

Techno-Pedagogy Practices in Teacher Education

Dr. Vijay Laxmi¹, Dr. Gobind Singh Gure²

¹Assistant Professor, B.K.M College of Education, Balachaur, Punjab, India

²Assistant Professor, School of Education, Central University of Rajasthan, Bandar Sindri, Ajmer, Rajasthan (India)

ABSTRACT

In the rapidly expanding knowledge based society, teaching becomes one of the most challenging professions so it is necessary for teachers to use and applies modern technologies in their teaching. Merely introducing technology to the educational process is not enough. One must ensure technological integration since technology by itself will not lead to change. Rather, it is the way in which teachers integrate technology that has the potential to bring change in the education process. Therefore, the aim of teacher education is to develop skills and appropriate knowledge among teacher trainees for using and integrating the correct technology in an appropriate manner. Every teacher should know how to use technology, pedagogy and subject area content effectively in their daily classroom teaching. Hence, knowledge of ICT and skills to use ICT in teaching/learning has gained enormous importance for today's teachers. There must be congruence between the school curriculum and teacher training curriculum. Otherwise, teachers are not ready to utilize their knowledge to effectively design teaching/learning processes, project work, and assignments. This will help student teachers to develop the concept of 'techno pedagogy' to a greater extent. Present article focuses on the various issues relating to ICT in education as a core component in pre-service teacher education and the different models to be adopted for its integration in education.

Key Words: - ICT, Teacher Education, Techno-pedagogy.

INTRODUCTION

"If a country is to be corruption free and become a nation of beautiful minds, I strongly feel there are three key societal members who can make a difference. They are the Father, the Mother and the Teacher." -- **A.P.J. Abdul Kalam**

Teacher is called as an architect and nation builder who leads their students from the darkness of ignorance to the light of knowledge. "The teacher is the most important element in any educational program. It is the teacher who is mainly responsible for implementation of the educational process at any stage" NCTE (1998). "No people can raise above the level of its teachers" (Indian education commission 1964-66). The quality of teachers is a key predictor of students learning (Ololube, 2005 a & b). Therefore, teacher education to produce teachers of high quality is of utmost importance. In recent years, Teacher education is gaining prominence because of the need for qualified teachers with the necessary skills and knowledge needed to adequately carry out teaching jobs as well as for professional growth (Osunde and Omoruyi, 2004). The knowledge of ICT and skills to use ICT in teaching and learning process has gained enormous importance for today's teachers. ICTs are tools that can facilitate teacher training and help teachers take full advantage of the potentials of technology to enhance student learning (UNESCO, 2003). Teachers must understand their role in technologically-oriented classrooms. Merely introducing technology to the educational process is not enough but one must ensure technological integration since technology by itself will not lead to change. Rather, it is the way in which teachers integrate technology that has the potential to bring change in the education process. ICTs have qualitatively and quantitatively impacted on teaching, learning and research through teacher education. Therefore, ICT provides opportunities for student-teachers, academic and non-academic staff to communicate with one another effectively during formal and informal teaching and learning (Yusuf, 2005). In the same vein, teachers need training not only in computer literacy but also in the application of various kinds of educational software to teaching and learning (Ololube, 2006). Thus, in the present era of technology, it becomes essential to every teacher should know how to use technology, pedagogy and subject area content effectively in their daily classroom teaching. Furthermore, there is a need to learn how to integrate ICT's into classroom activities.

TEACHER EDUCATION

Teacher's education is an area of great significance in any country. A sound programme of teacher's education and effective teachers training institutions are essential for the qualitative improvement of overall education system of a



nation. It is a truism that without improving the quality of teacher's education, the quality of schools education cannot be improved (Sharma, 2003). Teacher education is the process of training that deals with the art of acquiring professional competencies and growth. It is an essential exercise that enhances the skills of teaching and learning. It is designed to produce highly motivated, sensitive, conscientious and successful classroom teachers who handle students effectively and professionally for better educational achievement (Ololube, 2005 a & b). The National Council for Teacher Education (1998) defined teacher education as – A programme of education, research and training of persons to teach from pre-primary to higher education level. Teacher education is a programme that is related to the development of teacher proficiency and competence that would enable and empower the teacher to meet the requirements of the profession and face the challenges therein. Teacher education encompasses teaching skills, sound pedagogical theory and professional skills (Teacher Education-IV.pdf, n.d.).

Teacher Education = Teaching Skills + Pedagogical theory + Professional skills

- **Teaching skills** would include providing training and practice in the different techniques, approaches and strategies that would help the teachers to plan and impart instruction, provide appropriate reinforcement and conduct effective assessment. It includes effective classroom management skills, preparation and use of instructional materials and communication skills.
- **Pedagogical theory** includes the philosophical, sociological and psychological considerations that would enable the teachers to have a sound basis for practicing the teaching skills in the classroom. The theory is stage specific and is based on the needs and requirements that are characteristic of that stage.
- **Professional skills** include the techniques, strategies and approaches that would help teachers to grow in the profession and also work towards the growth of the profession. It includes soft skills, counselling skills, interpersonal skills, computer skills, information retrieving and management skills and above all lifelong learning skills. An amalgamation of teaching skills, pedagogical theory and professional skills would serve to create the right knowledge, attitude and skills in teachers, thus promoting holistic development (Teacher Education-IV.pdf, n.d.).

Thus, teacher education is a process of training that deals with art of acquiring teaching skills like effective classroom management skills, preparation and use of instructional materials and communication skills, professional skills such as soft skills, counselling skills, interpersonal skills, computer skills, information retrieving and management skills and above all lifelong learning skills and pedagogical theory that would enable the teachers to have a sound basis for practicing the teaching skills in the classroom.

TECHNO-PEDAGOGY

This is the hybrid method of teaching in which ICT is being used for teaching learning situation. Literally, 'pedagogy' refers to the art-science of teaching and 'techno' refers to the art-skill in handcrafting (weave or construct'). Here, 'techno' is a qualifier; it intersects or crosses the meaning of 'pedagogy' with its own. Thus, Techno-pedagogy refers to weaving the techniques of the craft of teaching into the learning environment itself (Thakur, 2015).

Ozoji (2003) defined "Information and Communication Technologies (ICTs) as the handling and processing of information which may be in the form of texts, images, graphs, instructions and so on for use by means of electronic and communication devices such as computers, cameras, telephones, etc."

According to Nwachukwu, (2004) "Information and communication technologies is the application of computers and other technologies to the acquisition, organization, storage, retrieval and dissemination of information."

'I hear and I forget, I see and I remember, I do and I understand.' Confucius' Proverb

Confucius' proverb clears the fact that if someone learns something with using his more senses then he can understand the concept in a well manner. In the same way, the use of information technology can engage learners in the four-step process as described by Kolb in the book Experiential Learning (1984), where he identifies the steps in the following manner:

Watching →Thinking→ Feeling→ Doing(Eyes)(Mind)(Emotions)(Muscle)

Core aim of using ICT in education is that to improve and transform educational practices by infusing ICT into curriculum and educational institutions. "The whole purpose of using technology in teaching is to give better value to students" (Miller et al., 2000).



Merely introducing technology to the educational process is not enough. One must ensure technological integration since technology by itself will not lead to change. Rather, it is the way in which teachers integrate technology that has the potential to bring change in the education process. For teachers to become fluent in the usage of educational technology means going beyond mere competence with the latest tools to developing an understanding of the complex web of relationships among users, technologies, practices, and tools. Teachers must understand their role in technologically-oriented classrooms. Thus, knowledge about technology is important in itself, but not as a separate and unrelated body of knowledge divorced from the context of teaching--it is not only about what technology can do, but perhaps what technology can do for them as teachers.

TECHNO- PEDAGOGICAL MODEL (TPACK MODEL)

Today the techno-pedagogical competency is very much needed for teachers in teaching and learning process, as it facilitates effective teaching and learning. The techno-pedagogical competency is nothing but the ability of the teachers to make use of technology effectively in teaching. The teachers develop techno-pedagogical competencies then they may try to make use of this often in teaching and it will in turn make the learning process simple and effective. In techno-pedagogy, there are three areas of knowledge, namely: content, pedagogy, and technology.

- **Content** is the subject matter that is to be taught.
- **Technology** encompasses modern technologies such as computer, Internet, digital video and commonplace technologies including overhead projectors, blackboards, and books.
- **Pedagogy** describes the collected practices, processes, strategies, procedures, and methods of teaching and learning. It also includes knowledge about the aims of instruction, assessment, and student learning (Thakur, 2015).

The approaches to technology integration in educational practices Technology Pedagogy and Content Knowledge (TPACK) were 'techno-centric' in nature. Technology integration in teacher education is largely influenced by this approach. Technological models aim to have teachers to acquire knowledge and skills about using technology, while pedagogical models are models that aim to have teachers to associate their technological knowledge with their pedagogical knowledge when teaching. One of the pedagogical models related to the integration of technology into education is the Technological Pedagogical Content Knowledge, TPACK model (Kabakci-Yurdakul, 2011).

The TPACK model was constituted by extending Shulman (1986) pedagogical content knowledge (PCK) and adding technology to it (Mishra & Koehler, 2006). Given the fact that the knowledge of teachers is special knowledge in the intersection of content and pedagogy, technology should not be considered as separate, but one of the inputs that shape this knowledge. This new term, which was derived from PCK, and defined as technological pedagogical content knowledge, is regarded as the foundation of effective teaching that benefits from technology (Mishra & Koehler, 2006). TPACK includes the presentation of concepts using technology: knowledge about using technology constructively to teach content, knowledge about what complicates or facilitates learning concepts, knowledge about the ways technology can help students comprehend difficult subjects, knowledge about the ways knowledge and technologies are used to add new information to current information, to develop new epistemology or to foster existing information about students' present knowledge and epistemology (Mishra & Koehler, 2006).

The TPACK framework is the complex interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK). The TPACK approach goes beyond seeing these three knowledge bases in isolation. The TPACK framework goes further by emphasizing the kinds of knowledge that lie at the intersections between three primary forms: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPACK) (Koehler & Mishra, 2009). The Seven Components of TPACK are as under:

- Content Knowledge (CK) "Teachers' knowledge about the subject matter to be learned or taught. The content to be covered in middle school science or history is different from the content to be covered in an undergraduate course on art appreciation or a graduate seminar on astrophysics... As Shulman (1986) noted, this knowledge would include knowledge of concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof, as well as established practices and approaches toward developing such knowledge" (Koehler & Mishra, 2009).
- **Pedagogical Knowledge (PK)** "Teachers' deep knowledge about the processes and practices or methods of teaching and learning. They encompass, among other things, overall educational purposes, values, and aims. This generic form of knowledge applies to understanding how students learn, general classroom management skills, lesson planning, and student assessment." (Koehler & Mishra, 2009).
- **Technology Knowledge (TK)** Knowledge about certain ways of thinking about, and working with technology, tools and resources and working with technology can apply to all technology tools and resources. This includes understanding information technology broadly enough to apply it productively at work and in



everyday life, being able to recognize when information technology can assist or impede the achievement of a goal, and being able continually adapt to changes in information technology (Koehler & Mishra, 2009).

- **Pedagogical Content Knowledge (PCK)** "Consistent with and similar to Shulman's idea of knowledge of pedagogy that is applicable to the teaching of specific content. Central to Shulman's conceptualization of PCK is the notion of the transformation of the subject matter for teaching. Specifically, according to Shulman (1986), this transformation occurs as the teacher interprets the subject matter, finds multiple ways to represent it, and adapts and tailors the instructional materials to alternative conceptions and students' prior knowledge. PCK covers the core business of teaching, learning, curriculum, assessment and reporting, such as the conditions that promote learning and the links among curriculum, assessment, and pedagogy" (Koehler & Mishra, 2009).
- **Technological Content Knowledge (TCK)** "An understanding of the manner in which technology and content influence and constrain one another. Teachers need to master more than the subject matter they teach; they must also have a deep understanding of the manner in which the subject matter (or the kinds of representations that can be constructed) can be changed by the application of particular technologies. Teachers need to understand which specific technologies are best suited for addressing subject-matter learning in their domains and how the content dictates or perhaps even changes the technology—or vice versa" (Koehler & Mishra, 2009).
- **Technological Pedagogical Knowledge (TPK)** "An understanding of how teaching and learning can change when particular technologies are used in particular ways. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies" (Koehler & Mishra, 2009).
- **Technological Pedagogical Content Knowledge (TPACK)** "Underlying truly meaningful and deeply skilled teaching with technology, TPACK is different from knowledge of all three concepts individually. Instead, TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones" (Koehler & Mishra, 2009).

The Dimensions of the Technological Pedagogical Content Knowledge Approach is shown below in figure (1) (Koehler & Mishra, 2009)



Figure 1: The Dimensions of the Technological Pedagogical Content Knowledge Approach (Source: Koehler & Mishra, 2009)

As indicated in Figure 1, the Technological Pedagogical Content Knowledge approach has three main components including content knowledge, pedagogical knowledge and technological knowledge, and their intersection constitutes three sub-components: pedagogical content knowledge, technological pedagogical knowledge, and technological content knowledge. The intersection of all three components is the Technological Pedagogical Education approach (Koehler & Mishra, 2009). Moreover, the studies conducted on TPACK with teachers and pre-service teachers, TPACK is important for the education of teachers and their professional development (Koehler & Mishra, 2005).



Teachers and pre-service teachers, the designers of learning environments, are expected to have technological pedagogical content knowledge (TPACK). Therefore, the determination of pre-service teachers' perceptions about their TPACK level is very important (Yavuz-Konokman et al., 2013).

Thus, to be a competent teacher the knowledge & skills of technology, pedagogy and content are required as the basics of an effective teacher in this new era of technology. Techno-pedagogical skills are become essential to teachers as well as pupil teachers and learners also.

PRINCIPLES OF USING ICT IN TEACHER EDUCATION

The Society for Information Technology and Teacher Education has identified basic principles for development of effective ICT teacher education (SITE, 2002). These are:

• Technology should be infused into the entire teacher education programme:

Throughout their teacher education experience, students should learn about and with technology and how to incorporate it into their own teaching. Restricting technology experiences to a single course or to a single area of teacher education, such as methods courses, will not prepare students to be technology-using teachers. Preservice teacher education students should learn about a wide range of educational technologies across their professional preparation, from introductory and foundations courses to student teaching and professional development experiences.

• Technology should be introduced in context:

Teaching pre-service student's basic computer literacy-the traditional operating system, word processor, spread-sheet, database, and telecommunications topics is not enough. As with any profession, there is a level of literacy beyond general computer literacy. This more specific or professional literacy involves learning to use technology to foster the educational growth of students. Professional literacy is best learned in context. Pre-service students should learn many uses of technology because they are integrated into their coursework and field experiences. They should see their professors and mentor teachers model innovative uses of technology; they should use it in their own learning, and they should explore creative uses of technology in their teaching. Teacher educators, content specialists, and mentor teachers should expose pre-service teachers to regular and pervasive modelling of technology and provide opportunities for them to teach with technology in K-12 classrooms.

• Innovative technology-supported learning environments in the teacher education programme:

Technology can be used to support traditional forms of learning as well as to transform learning. A PowerPoint presentation, for example, can enhance a traditional lecture, but it does not necessarily transform the learning experience. On the other hand, using multimedia cases to teach topics that have previously been addressed through lectures may well be an example of a learning experience transformed by technology. Students should experience both types of uses of technology in their programme; however, the brightest promise of technology in education is as a support for new, innovative, and creative forms of teaching and learning (SITE, 2002).

Hence, while integrating ICT in teacher education students should have the opportunity to use such applications in practical classes, seminars and assignments. The application of these three principles will go a good way towards effectively integrating ICT in teacher education.

APPROACHES TO ICT INTEGRATION IN TEACHER EDUCATION

There are a variety of approaches to professional development of teachers in the context of use of ICTs in education. Professional development to incorporate ICTs into teaching and learning is an ongoing process and should not be thought of as one 'injection' of training. Teachers need to update their knowledge and skills as the school curriculum and technologies change. Two aims of teacher training are fundamental:

- ➢ Teacher education in ICTs;
- > Teacher education through ICTs.

• Teacher Education in ICTs

The most obvious technique for professional development for teachers is to provide courses in basic ICTs knowledge and skills. It is necessary for teachers to become skilled in operating the new technologies and in exploiting them effectively as educational tools. Teachers must master the use of information – skills of research, critical analysis, linking diverse types and sources of information, reformulating retrieved data – if they are to teach their pupils to develop these same skills. There needs to be more emphasis placed on training in pedagogy, as opposed to the current trend in many education systems where the major focus is on specialized knowledge in specific curricular subjects. Teachers must be adequately equipped with more didactic competencies so as to assume their new role as experts in the learning process.



• Teacher Education through ICT's

ICTs may also support effective professional development of teachers in to how to use ICTs. A limited initiative to integrate an innovative approach to teaching and learning with one new technology for a large population of teachers can be an important early step for a nationwide strategy. The UNESCO document, Teacher Education Through Distance Learning (UNESCO, 2001), describes interactive radio, a professional development model in which radio programmes provide daily half-hour lessons introducing pupils to English through active learning experiences with native English speakers. As sources of information and expertise, as well as tools for distance communication, ICTs can offer many new possibilities for teacher education. Teachers may through the regular use of these technologies. Use of new media, new rules of communication – even a new language – have to be learned (Khirwadkar, 2007).

Additionally, Collis & Jung (2003) described that the use of ICT within teacher training programs around the world is being approached in a number of different ways with varying degrees of success. These approaches were subsequently described, refined and merged into following approaches:

- **ICT skills development approach:** Here importance is given to providing training in use of ICT in general. Student teachers are expected to be skilled users of ICT for their daily activities. Knowledge about various types of software, hardware and their use in educational process is provided.
- **ICT pedagogy approach:** Emphasis is on integrating ICT skills in a respective subject. Drawing on the principles of constructivism, pre-service teachers design lessons and activities that centre on the use of ICT tools that will foster the attainment of learning outcomes. This approach is useful to the extent that the skills enhance ICT literacy skills and the underlying pedagogy allows students to further develop and maintain these skills in the context of designing classroom- based resources.
- **Subject-specific approach:** Here ICT is embedded into one's own subject area. By this method, teachers/subject experts are not only exposing students to new and innovative ways of learning but are providing them with a practical understanding of what learning and teaching with ICT looks and feels like. In this way, ICT is not an 'add on' but an integral tool that is accessed by teachers and students across a wide range of the curricula.
- **Practice driven approach**: Here emphasis is on providing exposure to the use of ICT in practical aspects of teacher training. Focus is on developing lessons and assignments. Using ICT and implementing it in their work experience at various levels provides students an opportunity to assess the facilities available at their school and effectively use their own skills (Collis & Jung, 2003).

Therefore, in this regards, ICT in teacher training can take many forms. Teachers can be trained to learn how to use ICT tools. ICT can be used as a core or a complementary means to the teacher training process (Collis & Jung, 2003). The various ways in which ICT teacher training efforts could be classified into four categories are shown below in Figure 2.



Figure 2 Categories for ICT in teacher training (Source: Collis & Jung, 2003)

From the above suggested approaches, regarding ICT as a core component at the pre-service level, integration of all approaches would help in developing proper attributes among prospective teachers. There should be joint efforts of educators and prospective teachers in implementing and sharpening ICT skills. Whatever approach is followed in educational institutions to develop knowledge about ICT, it has inherent limitations. Coupled with other reasons, we are not making student teachers fully confident in using ICT in their daily classroom activities.



MAIN CHALLENGES IN THE INTEGRATION OF ICT WITH TEACHER EDUCATION

Major hurdles in the integration of ICT in teacher training programs at the pre-service level of teaching/learning process are:

- ICT basics are taught to teacher trainers focusing on technical issues, but little emphasis is given to the pedagogical aspects.
- Educational technology courses are taught in a rather traditional way and show little evidence of using new technology to support instructional innovations.
- Students don't know how to use new technology in their classroom instruction when they go to schools.
- Technology input is not integrated in the curriculum courses, especially method courses.
- The time spent for practical sessions is less, as more time is spent for theory sessions. It is very clear that student teachers will not get much scope in order to integrate ICT in curriculum or the teaching/learning process.

Moreover, (Khirwadkar, 2007) suggested that in teacher training programs at the secondary level, the ICT education scenario is struggling with the following problems are:

- Only at the awareness development level objectives are being achieved, but higher order thinking skills regarding the use of ICT tend not to be occurring.
- Technology, pedagogy and content area integration is a rare feature. All components are dealt with separately which creates confusion for students.
- There is a serious discrepancy among syllabi of teacher training institutions and secondary schools. Syllabi at various institutions are not on a par with school level curriculum.
- Time duration of the courses related to ICT education is too short to develop knowledge and necessary skills among students to achieve higher order thinking skills.
- There is a lack of availability of proper infrastructural facilities at most of the institutions.
- There is a mismatch between available hardware and software to develop required learning resources. Support from technical staff for maintenance is dismal (Khirwadkar, 2007).

Although, there are certain basic problems associated with the integration aspects of technology at pre-service and inservice level of teacher education such as lack of availability of proper infrastructural facilities, learning resources, lack of new technology to support instructional innovations, lack of techno- pedagogy knowledge and practices but for education to reap the full benefits of ICTs in learning, it is essential that pre- and in-service teachers are able to effectively use these new tools for learning.

FINAL WORDS

Educational systems around the world are under increasing pressure to use the new information and communication technologies (ICTs) to teach students the knowledge and skills they need in the 21st century. Technology is never a substitute for good teaching without techno-pedagogical skilled instructors; no electronic delivery can achieve good results. Teachers in India now started using technology in the class room like- Laptops, LCD projector, Desktop, EDUCOM, Smart classes, Memory sticks are becoming the common media for teacher education institutions. With the emerging new technologies, the teaching profession is evolving from an emphasis on teacher-centred, lecture-based instruction to student centred, interactive learning environments. Designing and implementing successful ICT-enabled teacher education programmes is the key to fundamental, wide-ranging educational reforms. Teacher education institutions and programmes must provide the leadership for pre- and in-service teachers and model the new pedagogies and tools for learning. Thus, as a fraternity of teachers we should use techno-pedagogical skills in Teacher Education in 21st Century because these are only who can construct a leading road for the advanced future for pupil teachers as well as the students. If techno-pedagogy would be used then it can make a difference to provide accessibility, equality and quality of teacher education, thus at the end overall education.

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