and in a more effective manner.
- *Assessment of learners:* ICT can guide the learner and the teachers by providing them feedback through feedback software which tells them about their mistakes side by side during the learning process.
- *Effective presentation:* The learning material can be presented more effectively through ICT. It makes the material more presentable and hence enhances the interest of the learner and thus results in good learning.
- *Communication channels increased:* Through ICT, distance never remains an issue as the learners and educators can share their views, ideas through emails, discussion groups and chat rooms.
- *Flexibility:* ICT is flexible and it can be adjusted according to the ages and abilities of the learners and also according to the skills and competence of the educator, which makes teaching learning process effective.

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- *ICT opens up new opportunities in teaching and learning:* ICT provides an opportunity to the educators to develop new ways and methods for making learning more effective and provides the educators an opportunity to educators to learn new skills and polish their career more.
- *Autonomous learning:* The use of ICT will change the role of the teacher as well as the learner to a great extent. ICT will provide students a wide choice regarding how they approach their study, without the direction of the teacher and hence minimal teacher management.

1.2 Three phases in the successful integration of ICTs

Three phases in the successful integration of ICT into teaching and learning are discussed as under:

1. The establishment of institution-wide technological infrastructure and the bottom-up institution-wide adoption of ICT in teaching and learning activities (mostly experimentation, often without real reflection on the impact of ICT on student learning).
2. The pedagogical use of the infrastructure and the effective integration of ICT into teaching and learning activities to improve learning (reflection on the entire teaching and learning process with an emphasis on student learning).
3. The strategic use of ICT with a view to the different target groups of higher education. The goal in this stage is to integrate the different elements of the technological enterprise into a "seamless educational enterprise" (Morrison and Oblinger 2002), (Collis and Vander Wende 2002).

1.3 Factors influencing teacher's adoption and integration of ICT

Several factors influencing the adoption and integration of ICT into teaching have been identified by researchers. Five characteristics that influence the innovation adoption decision have been identified by Rogers (2003). Organisational capacity, technological considerations, content and user characteristics are the factors which have been identified by Stockdill and Moreshouse (1992) which influence the adoption and integration of ICT into teaching. Teacher-level, system-level and school-level factors influence the adoption of ICT and these have been identified by Balanskat, Blamire & Kefalla (2007).

1.4 Personal Characteristics

Personal characteristics of the teachers can also influence the ICT adoption and integration to a great extent and these are age, gender, educational

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qualification, computer experience for educational use, experience in the field of education and attitude towards computer as identified by Schiller (2003). The effectiveness of the technology is not determined only by its existence in the classroom rather it is determined on the readiness and promptness of the teachers to integrate the new technology into the teaching learning process. (Jones, 2001). The attitudes of teachers towards technology greatly influence their adoption and integration of computers into their teaching. Lack of competence or skill to handle the new technology, lack of confidence, fear of the technology and anxiety are the factors which result in preference of the conventional teaching methods over ICT. (Russell & Bradley, 1997). Therefore, it is very important to understand the personal characteristics of the teachers.

1.4.1 *Teachers' attitudes*

Successful implementation of technology in education requires teacher's support and positive attitude to a great extent. If the teachers feel that the ICT integration in teaching learning is not fulfilling their and their student's demands, then they will be somewhere reluctant in using technology in teaching. On the other hand, if the attitude of the teachers is positive towards ICT, then it will have a positive effect on the successful integration of ICT in the teaching learning process. The factors which influence the ICT integration into teaching learning are the attitudes of the teachers as well as the belief which the teachers have towards technology. (Hew and Brush, 2007; Keengwe and Onchwari, 2008). The positive attitude of the teachers towards the computers is very much affected by the experience of the teachers with the computers. More the teacher's computer experience, more will be the positive attitude towards computers (Rozell & Gardner, 1999).

1.4.2 *ICT Competence*

Computer competence is the ability of handling various applications on computer for more than one purpose (van Braak et al., 2004). One of the major predictors of ICT integration into teaching is computer competence of the teachers and this helps a lot in successful integration of ICT in teaching learning (Berner (2003), Na (1993) and Summers (1990) as cited in Bordbar (2010)). According to Peralta & Costa (2007), those teachers have higher confidence levels and greater ability regarding use of computers in teaching who have a considerable amount of computer experience with them. The teacher's confidence regarding the use of computers in teaching learning is very much related to the teacher's perception of their capability of using computers in the classroom (Jones, 2004).

1.4.3 *Computer self-efficacy*

Research has reported that the self-efficacy of the teachers has a great effect on the use of ICT by them. Self-efficacy is defined as a belief in one's own abilities to perform an action or activity necessary to achieve a goal or task (Bandura, 1997). In real meaning, self-efficacy is the confidence that a person has in his/her ability to do a particular thing or task which he/she is aspiring or willing to do. So, it can be said that the confidence of the teachers refers both to the perception of the teacher in relation to his/her success in using ICT efficiently in teaching learning and also to how far the teacher thinks or perceives her/his ICT usage success under his/her control (Peralta &Costa, 2007).

1.4.4 *Gender*

Different studies have reported the use of ICT and gender differences. Studies related to ICT and gender differences have cited that the female teachers have limited access to the technology and they have limited skill as well as they lack interest in technology and all this leads to their low levels of computer usage (Volman &van Eck, 2001). A study conducted by Markauskaite (2006) revealed significant differences between males and females with regard to technical ICT capabilities and sustainability. Research studies have revealed more usage of ICT by male teachers in their teaching as compared to female teachers (Kay, 2006; Wozney et al, 2006).

1.4.5 *Teaching Experience*

Many research studies have been conducted on teaching experience and ICT usage. Some research has revealed that the usage of computer technology in teaching learning process is not at all influenced by the teaching experience of the teacher (Niederhauser & Stoddart, 2001), but most of the research has revealed that the successful ICT integration in classrooms is very much affected by the teaching experience of the teacher (Wong & Li, 2008; Giordano, 2007; Hernandez-Ramos, 2005). Baek, Jong & Kim (2008) claimed that the teachers with more teaching experience are quite reluctant to ICT integration in teaching learning process. U.S. National Centre for Education Statistics, 2000 reported that the teachers with more teaching experience were more reluctant to ICT integration in their teaching as compared to the teachers who had less teaching experience.

1.4.6 *Teacher workload*

Research studies have revealed that the teacher workload affects the technology acceptance by the teachers in the classrooms to a great extent. Many factors

lead to the increased work load of the teachers due to the technology use in education and these factors are acquiring of new skills, constant upgrading, regular student mails, search for strategies for teaching and course maintenance and this acts as a negative factor for technology acceptance by the teachers (Samarawickrema & Stacey, 2007). Fullan (2003) also claimed that in order to make the teachers realize the actual aims of the educational system and also the acceptance of the new initiatives by the teachers, it is necessary to reduce the workload of the teachers.

1.5 Institutional characteristics

Institutional factors help to improve teachers' existing attributes. Technology training and teacher commitment to teaching are the factors which are quite reliable for technology integration in classrooms. Vannatta & Fordham (2004) were of the view that the teachers and the administrators should facilitate to make contribution to teaching improvement and this cannot be done by only providing extensive training in effective use of technology in education. Norris, Poirot & Soloway (2003) pointed out the importance of technology access. So, it is essential to understand the institutional characteristics that influence the ICT integration and adoption in teaching learning process.

1.5.1 *Professional development*

Professional development of the teacher is the key factor to the successful integration of computers in the classroom teaching. Quality professional training programs help the teachers to a great extent in implementation of technology in education and also in transformation of teaching practises (Brinkerhoff, 2006; Diehl, 2005). High quality teacher training programs always offer new teaching learning technologies, teacher gets a more clear vision about students' attainment, educators are more involved in teaching of the contextual matter and such training programs teach teamwork skills to the participants. These training programs, if based on the subject matter helps the teachers in the integration of technology in the teaching learning to a great extent (Lawless and Pellegrino, 2007).

1.5.2 *Accessibility*

A necessary condition to the ICT integration in school education is the access to ICT infrastructure and resources (Plomp, Anderson, Law, & Quale, 2009). The availability and accessibility of ICT resources such as hardware, software, etc. are the important factors for the effective adoption and integration of ICT in school teaching. The teachers will be reluctant to use ICT in teaching if they don't have an access to ICT technology. So, it can be said that the access to the

ICT resources will help in the effective integration of ICT in classrooms by the teachers. Obviously, to encourage student-centred technology learning, it is necessary that learners have access to quality technology resources.

1.5.3 *Technical support*

Jones (2004) reported that lack of technical support will also discourage the teachers from using ICT in teaching learning. The fear of equipment failure will lead to the non usage of technology in the classrooms by the teachers as they will think that the technical repair will not be provided on time and this will at the end of the day effect their teaching to a great extent. So, it can be said that if proper technical support is provided, then it will have a positive influence on the ICT integration by the teachers in the classroom teaching.

1.5.4 *Leadership support*

Leadership support is an imperative factor which acts as a positive factor for ICT integration in classroom teaching. Only that leader stimulates and encourages the teachers to use technology in classroom teaching who implements the technology plans and also shares a common vision with the teachers (Yee, 2000). One of the major predictors of technology usage in classroom teaching is the school technology leadership apart from the infrastructure support (Anderson & Dexter, 2005). Becta identified five essential factors for the effective utilization of ICT in schools and these are teaching of ICT, ICT resources, teaching in general, general school leadership and ICT school leadership (as cited in Lai & Pratt, 2004, p. 462).

1.6 Technological Characteristics

The significant factor which has a considerable impact on the adoption of innovation is the technological characteristics. Studies have revealed that various technology attributes like complexity, compatibility, relative advantage and trial ability as perceived by an individual have a great influence on the rate of technology adoption (Rogers, 2003). According to Dillon & Morris (1996, p.6), "innovations that offer advantages, compatibility with existing practices and beliefs, low complexity, potential trial ability and observability will have a more widespread and rapid rate of integration". It can be said that the teachers will quickly adopt a new technology if they feel that a particular technology has an advantage over the existing one, has compatibility with their social needs, is easy to adopt, can be used on trial basis and results can be seen which will prove its usage and advantages for the educational system.

Factors influencing teacher's adoption and integration of ICT in education
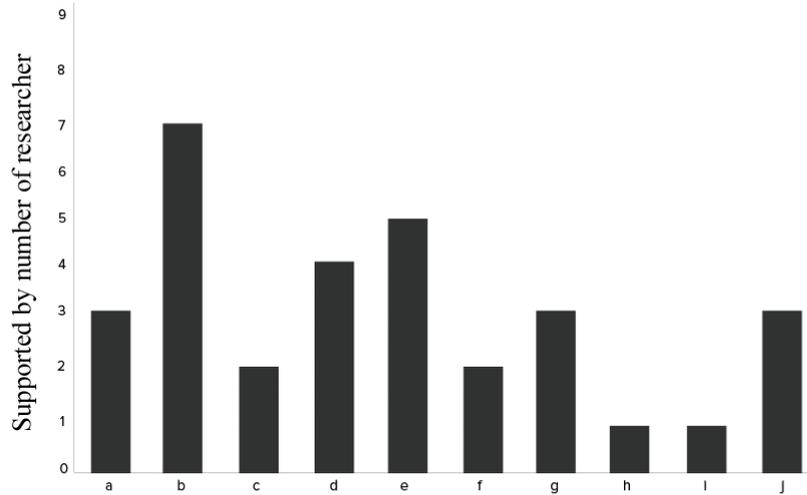
Factors influencing teacher's adoption and integration of ICT

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x-axis represents factors influencing teacher's adoption and integration of ICT

y-axis represents Supported by number of researcher

- **a** represents the factor Teachers' Attitudes, which was supported by 3 researchers i.e. Hew & Brush 2007; Keengwe & Onchwari, 2008;and Rozell & Gardener, 1999.

- **b** represents the factor , ICT competence, which was supported by 7 researchers i.e. van Braak et al., 2004: Berner, 2003;Na, 1993;Summers, 1990; Bordbar, 2010; Peralta & Costa, 2007 and Jones, 2004.

- **c** represents the factor , computer self-efficacy, which was supported by 2 researchers i.e. Bandura, 1997; and Peralta & Costa, 2007.

- **d** represents the factor, gender, which was supported by 4 researchers i.e. Voltman & Van Eck, 2001; Kay, 2006; Wozney et al, 2006; and Markauskaite, 2006.

- **e** represents the factor,, teaching experience, which was supported by 5 researchers i.e. Nederhauser & Sloddart, 2001; Wong & Li, 2008; Giordano, 2007; Hernandez & Ramos, 2005; and Baek, Jong & Kim, 2008.

- **f** represents the factor,, teacher workload, which was supported by 2 researchers i.e. Samarawickrema & Stacey, 2007; and Fullan, 2003.

- **g** represents the factor, professional development, which was supported by 3 researchers i.e. Brinkerhoff, 2006; Diehl, 2005; and Lawless & Pellegrino, 2007.

- **h** represents the factor, accessibility, which was supported by 1 researcher i.e. Plomp, Anderson, Law & Quale, 2009.

- **i** represents the factor, technical support, which was supported by 1 researcher i.e. Jones, 2004.

- **j** represents the factor, leadership support, which was supported by 3 researchers i.e. Yee, 2000; Anderson & Dexter, 2005; and Lai & Prett, 2004.

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1.7 Barriers to the integration of ICT in education

Barriers to the ICT integration in education has been divided into main two categories by several studies and these are: intrinsic and extrinsic barriers. Time, support, resources and training have been cited as the extrinsic factors and beliefs, attitudes, practices and resistance as intrinsic factors by Ertmer (1999). On the other hand, Hendren (2000, as cited in Al-Alwani, 2005) considered extrinsic barriers as pertaining to organisations and intrinsic factors as pertaining to teachers, administrators and individuals. The teacher-level barriers and school-level barriers is another classification found in the literature regarding types of barriers to successful ICT integration in education. Becta (2004) grouped lack of confidence, lack of time and resistance to change as teacher level barriers and lack of technical support, lack of access to resources as school level barriers. Some of these studies look at the barriers at teacher, institution, or system level. However, the barriers can be discussed under the following two sub headings:

1.7.1 *Teacher level barriers*

- *Lack of confidence:* Lack of confidence has been indicated as the main barrier to use of ICT in education by the teachers. Many research studies have indicated reasons for the lack of confidence among the teachers with regard to use of ICT in education. For instance, Beggs (2000) stated that fear of failure was the reason behind the lack of confidence among the teachers with regard to the effective use of ICT in education. Lack of confidence can also be due to the teachers' being lagging behind in up-to-date knowledge about the new technology and this leads to their being resistant in using ICT in education (Balanskat et al., 2006). Some teachers want to extend the use of ICT in coming future because they understand that the technology is helpful in their teaching and personal work and they have been able to realize this due to the confidence which they have in using ICT (Cox, Preston, and Cox, 1999).

- *Lack of teacher competence:* Lack of teacher competence into pedagogical integration of ICT in education acts as another barrier which is directly related to teacher confidence (Becta, 2004). Research has reported that in the developing countries, lack of teachers' competence is the main barrier to the successful integration of ICT in education by the teachers (Pelgrum, 2001; Al-Oteawi, 2002). Thus, it can be stated that lack of teacher competence acts as a strong barrier to the successful ICT integration in education.

- *Resistance to change and negative attitudes:* Some teachers are not ready to accept changes or accept new technology for teaching learning and it

acts as a barrier in ICT integration in education. Teachers are sometimes resistant to change. The beliefs of the teachers do have a great influence on the ICT integration in education. Teachers having strong beliefs about a particular teaching method won't accept the new technology for education and this hampers the integration of new technologies in education. Teachers sometimes feel that although they are using ICT in classroom teaching, they are not given required reward for this effort and because of this very reason, they become reluctant in technology usage in education

1.7.2 *School-level barriers*

- *Lack of time:* Lack of time also acts as a barrier to the successful ICT integration in education even though the teachers are skilled and competent enough in using ICT. Teachers complain that due to ICT integration, a lot of time is required to plan lessons for the class, exploring of various sites and also having a look at the varied aspects of the educational software (Sicilia, 2005). The lack of time with regard to getting enough knowledge about the new technology and also dealing with the technical problems has also been reported by many researchers.

- *Lack of effective training:* Lack of effective training is also one of the important barriers to the successful ICT integration in education. The use of the ICT in classroom teaching requires a lot of skill and efficiency and this can be acquired by the teachers through proper training. Only then, they can do proper justice to ICT usage in the teaching learning process. But the teachers usually lack this effective training. If ICT is to be integrated in the classroom teaching, the teachers need to be given efficient training in this to make it successful.

- *Lack of accessibility:* One of the barriers which demotivates the teachers from technology integration into the teaching learning is the lack of accessibility. There can be various reasons for the lack of accessibility. The inaccessibility of ICT resources may be due to the lack of personal access for the teachers, poor quality hardware, poor resource organisation and software not being appropriate (Becta, 2004).

- *Lack of technical support:* Without both good technical support in the classroom and adequate school resources, teachers cannot be expected to overcome the barriers preventing them from using ICT (Lewis, 2003). Pelgrum (2001) found that in the view of primary and secondary teachers, one of the top barriers to ICT use in education was lack of technical assistance. In Sicilia's study (2005), technical problems

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were found to be a major barrier for teachers. These technical barriers included waiting for websites to open, failing to connect to the Internet, printers not printing, malfunctioning computers, and teachers having to work on old computers. "Technical barriers impeded the smooth delivery of the lesson or the natural flow of the classroom activity" (Sicilia, 2005, p. 43). Hence, several studies have identified various barriers to ICT integration in teaching: lack of computers, lack of quality software, lack of time, technical problems, teachers' attitudes towards computers, poor funding, lack of teacher confidence, resistance to change, poor administrative support, lack of computer skills, poor fit with the curriculum, lack of incentives, scheduling difficulties, poor training opportunities, and lack of skills in how to integrate ICT in education.

Barriers to the ICT integration in education

Authors	Barriers						
	Lack of confidence	Lack of teacher competence	Resistance to change and negative attitudes	Lack of time	Lack of effective training	Lack of accessibility	Lack of technical support
Beggs, 2000							
Balanskat et al., 2006							
Cox, Preston, and Cox, 1999	✔						
Becta, 2004		✔				✔	
Pelgrum, 2001		✔					✔
Al-Oteawi, 2002		✔					
Sicilia, 2005				✔			✔
Lewis, 2003							✔

1.8 Checking barriers for ICT integration in teaching learning

The barriers discussed above can be checked in the following manner for effective integration of ICT in the teaching learning:

1.8.1 *Teacher level barriers*

The teachers can check the barriers in the following manner:

- For checking lack of access, teachers should make the effective use of resources offered at the school and they also should have access to ICT at home.
- For checking resistance to change, the teachers should be open minded and accept the change for good.
- For checking the barrier of lack of time, the teachers should learn to be more organised and they should also acquire time management skills.
- Lack of training barrier can be checked if the teachers prepare themselves by self training, or taking up the training sessions at the school or they can learn how to have access to the resources on their own.
- In order to check lack of technical support, the teachers should rely on themselves for solving problems arising while use of ICT and they can also access the available support.

1.8.2 *School level barriers*

The school organisation can check the barriers in the following manner:

- By providing the ICT hardware and software, the school can check the lack of access barrier.
- Providing training in the new pedagogical approaches, the school can check the barrier of resistance to change.
- The school can check the lack of time barrier by providing sufficient time to the teachers and this can be done by reducing the number of teacher lessons or by increasing the daily lesson time.
- The school can provide training courses with the new devices, modern technologies and also training in the new pedagogical approaches and check the lack of training barrier.
- By providing the appropriate and continuous technical support, the school can check the lack of technical support barrier.

1.9 Changed role of the teacher

With the ICT integration in teaching learning, the role of the teacher needs to change and there are four reasons that can justify this change:

- The integration of ICT in teaching learning will cause many teaching resources like chalkboards and projectors to become obsolete. These will no more be used by the teachers for presenting the study material and teachers will be making use of new electronic resources for the same.
- Some assessment methods will become redundant because of ICT integration and the student's knowledge can be assessed by using online tests. Due to ICT, it will become easy for the teacher to keep a track of the student's scores by maintaining a database stored in an electronic format.
- The other changed role of the teacher requires the teachers to promote critical thinking skills and collaborative learning practise in the students. ICT will provide the students with a great knowledge through internet but there is lot of information which is available on the internet and the changed role of the teacher requires helping the students to differentiate properly between the right information and the misinformation.
- The other thing which is required by the teachers is to meet the demands of the learner and to provide them with the curricula which will meet their demands of learning and internet will help the teachers in this to a great extent.

2. CONCLUSION

ICT has become an important factor for effective teaching learning. It has brought a revolution in the teaching learning process. And all this has positively affected the learning of the students as the students show great enthusiasm in learning through ICT. But there are certain factors which help in the acceptance of ICT in teaching learning by the teachers and these factors should be motivated in one way or the other. Apart from these, there are some factors which act as barriers to successful integration of ICT in teaching learning and these barriers can be checked through certain implications by the school and the teachers for making ICT a success in the teaching learning. Teachers and the school authorities should feel positive about ICT, only then they can teach the students about the real worth of ICT in teaching learning and this can do wonders for both the teachers as well as the students.

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