Research Paper

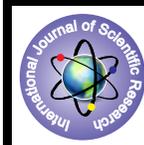# Towards Achieving a Paradigmatic Shift in Teacher Education through Information and Communication Technology Enabled Capacity Building of Teachers

Education

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ABSTRACT With the emerging new technologies, the teaching profession has evolved from an emphasis on teacher cen-tred, lecture-based instruction to student-centred learning-based interactive learning environment. Design-ing and implementing successful ICT enabled teacher education programmes is the key to fundamental wide-ranging educational reforms. For education, and especially teacher education, to reap the full benefits of ICT in learning, it is essential that pre-service and in-service teachers are able to effectively use these new tools for learning. New teachers should be able to effectively use these new tools for learning. New teachers entering classrooms of the twenty first century must have training and skill to merge today's' technologies into learning activities/ strategies that will stimulate and maintain student interest and at the same time prepare young people for the world they live in. In order to effectively harness the power of the new ICTs to improve learning, the students and teach-ers must have sufficient access to digital technologies and the Internet in their classrooms. High quality, meaningful and culturally responsive digital content must be available for teachers and learners. The teachers must have knowledge and skills to use new digital tools and resources so as to help their students to achieve high academic standards. The present paper explores that how ICT would be able to bring about a paradigmatic shift in the present teaching and learning process and how it is reconfiguring, the landscape of the way the course content is being delivered in the present century classrooms. In the present paper, the author has made an elaborative attempt to examine how ICTs have caused a significant impact on the professional development and capacity building of both pre-service and in-service prospective teachers and teacher educators.

Introduction

In the present century, competencies in education, especially in teacher education are seen more in line with Information and Communication Technology (ICT). Advances in ICT during the last twenty years in India have had a significant social and eco-nomic impact in general and educational domain in particular, ICT have potentially revolutionized the human thought, feeling and behaviour by enabling any person any where in the world to exchange visual and aural experiences with any other person at any other place in the world. ICT is a holistic approach to the design, development, implementation, management and evalu-ation of educational programmes constructively.

ICTs have the potential to enhance access, quality, and effec-tiveness in teacher education and to enable the development of more and better teachers. As computer hardware becomes available to an increasing number of schools, more attention needs to be given to the capacity building of the key transform-ers in this process, namely, the teachers. ICTs are one of the ma-jor contemporary factors shaping the global economy and pro-ducing rapid changes in the society. They have fundamentally changed the way people learn, communicate, and do business. They can transform the nature of education-where and how learning takes place and the roles of students and teachers in the learning process.

In the era where the world of education and learning are chang-ing rapidly, bringing new realities and challenges to Teacher Educational Institutions (TEIs) through innovations in the use of ICTs has significant implications. Today teacher educa-tion in India is being overhauled and redesigned to include the changes taking place across the world. New opportunities and possibilities especially those in the electronic and other related applications for skill development outside formal learning ar-rangements stimulate the reform of the existing educational provisions. The past decade has seen efforts made at different levels not merely to spread the use of computer and related technologies but also to integrate the same in the core function-ing of institutions i.e. teaching-learning.

Developments and innovations in the field of ICT have posed new questions on the regulatory capacities of the organizations, infrastructure development, the way teacher educators view learner and learning, available technology and ICTs and provi-sions of teaching and learning. It poses challenges in ICT appli-cation, integration and use for and in the teacher training pro-grammes, on issues and challenges associated with use of ICT in enhancing teacher quality and enabling and enhancing the ICT use in the associated schools. Tremendous efforts have been put

through corporate interventions and the institutional efforts in integrating ICT in teacher education with an aim to bring a transformation n teacher learning and improving teacher qual-ity. To some extent attempt has also been made to look at the challenges the institutions may face in implementing and inte-grating the ICT at various stages of teacher preparation and the perceived threats. Thus, in order to see successful integration of ICT in the field of teacher education, there is need to empower teacher educators and teacher trainees.

What is ICT?

ICTs stand for Information and Communication Technologies and are defined, as a "diverse set of technological tools and re-sources used to communicate, and to create, disseminate, store, and manage information." These technologies include comput-ers, the internet, broadcasting technologies (radio and televi-sion), and telephony (UNDP, 2000).

The term, Information and Communication Technologies (ICTs) refers to forms of technologies that are used to create, store, share or transmit, exchange information. This broad definition of ICT includes such technologies as: radio, television, video, DVD, telephone, satellite systems, computer and network hard-ware and software; as well as the equipment and services asso-ciated with these technologies, such as videoconferencing and electronic mail. (UNESCO, 2002)[8].

Information and Communication Technology is a collective term for various technologies involved in processing and transmit-ting information. ICT has not only enabled us to work quickly, but also provides relevant and sufficient data for making appro-priate decision. Thus, ICT can be defined as the use of hardware and software for efficient management of information, i.e. stor-age, retrieval, processing, communication, diffusion and sharing of information.

ICT Vision in Teacher Education: Towards a Paradigmatic Shift in Teaching-Learning

Technological advancement has contributed greatly to the ac-celeration of human progress in the recent past. Education systems around the world are under increasing pressure to use the new information and communication technologies to teach the students, the knowledge and the skills they need in the 21st century. With the emergence of new technologies, there is a paradigmatic shift in the present teaching profession, which is evolving form an emphasis on teacher centred and teacher-based instruction to student-centred, interaction learning. This is made possible through the role of ICT in education. Through the ongoing and effective use of technology in the schooling

process, students have the opportunity to acquire important technology capabilities. The key individual in helping students develop those capabilities is the classroom teacher. The teacher is responsible for establishing the classroom environment and preparing the learning opportunities that facilitate students' use of technology to learn, and communicate. Consequently, it is critical that all classroom teachers are prepared to provide their students with these opportunities. Both professional development programs for teachers currently in the classroom and programs fro preparing future teachers should provide technology-rich experiences throughout all aspects of the training. Today's classroom teachers need to be prepared to use technology and knowing how that technology can support student learning. Schools and classrooms, both real and virtual, must have teachers who are equipped with technology resources and skills and who can effectively teach the necessary subject matter content while incorporating technology concepts and skills. Interactive computer simulations, digital and open educational resources, and sophisticated data-gathering and analysis tools are only a few of the resources that enable teachers to provide previously ICTs are a major factor in shaping the new global economy and producing rapid changes in society. Within the past few decades, the new ICT tools have fundamentally changed the way people communicate and do business. They have produced significant transformations in the industry, agriculture, medicine, business, engineering and other fields. They also have the potential to transform the nature of education-where and how learning takes place and the roles of students and teachers in the learning process. Teacher education institutions may either assume a leadership role in the transformation of education or be left behind in the swirl of rapid technological change. For education to reap the potential benefits of ICTs in learning, it is essential that pore-service and in-service teacher s have basic ICT skills and competencies. Teacher education institutions and programmes must provide the leadership for pre-service and in-service teachers and model the new pedagogies and tools for learning. They must also provide the leadership in determining how the new technologies can best be used in the context of the culture, needs, and economic conditions within their country. To accomplish these goals, teacher education institutions must work closely and effectively with K-12 teachers and administrators, educationists, national or state agencies, teacher unions, business and community organizations, politicians and other important stakeholders in the educational system. Teacher education institutions also need to develop strategies and plans to enhance the teaching-learning process within teacher education programmes and to asu8re that all future teachers ware well prepared to use the new tools for learning.

Capacity Building of Teachers
Teaching is becoming one of the most challenging professions in out society where knowledge is expanding rapidly. As new concepts of learning have evolved, teachers are expected to facilitate learning and make it meaningful to individual learners. Therefore the challenge for higher education institutions, particularly teacher education, has been to create a new generation of teachers capable of employing a variety of technology tools into all phases of academic, administrative, research and extension activities. A teacher being a pivot n the process of teaching–learning process has gained immense importance. A teacher is expected to know successful integration of ICT in his subject area to make learning more interesting. In this regard capacity building of teachers refers to the set of knowledge, abilities and skills possessed by the teacher related to Information and Communication Technology and brings it to the teaching-learning situation.

Today teachers need to be adequately prepared to implements a state-of-the-art ICT curriculum. Indeed, introducing any new curriculum calls for careful preparation, management resourcing, and continuing support. In the case of an ICT curriculum, even more concerns have to be considered. Educational research studies show that programmes of professional development for teachers are most effective if directed to the stage of ICT development reached by schools. The implications of these research findings are that teacher development is best conceived as an

ongoing process, with many professional development activities conducted in schools. New technologies require new teacher roles, new pedagogies, and new approaches to teacher training. The successful integration of ICT into the classroom will depend on the ability of teachers to structure the learning environment in non-traditional ways, to merge new technology with new pedagogy, to develop socially active classrooms, encouraging cooperative interaction, collaborative learning, and group wok. This requires different set of classroom management skills to be developed. The key skills of the future will include the ability to develop innovative ways of using technology to enhance the learning environment, and to encourage technology literacy, knowledge deepening and knowldge4 creation.

Approaches of Capacity Building
The capacity building within teacher training programmes around the world is being approached in a number of ways with varying degrees of success. These approaches are subsequently described, refined and merged into four primary approaches, which are as following:-

1. ICT skills development approach:
In this approach, importance is given to provide training to use information and communication technologies. Students-teachers are expected to be skilled users of ICT in their day-to-day activities. Knowledge about various software, hardware and their use in educational process is provided.

2. ICT pedagogy approach:
This approach emphasize on integrating ICT skills in respective pedagogy drawing on the principle of constructivism. This approach is useful to enhance ICT skills and the pedagogy allows students to further develop and maintain these skills in the context of designing classroom-based resources.

3. Subject-specified approach
Here ICT is embedded into one's own subject area. In this approach teachers not only expose students to new and innovative ways of learning, but also provide them with a practical understanding of what learning and teaching with ICT looks and feels like.

4. Practice-driven approach:
Here the emphasis is on providing exposure to use of ICTs in practical aspects of teacher-training course. Importance is on developing lessons, assignments, preparing charts, models using ICT and implementing these4 in their practical work experience. The students are provided with an opportunity to assess the facilities available at work place and effectively use their own skills to manipulate these facilities.

Ideally an integrated approach is to be followed for capacity building in teacher education. An integrated approach should develop confidence among student-teachers to use ICT in their day-to-day instructional activities.

Capacity Building of In-service Teachers
In the present context, many of the state teacher training institutions do not have sufficient infrastructure to provide training to the teacher. The changing technology innovations may be able to bridge the demand and supply gaps. The major problem lies in providing sufficient infrastructures to these training institutes. Under Sarva Shiksha Abhiyan (SSA), the vision to develop a state level training institute also does not look effective. After five years of implementation of SSA, some of the states were unable to make SIEMAT operational. Under the SSA the Indira Gandhi National Open University (IGNOU) has initiated teleconferencing to provide teacher training. Still only in 107 districts are facilities for teleconferencing available. If we analyze the demand and supply matrix still a lot has to be done.

Capacity building of teachers will be the key to the widespread infusion of ICT enabled practices in the school system. A phased out programme of capacity building will be planned.In-serivce training of teachers will comprise of Induction training as well as refresher courses. The induction trainings should be im-

parted by the State Councils of Educational Research training (SCERTs) or such other institutions of the state government and should preferably be completed before the commencement of the academic year. The refresher trainings should be carried out every year to enable the teachers to share, learn and keep abreast of the latest trends in ICT based teaching learning processes. The induction training would be followed by teacher's evaluation to ensure that the minimum competency is achieved.

Training in ICT will be integrated with general training programmes organized for teachers and school leaders at all levels in order to popularize its use and to demonstrate. effective practices in ICT. Beginning with an initial sensitization through ICT operational skills and ICT enabled subject teaching skills, teachers will become part of online professionals groups (e.g. English teachers association) to continue their education, pool in their resources and actively contribute to the strengthening of domain specific knowledge within the country.

Teacher participation in the digital content development process will catalyze its broad- based usage in the classrooms. Teacher capacities will be developed in instructional design, selection and critical evaluation of digital content, and strategies for effective use of digital content to enhance student learning.

Capacity Building of Pre-service Teachers
Capacity building of pre-service teachers can be done in the following ways:

1. Teacher education will be suitably oriented and trained to use ICT in their pre-service teacher training programmes. They will also be expected to enable pre-service teachers to be sensitized to and practice the use of ICT.,
2. All pre-service teacher education programmes will have a compulsory ICT component. The existing curricula for pre-service teacher's training will need to be revised for including the appropriate and relevant ICT course. All teacher trainees passing out of teacher education programmes will have obtained adequate levels of competency in ICT and ICT enabled education. This proficiency will form a part of the eligibility criteria for teacher appointments.
3. National Council for Teacher Education (NCTE) has already laid down guidelines about availability of ICT infrastructure in each such training institution. NCTE would prescribe appropriate curriculum in ICT, to be revised periodically, for such teachers and also provide necessary funds under its own budget.

ICT for Capacity Building of Differently Able Teachers
Content Generation for Capacity Building of Persons with Blindness or Low Vision: This content is being generated in accessible format like e-text, Braille, Daisy, large print and audio for text books for graduate/post graduate level visually impaired teachers and students.321 hours (30Nos) of English Audio Daisy books and 347 hours (30Nos.) of Hindi Audio Daisy books have been generated for inclusive education.11 books in Hindi and 27 books in English have been converted into e-Text. 10 books have been generated in synthesized voice, 20,000 copies of CDs of these books have been distributed.

SAFA™ : SAFTA™ (Screen Access for All) is a screen reading software in vernaculars to enable the visually impaired persons to operate PC using speech output support for MS Word applications in windows environment. It has been used by more than 1,000 visually impaired regular users in Hindi and English. A helpline is being run to provide support to SAFA users. 18 SAFA training sessions at different organizations have been conducted throughout the country benefiting 2150 persons of various age groups. Work is going on to incorporate support for more applications and Indian languages. A comprehensive Satellite/Internet based National Network for Education Training and Empowerment of the Disabled: Media Lab Asia, together with Indian Space Research Organization (ISRO), has set up content creation facility in the area of different disabilities. The content is being telecast through EduSat based channel, "Navshikhar" regularly for all stakeholders in disability field. 470 RCI/MSJE

recognized institutions are connected to Navshikhar. Regular transmission of programs is being connected from Monday to Friday from 10:00 hours to 17:00 hours. Additionally an interactive Internet portal, "Punabhava.in" is providing all relevant information o differently disability issues. Portal is being regularly updated and is being made accessible as per W3C guidelines.

Sanyog: Sanyog is an alternative and argumentative iconic-based communication system for persons with neuro-motor disorders. Object based iconic communication interface is being enhanced in Bengali, Hindi and English. By object driven icon selection, the system can generate simple sentences in all the three languages. Embedded and the WinCE based version of the system for Windows based PDAs with SMS facility is also being developed. The soft keyboard version of Sanyog using WinCE is also under development. Supply installation and commissioning of computerised Braille transcription system at the blind schools throughout the country: The aim of this project is to address the reading, writing, printing and learning Braille needs of visually impaired teachers and fulfilling the dearth of content in accessible formats in schools. Computerized Braille Transcription System has been installed in thirty six schools where over 800 teachers have been trained and around 3000 students have been benefited. ICT enabled integrated assessment tool for mentally retarded children-Punajjani™: This project aims at providing assessment and evaluation of the mentally retarded children and analysis of the results. The tool ahs been installed in 8 schools of Kerala on a pilot basis. It is benefiting around 850 mentally retarded students.

ICT Training Dimensions for Teachers and Teacher Educators
For the successful implementation of ICT, teacher trainees, teachers and teacher educators need to be trained in the following dimensions:-

1. Awareness phase:
The training should make the teachers aware of the importance and possibilities of ICT-the current tends and future projections.

2. Learning theories and technology integration:
Traditional and modern view of learning, shift from teaching to learning, constructivism, role of ICT in lifelong learning.

3. Basic hardware skills:
Hands on experiences in operating:
a) The PC and laptops: switching on, shutting down and networking.
b) Storage devices: - floppy drive, CD ROM drive, flash drive and burning CD-ROM.
c) Output devices using printers and speakers.
d) Input devices using keyboard (including shortcuts), mouse, modem, scanners, webcam, digital camera, camcorders, date loggers and display devices namely; data projectors and interactive white boards etc.

4. Understanding system software:
Features of desktop, starting on applications, resizing windows, organizing files(creating, editing, saving and renaming), switching between programmes, copying etc.

5. Using applications/productivity software:
Word processing, spreadsheet, database, presentations, publishing, creation of Portable Document Format (PDF) files, test generation, data logging,. Image processing etc.

6. Using Multimedia:
Exposure to multimedia CD ROMs in different subjects, installing programs, evaluating CD ROMs, approaches to using CD ROMs, creating multimedia presentations.

7. Using Internet, email, communities, forums, blogging, wiki:
Subscription to mailing lists, e-mail and Internet projects, web searching strategies (navigating, searching, selecting and saving

information), videoconferencing, designing webpages, freeware and shareware, evaluating website resources, virtual fieldtrips, learning opportunities using the web and netiquette.

8. Pedagogical applications of ICT tools:
Specific use of applications software in different subjects, ITC tools and pedagogy, unit plan integrating ITC tools, approaches to managing ICT-based learning groups, assessment rubrics, creating teachers and student support materials, supporting student with special needs.

9. Social, legal, ethical and health issues:
Advantages and limitations of computer use, privacy violations, copyright infringement, plagiarism, and computer security (hacking, virus, misuse, abuse and staying safe) health use (seating, light, sound, radiation, and exercise).

10. ICT for professional and personal productivity:
ICT for administration, record keeping, reporting and transfer of information, attendance, research, careers in computers and professional development opportunities.

As an advanced training website development, installation and use of server based applications, training in course management system, a learning course content development using various authoring tools; audio/video/image editing, animation etc. can be introduced. In addition to the hands on experiences every training program could include an ICT awareness and familiarity quizzes, exhibitions of ICT books and multimedia CD ROMs by commercial agencies, poster session on success stories, case study presentations and analysis, ICT based demonstration lessons in the schools etc.

Teacher Educators' ICT-Based Initiatives
Whatever may be the dimensions in the training and however well designed it is, the transformation can't be achieved without the leadership, commitment and initiatives of the teachers and teacher educators , both could take up initiatives like:-

1. Self-learning using the tutorials available on the net or print medium.
2. Hiring an ICT expert by a group of teachers/teacher educators.
3. Enrolling for online professionally development courses. There are many websites offering free training modules.
4. Attending ICT training courses, seminars, conferences and workshops.
5. Communities of teacher's collaborative groups to integrate ICT into their curriculum (same subjects, different subjects, same school//college, different school/college).
6. Online learning by means of videoconferencing, discussing forum, chat, blogging etc.
7. Visiting institutions where the ICT is already being integrated.
8. Action research trying out various models of technology integration and publishing the result of the same.
9. Membership and active participation in National and International associations, whose primary concern is technology. The organizations like International Society for technology in

Education(ISTE), All India Society for Electronics and Computer Technology (AISECT), Society for Educational Technology Research and Development (SETRAD) etc. could be considered.

10. Take up diploma or Certificate courses on ICT offered through distance mode by National or International universities and organizations. The University of Hull currently offers a course "Med. In E-learning/" through online mode. (http://ces.hull.ac.uk/courses/MEdlineLearning.html).
11. Exploring the possibility of faculty exchange program to get placed in an organization where the ICT integration is already in place.
12. Taking up short-term or long-term projects related to ICT from UGC and ICSSR. This may be in collaboration with school teachers.
13. Keeping up-to-date with the latest developments in ICT through journals, magazines, newspapers and the Internet.
14. Teacher educators modelling the ICT integration in their academic work.
15. Planning and implementing ICT in-service training programs for school teachers-the best way to learn is to teach.
16. Creating a pool of ICT competent past teacher trainees and involving them in the training programs.
17. Designing and implementing self financing certificate course in ICT for in-service teachers.

Conclusion
Globalization and technological change-processes that have accelerated in tandem over the past fifteen years-have created a new global economy, "powered by technology, fuelled by information and driven by knowledge". The emergence of this new global economy has serious implications for the nature and purpose of educational institutions. As the half-life of information continues to shrink and access to information continues to grow exponentially, schools cannot remain mere venues for the transmission of a prescribed set of information from teacher to student over a fixed period of time. Rather, schools must promote, 'learning to learn'; i.e., the acquisition of knowledge and skills that make possible continuous learning over the life time. The illiterate of the 21st century, " according to futurist Alvin Toffler, "will not be those who cannot read ad write, but those who cannot learn, unlearn, and relearn."

ICT has the ability to enhance every type of development in the society. ICT can be used as a tool to improve the quality of education for preparing manpower to face the challenges of future. The significant development in ICT can make substantial changes both for teaching and training. The rich and effective presentation of information changes learner's perception and understanding of the context. Similarly the vast distribution and easy access to information can change relationship between teacher and learner. Hence teacher educators and educationist are required to enhance their traditional concepts of learning by incorporating ICT in the field of teacher education. Today education can be provided via satellite, this will save time, reduce unnecessary mobility and more. However to succeed, the digital divide need to be bridged. Institutions could use the platform of satellite TV, radio, VSAT, etc. it could even create and use of distance-learning centres. Finally, it can be concluded about the distinctive role of IC T by saying, "Information and Communication Technology is a life time process. Let us learn about ICT, Learn with ICT and Learn through ICT."

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