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## **Fostering Professional Development among Teachers through Implementation of Information and Communication Technologies in Teacher Training Institutions and Colleges of Teacher Education**

**Dr. Shazli Hasan Khan**  
Assistant Professor,  
Department of Education and Training,  
Maulana Azad National Urdu University  
(MANUU)

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### **Abstract**

Twenty first century is the age of Information and Communication Technology (ICT). ICT has influenced all aspects of human life, teacher education cannot be exception. In the present age of globalization, the education systems all around the world are increasing pressure to use ICT and enhance the knowledge & skills of the teachers as well as of the students. ICT is an important instrument, which can transform the present isolated, teacher-centred, book-centred learning environment into a rich student-centred environment. With the growth and advent of new Information and Communication Technologies (ICTs) and their integration into higher education and teacher education programmes, ICTs have brought about a paradigm shift from the old traditional teaching- learning process into a new paradigm of teaching-learning.

Thus, the growth and development of ICTs clearly shows that countries all over the world have accepted ICT to bring about a qualitative change in the delivery of educational services. In teacher education, teacher trainees and teacher educators are adapting themselves to the use of new information technologies. With information growing at a very rapid pace, ICT has not only helped in expanding, producing knowledge, but also have provided necessary help and technical support required to keep up with the information growth. The present research paper aims to finds out how integration and implementation of ICT in teacher education institutions and programmes have helped to achieve professional development of teachers. The present research paper also tries to find that how ICTs would

be able to transform the present teacher-centred classroom learning environment into a more innovative, rich ICT-based student-centred learning environment.

**Key words:** E-learning, ICT, Interactive Learning Environment, Pedagogy, Professional Development, Teacher Education.

## 1. Introduction

Twenty first century is the age of globalization. Our lives have changed as communication has entered a new era. ICT has not only accelerated teaching learning process, but also have provided unforeseen opportunities that enable enormous growth and development. Yet, teacher education is an area which is struggling to afford educational opportunities, to provide their students with necessary knowledge and skills for evolving market places and sophisticated learning.

With information being generated at a mind boggling pace, ICT has not only helped in expanding knowledge, but also have provided the necessary help and technical support required to keep up with the information growth. In the field of education, ICT provides the teacher with a variety of tools which would help to transform the oft seen teacher centered classroom into a rich, students focused, and knowledge rich environment. ICT demands systems wake up to the call of transformation in the paradigm of traditional learning. Many teachers & educators believe that creating a paradigm shift in the views of the learning process, coupled with the application of new information technologies, may play an important role in bringing educational systems into alignment with the knowledge based information rich societies. Sandholtz, Ringstaff and Dwyer (1997)<sup>17</sup> identify the shift that will take place in changing from a focus on teaching to a focus on learning.

ICTs have brought new possibilities into teacher education, but at the same time, they have placed more demands on teachers. ICTs exemplified by the Internet and Interactive multimedia, are of great significance for teacher education. It needs to be effectively integrated into formal classroom teaching and learning conditions. It is also to be focused in teacher education programmes. The ICTs integration in education in general and teacher education in particular is the need of the day. Its adequate recognition and support of relevant needs is crucial for integration and effective utilization for quality education programmes. Use of ICTs can make substantial change for teacher education and training in two ways. Firstly, the rich representation of information changes learner's perception & understanding of the content. Secondly, the vast distribution and easy access to information can change

relationships between educators & student-teachers. ICT can also provide powerful support for educational innovations.

The effective & efficient use of ICT depends largely on techno-competent teachers. They should be able to appreciate the potential of ICT and adjust themselves with a new culture of professionalism within electronic environment. A right and positive attitude towards ICT can bring out professional excellence among teachers. Laferriere & Breuleux (2002)<sup>5</sup> raise many issues related to ICT in teacher education. Some of them are as following:

1. ICTs as a mere technology or a catalyst of change?
2. ICTs as a subject matter or as tools for learning a broad variety of subject matter?
3. ICTs as time consuming or time saver?
4. ICTs belonging in the lab or in the classroom?
5. Face-to-Face or Online interaction?
5. ICTs as information source or communication tool?
6. ICT as individual or collaborative tool?

While planning to introduce ICT in teacher education, one has to resolve them.

## **2. Objectives of the Study**

The following are the objectives of the present study undertaken:

- 1.) To study professional development of teachers through Information and Communication Technologies implementation in teacher education.
- 2.) To study various methods and strategies which have been used for the integration of ICTs in pre-service teacher education
- 3.) To study how inclusion of ICT and its related content is helping to improve pedagogy in teacher education?
4. To study various case studies related to ICT initiatives taken by teacher training institutions in India.

## **3. Methodology of the Study**

The author conducted his research studies on the basis of availability of secondary sources of data. Secondary data has been collected from various books, journals, research articles etc. The author also browsed and retrieved some data from ICT related websites. The methodology of the study also includes the thoughts and writings of various authors in the stream of academic research and corporate industry. Thus, the author utilized and exhausted all resources available for carrying out the present research study.

## **4. Model Strategies for ICT use in Pre-Service Teacher Education**

In order to introduce ICT in pre-service teacher education, a number of methods & strategies are suggested. Many of these strategies employ commonly used productivity tools such as word processing, database, spread sheet or browser applications. These tools could be used in many different ways to learn other curricular areas. Strategies that are multipurpose in application may also be used to help teacher trainees to quickly develop technology-rich lesson plans for their practice teaching. Some of the strategies are as suggested below:

**a) Web Based Lessons**

**Web Quest**

It is an inquiry oriented activity for which most of the information is collected from the web. Web quest are designed to help learners use information rather than spending timer in collecting information and hence important related web recourses are suggested in the lesson. Questions are developed so as to encourage learners thinking at Analysis, Synthesis & Evaluation levels (suggested by Bloom).

Web Quest helps the teacher educators/teachers to plan activities that would make use of web resources as a compulsory component.

**b) Mutlimedia Presentations**

Multimedia is a combination of text, sound, animation, graphics, video etc. In the project based teaching-learning, the students acquire new skills of planning, designing, preparing and using Multimedia presentations. Some multi media products which are included are:

- i) Creating a web page.
- ii) Developing Multichoice items for evaluation.
- iii) Developing navigation facility.
- iv) Making multimedia interactive.
- v) Creating a video film with a handcam to be included in the presentation.

**c) Telecomputing Project**

UNESCO (2002)<sup>23</sup> suggested a Telecomputing project as one of the strategies. Telecomputing projects are internet-rich learning activities that often involve students in one location collaborating with students or adults in one or more other locations.

They may share among other things:

- Experiences
- Data
- Beliefs
- Information

- Problem-solving strategies
- Products they have developed or jointly developed

Telecomputing tools include email. Electronic mailing list, electronic bulletin boards, discussion groups, web-browsers, real time chatting and audio-video conferencing. Online resources include websites, interactive environments and remotely operated robotic devices.

UNESCO guidelines (2002)<sup>24</sup> for introducing ICT in teacher education would help the teacher education colleges and organizations to plan the introduction of ICT properly into teacher education curriculum. These guidelines are as following:

- i) Use the Framework for ICTs in teacher education as suggested by UNESCO<sup>23</sup> (section II) when planning for infusion of ICTs.
- ii) When planning curriculum, be sure it is congruent with the educational vision, the culture and the context of each region both locally and globally. Develop the vision and standards in stages starting with a core that can be expanded into a set of standards, implemented with ICTs for the preparation and continuing professional development of teachers.
- iii) The ICT curriculum should facilitate change towards a more inclusive approach that promotes positive and supportive interdependence between teachers and students, while maintaining individual accountability and autonomy.
- iv) Plan the curriculum to promote intercultural collaboration and develop a learning community within and between schools and countries using shared and complementary approaches with language and cultures.

One can draw from Jung's (2000)<sup>3</sup> experience and state that the success of the ICT integration in Teacher Education lies in the inclusion of certain strategies like:

- Providing a short compulsory course that focuses on hands-on ICT experience at the pre-service teacher training programme. That is to say the focus needs to be on successful applying ICT skills to achieve pedagogical objectives rather than teaching the ICT skills in isolation.
- Providing an advanced level course for interested students who can develop more advanced ICT based pedagogical skills.
- ICT should be used to teach all subject matter areas at the pre-service level, so that the pre-service teachers are able to get hands on experience.
- The curriculum of the teacher education programme needs to provide flexibility in curriculum so as to provide opportunity for student teachers to develop various ICT

infused instructional material.

The rapid infusion of technology into the educational system at the school level and at the higher education level, requires a new generation of teachers who are able to use the new tools to enhance their productivity and decision-making activities and who understand the importance of integrating technology into the learning process. It thus, becomes the onus of the teacher education programme of the country to cater to demands of the educational system of ICT friendly teachers who take the initiative to use ICT in their classroom environments. An ICT-enabled teacher education classroom will provide the necessary motivation and expertise required by the pre-service teacher to understand the importance and capabilities of ICT in teaching-learning process.

### **5. ICT Related Professional Development of Teachers**

ICT related professional development of teachers implies updating, strengthening and sharpening of the professional competencies in the usage, understanding & development of ICTs. In case of teacher educators, strengthening of professional competencies may lead to more effective preparation of prospective teachers. This will also equip them to innovate not only new methods of teaching through ICTs, but also ore imaginative ways of curriculum transaction, classroom management, and more effective use of learning resources available to them.

Therefore, it is very imperative for every teacher educator to reassess his/her professional competence and identify and chalk out a programme for updating them, in terms of new professional needs. The professional development of teachers need to focus on teaching & learning rather them hardware and software. The teachers should be provided with all required support whenever needed. Just-in time approach works well with ICT professional development. ICT provides the teacher with a variety of tools which help transform the off seen teacher centered classroom into a rich student focused and knowledge environment. ICT demands that the educational systems wake up to the call of transformation in the paradigm of traditional learning.

Teaching technology will be a promise for future teachers and the effective use of ICT can lead to their benefits in terms of:

- 1.) Prompting initiative independent learning.
- 2.) Improving presentation.
- 3.) Developing problem-solving capabilities.
- 4.) Greater motivation, inventive thinking, curiosity and sound reasoning.
- 5.) Promoting better information handling skills.

- 6.) Improving social and communication skills.
- 7.) Store and handle large amount of information in different ways.
- 8.) Effective communication with team working, collaboration and inter-personal skills.
- 9.) Using the internet and e-mail facilities to gain knowledge and acquaint oneself with the changing knowledge base.
- 10.) Developing multimedia kits for teaching learning process.

Sabharwal (2000)<sup>16</sup> proposed a number of measures for providing meaningful professional development programmes for teachers, chief among these are the following:

- i) Greater correlation between pre-service and in-service education programmes. Pre-service education curricula should be updated regularly, say, every three years and firm foundations of early orientation to professional development should be laid during pre-service programme.
- ii) Greater use of ICTs and distance mode. Professional development programmes should be provided more and more through the distance mode in view of the large number of teachers who need it. Use of ICTs, both off-line as well as on-line should result in active teacher participation. Use of ICTs with distance mode can be cost-effective and serve large groups of teachers.
- iii) Instead of withdrawing teachers from their place of work, 'on-site' professional development programmes should be increased. On-site programmes can address problems related to ground realities of classroom and teachers' work situations and also promote interaction between teachers and management authorities.
- iv) Professional development programmes for teachers need to be based on 'practical ethics' and made more need-based and pedagogy specific.
- v) Collaborative, participatory programmes can be more effective in teacher involvement and analysis of teachers' attitude and beliefs. These programmes can also be instrumental in promoting a shared vision with which teachers identify themselves.

Professional development thus requires good teacher education, curriculum, training policy for teachers and teacher educators, developing self-learning package, creating general awareness, skill development and transactional strategies.

## **6. Inclusion of ICT Content in Teacher Education Programmes**

The effective and efficient use of ICTs depends largely on technically competent educators/teachers. They should be able to appreciate the potential benefits of ICT and have positive attitude towards ICT. Four phases are conducted so as to facilitate the integration of ICT content in teacher education programmes. These phases are following as under:

6.1. ICT literacy.

6.2. The effective and efficient use of ICT hardware and software for teaching-learning activities.

6.3. Pedagogy based ICT use (integration of ICT in subject content, teaching, online support, networking and management).

6.4. Adopt best innovative practice in the use of ICTs.

### **6.1. ICT Literacy**

“ICT Literacy means the use of digital technology, communication tools and/or networks to access, manage, evaluate and create information in order to function in a knowledge society”. This can be achieved through the following:

- a) List ICT tools, their utility and functions.
- b) Computer-input, output, storage devices and functions.
- c) Computer operating systems and application software.
- d) Know your computer (configuration of your computer).
- e) General Software applications like MS office, Power Point, Excel, Access, Publisher etc.
- f) Internet and its tools like email, browsers, websites, search engines, chat etc.

### **6.2. The effective and efficient use of ICT hardware and software for teaching learning activities:**

Content is similar to that covered in the first phase, but it is linked directly to teaching-learning. Examples, templates; practice exercise are used to demonstrate how general applications software can be used for teaching-learning activities and content in different subjects. Some examples are as given below:

- a) Using PowerPoint, create presentation of lessons on different topics (using following steps: plan the content; create presentation; story board; create an outline; enhance a presentation; add animations; sound or voice, movie clips, charts, print slides for handouts or transparencies; save presentations in different formats)
- b) Using Microsoft Excel create time table, class list, grade book, time line, work book and chart.
- c) Using Microsoft Publishing, create student/teacher publications like newsletter,

poster, brochure etc.

d) Create email-account, create a website.

### **6.3. Pedagogy based ICT use (integration of ICT in subject content, teaching, online support, networking and management)**

This phase is more advanced in terms of integrating ICT across the curriculum.

a) Integrating ICT into subject specific teaching like mathematics, science, social sciences, languages etc.

b) Using online tools for information gathering and online collaborative work like e-mail, website and discussion groups, etc.

### **6.4 Adopt best innovative practices in the use of ICT**

Sharing the best practice in different teacher education institutions using ICT and adopt the best innovative practice in the use of ICT and keep abreast with latest ICT tools and gadgets. In planning, the integration of ICT in Teacher Education, it is important for the Teacher Education institutions to understand the knowledge and skills necessary for teachers to effectively use ICT in their instruction. They must also understand the institution's level of readiness to integrate technology into their teacher education curriculum.

## **7. How does ICT Help in Teacher Education?**

In new technology era, the role of educator/teacher has changed and continues to change from being an instructor to a constructor, facilitator, coach and creator of learning situation. A educator/teacher will be able to integrate the use of ICTs into training/teaching effectively if he develops various competencies like creativity, flexibility, logistic skills, skill for project work, administrative and organizational skills and collaborating skills.

ICTs can help teachers/educators in the following ways:

- ICTs enables to enhance the initial preparation by giving good teaching and/or training materials, use simulators, recording and feedback practices, teaching and microteaching, other training institution experiences and working, introducing trainees with resource and support on cyberspace, example; the use of technologies for teaching training situation.
- Through on-line digital libraries, journals, hyperlinks etc, self-paced individualized learning can be done by the teachers.
- Teachers' training on demand (orientation or refresher courses) can be facilitated through video-conferencing or on-line.
- With the help of ICT, teachers/educators can access with colleagues, institutions and universities, centres of expertise, rich resources at cyber space and national organizations like UGC, NCTE, NCERT and NAAC etc.

- ICTs enable to interact with students at a physical distance.
- Face to Face interaction can be made more interesting and effective through varieties of audio-visual presentation.
- Didactic Software/Courseware and Intelligent tutoring Systems can dramatically reduce the cost of teacher training.
- ICTs enable to give feedback and testing objectively and fast without biases.
- By making use of hypermedia technology, teachers can develop/update/revise resource materials in the form of e-books, on-line courses, multimedia packages etc, to facilitate learner controlled instruction.
- ICTs provide lifelong and professional development by providing courses at a virtual situation, training on demand, orientation and refresher courses through video-conferencing or online.
- ICTs enable to facilitate sharing of ideas, experience as well as collaborating on projects, exchanged materials, through virtual communities.

In teacher education, teacher trainees and the teaching communities are adapting to the new ICTs. Now various software's have been developed for the education sector so as to aid students in areas like online tutoring, classroom management, web-based learning and aiding students with learning difficulties. The role of technology, media and telecommunications provides an excellent opportunity in teacher education. India can use technology to the maximum so that even in the remotest part of the country, the classrooms are well equipped with latest technologies in teaching learning.

The whole world today is in the grip of Information cum communication technology. Teachers need to be proficient in using e-learning teaching strategies via the following:

- a) **E- Lecturing**
- b) **E- Discussion**
- c) **E- Mentoring**
- d) **E- Tutoring**
- e) **E- Access to network**
- f) **E-structured resources group activity**
- g) **E-informal peer interaction**
- h) **E- connected education**
- i) **E-Quality learning and simulations**

a) **E-lecturing-** this provides concepts and techniques to fulfill learners needs, e -lecturing includes blackboard, Web CT, ICEWL etc. e-learning also includes web tracking by

providing access to rich sources of information, encouraging meaningful interactions, bringing people together.

**b) E-discussion**-during discussion forum, a learner is expected to initiate a discussion and post replies.

**c) E-mentoring**—e-learning facilitates the learner to seek assistance/guidance electronically. This is a professional assistance in a particular subject area.

**d) E-Tutoring** is a learning instrument in the hand of modern education, so as to bridge the gap of face-to-face interaction.

**e) E-Access**—Access net resources as learning environment help the learner to prepare various assignments, projects which may be located in the form of course, documents.

**f) E-structured group activity**—here e-learning as a learner is expected to participate in structured group activities electronically: i) Seminar ii) Small group discussion iii) Learning partnership iv) Simulations or role plays and v) Peer learning groups etc.

**g) E-informal peer interactions**—It involves electronic peer interactions like emails, chat rooms, net learners group which ultimately facilitates the teaching learning process.

**h) E-connected education**-here learners, teachers, professionals are connected better to information ideas so as to connect each other to identify, understand, develop and improve effective combinations of learners needs, teachers needs, approaches to teaching-learning, mass media and application of technology, assessment and feedback.

**i) E-Quality learning and simulations**-easy accessibility, fast sharing of documents, internet based distance education programmes which offer diploma and degree courses based entirely on computer mediated learning.

E-learning courses have now gained market accessibility and are flexible regardless of instructional programme.

## **8. ICT Initiatives taken by leading Teacher Training Institutions in India: Case Studies**

### **8.1 Integrating ICT as a Core Course at the B.Ed level in MS University Baroda**

Realizing the importance of ICT in Teacher Education a two-credit compulsory course, namely, ICT was designed, developed and implemented in the B.Ed programme offered by Centre for Advanced Studies in Education (IASE); Faculty of Education & Psychology, M.S. University, Baroda. The aim of this project is to integrate ICT in Teacher Education.

### **8.2 Introduction of ICT in Teacher Education Course at SNTD Women's**

### **University, Mumbai**

Department of Educational Technology of SNDTU offers a course entitled, Master in Educational Technology-Computer Applications (METCA). The course aims at developing teachers/trainers/Instructional Designers for the distance learning mode, especially for teaching through Interactive Multimedia (CBT) and Online Learning (WBT). The students are developed as Instructional Designers. METCA is the only formal master level course offered in India in Instructional Design for CBT and WBT (Kamat, V, 2005)<sup>4</sup>.

### **8.3 A Case Study of GVM's College of Education, Goa**

In GVM's College of Education, Goa, there was an effort to integrate ICT in pre-service teacher education (Vernal.L. Paily, 2004)<sup>25</sup>. In this college, Intel's Teach to the Future program was implemented in five phase, expanding from 14<sup>th</sup> July to 20<sup>th</sup> Dec, 2003. Unit planning components of Intel's programme were integrated with the subject methodologies of B.Ed course. The skills thus gained during this programme were transferred by the students on their own, to the projects and assignments in the professional courses.

### **8.4 Intel's Teach to the Future Training Programme**

Intel's Teach to the Future Training programme was held at IASE (Institute of Advanced Studies in Education) Jamia Millia Islamia in April, 2002 with 26 master trainers. Later on in July, 2002 another batch of teacher educators was given training in the pre-service programme. At Jamia Millia Islamia, Delhi, Educational Technology and Computer Education are being offered as an elective subject to the B.Ed and Diploma students of the Department of Education from 1988 onwards. At IASE, JMI, the Technology Assisted Lesson (TAL) has been made a compulsory component of in-service teacher education programme of both PGTs and TGTs organized on regular basis by the department. These teachers are provided with compulsory skills and given the task of integrating technology into at least one lesson in teaching subject.

### **8.5 A Case Study of Chaudhary Charan Singh University (CCSU), Merrut.**

Educational Technology is being taught as a core subject and computer education as an elective subject at B.Ed level. Educational Technology imparts theoretical knowledge of the technological advancements in different areas of hardware and software. There is non provision for assessing students' practical skills in the field of ICT in final examination. So, there is a need to make B.Ed course work more practical oriented and include practical components in B.Ed final examination.

NCTE, SCERT, IASEs and DIETs are being equipped with necessary hardware. NCTE is in the process of developing ICT-based instructional packages for teacher educators. NCTE

is also using ICT-enabled learning, bringing in several innovations in teacher education in the context of quality assurance. IGNOU (Indira Gandhi National Open University) also in collaboration with MPBOU (MP Bhoj Open University) has joined hands in taking up the responsibility of training teachers in IT, orienting students on Interactive Multimedia scripting and educational software (IMM-CDs), and development of IMM-CDs on hard spots in subject areas of English, Mathematics, Science and Social Studies for elementary level.

### **9. Recommendations and Suggestions**

ICTs provide both new opportunities and challenges for teachers. This can be used to serve as a catalyst to help change the role of teachers from information dispenser to that of guide, mentor, knowledge giver, navigator, consultant and even co-learner with the students. If we embrace technology and exploit its capability to its full potential, it can then only broaden and fulfill our professional aspiration. The following recommendations can be incorporated into our teaching-learning process, so as to enrich the value and sanctity of our teaching profession through the use of ICT skills:

- 1.) Teachers should be computer literate and become familiar with the newly emerging technological devices and systems.
- 2.) The continuing education opportunities should be available to the teacher in a sustained manner for their professional development.
- 3.) Teachers are to be supported with a laptop, computer, modem and Internet access. This could enable them to have easy access to practice and to build their skills level and provide a vehicle for communication between themselves and support personnel.
- 4.) Pre-service teacher education programmes are needed that not only prepare teacher to use the current generation of technologies, but also to accommodate and even develop new technologies in the future.
- 5) In-service professional development programmes are needed to provide techno-based training opportunities and technical support.

### **10. Conclusion**

If we are to cope with the challenges of the rapidly changing society and make use of new opportunities offered by ICT, plans have to be realized by giving teachers/educators and students access to necessary equipments. The most important competence building in the field is the development of pedagogical methods. That can happen only when long-term competence programmes can work along with real-life experiences where educators/teachers and students are using ICT in their daily work and daily learning experiences. The teachers

must have the requisite knowledge and skills to use the new digital tools and resources so that they can become not only computer literate but digitally proficient. The updating of the teachers through exposure to ICTs will go a long way in redeeming the promise made for the future. The effective and efficient use of ICT depends largely on- techno-competent teachers. They should be able to appreciate the potential of ICT and should have a positive attitude towards ICT with a new culture of learning within electronic environment. They have to adopt the philosophy of life-long learning with technological-support in their professional activities. Full integration of ICTs in education is still far from desired, particularly so in teacher education.

As a teacher, the crux of ICT integration in teacher education is to understand that it is the amalgamation of the learning theories along with the epistemological options which are available to the teachers which help in achieving the objective of complete integration and implementation of ICT in the education process and in teacher education in particular. The integration of ICT into the very idea of teaching and learning might be termed as the 'informatization of education'. Informatization represents the necessary components, conditions, catalysts required for the modernization of education which will permit the move from reproductive model of teaching to an independent model that promotes initiation and creativity with information.

Therefore, to conclude it can be said that the use and implementation of ICT in teacher education involves the rationalization of administrative routines, communication and transmission of knowledge, while at the same time preventing any serious negative impact on pedagogy and teaching conditions (Vuorikari, Maouselis and Duval, 2009)<sup>26</sup>. Thus, there is not only an urgent and necessary need to integrate ICT in teacher education and education but also to make teacher educators capable enough to use ICT in such a manner so that it is able to stimulate teaching and learning actively and judiciously.

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**Author: Dr. SHAZLI HASAN KHAN**

**Assistant professor, Department of Education & Training,  
MANUU, Hyderabad-500032**