

ICT IN PRE-SERVICE TEACHER TRAINING

India Case Study

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I Background

This survey is being conducted as part of the drive to implement ICT teacher training in every country in the Asian and Pacific region by 2008. Currently the 45 countries in the Asia and South Pacific region have a wide range of policies with regard to ICT in education, from those yet to fully develop a policy to those undergoing upgrades to longstanding policies. These variations in ICT absorption within education have led to relative variations in the scale of teacher training provision in the use of ICT as a teaching and learning tool.

A broad assessment and analysis of the present level of provision of Information and Communication Technology (ICT) training in pre-service teacher education programmes in India is presented in this case study. The study focuses on the extent to which ICT has taken roots in the curricula, including some current practices, recent initiatives, developments and future trends. It offers an overview of the current usage of ICT in pre-service education and is intended as a precursor to a more detailed and in-depth follow-up study that may be needed on the same theme at a later date. The survey includes the use of all types of technology currently in use, ranging from computers to television and radio, in both traditional and distance training programmes.

India is a vast country with a population of over a billion people spread over more than thirty states and centrally administered territories each of which has its own system of education at every level, including Teacher Education. As such, it is impracticable to present a representative picture of ICT usage in this field. Therefore, the canvas is restricted to one or two states or systems together with some institutions of a national or regional character and the picture that emerges can be treated as broadly indicative of the situation in the country as a whole.

The pace of developments in ICT in recent years has been breathtaking. We have seen the modest IBM PC of the early eighties grow into a multipurpose, multimedia computing and communication device of exceptional sophistication, versatility, speed and affordability. It can now be part of a truly global network of hundreds of millions of computers, the *Internet*, which has created an *information superhighway* in cyberspace. Marshall McLuhan's vision of the *global village* has become a distinct reality. The barriers that separated peoples and nations earlier are fast vanishing.

India has made impressive strides in the application of Information and Communication Technology in recent years and this is reflected in a vibrant and fast growing economy. It is now an acknowledged world leader in the knowledge industry. However, the Education sector, particularly the area of Teacher Education, has lagged behind other sectors of the Indian economy in benefiting from the fruits of technological developments.

II Objectives of the Case Studies

- 1 To analyze pre-service teacher training initiatives, developments, and current practices *via* in-depth situational analyses of six selected countries, in order to

provide a range of studies to which certain classifiers may be attributed to facilitate the production of a regional overview.

- 2 To serve as an initial needs analysis, with more in-depth assessments to follow, to learn from current national strategies and solutions to problems encountered, and to assess and plan the best path for pre-service ICT teacher training progress in each country.

III Programme Objectives

1 Goals and Objectives of ICT Pre-service Programmes

The main objective of ICT pre-service teacher education programmes has been to produce teachers who

- (i) Are qualified and competent to employ the tools of the technology to supplement their traditional teaching methods and thereby achieve enhanced student learning,
- (ii) Can use the tools of the technology to keep themselves abreast of the latest developments in the subject/s they teach, and
- (iii) Can contribute to their own professional advancement.

2 Expected Benefits and Outcomes

After the training programme the prospective teachers are expected primarily to be able to

- Teach their subject/s using the tools of ICT wherever possible, achieving an appreciable degree of integration,
- Teach the basics of ICT, both theory and practice, that would enable their students to benefit from the tools of the technology,
- Employ and promote Web-based education as a strategy to promote directed self-learning among their students, and
- Motivate their students to pursue ICT in their future higher studies and as career options.

3 Policies on ICT Pre-service Training

The National Council for Teacher Education (NCTE) is a statutory body constituted under an act of Parliament to regulate all aspects of teacher education in the country. It played a pivotal role in the promotion of computer literacy among teacher educators during the early stages of introduction of an ICT component in the teacher education curriculum in the country. The NCTE also developed the curriculum guidelines and a suggested syllabus.

Almost all state and central government agencies have adopted a liberal policy of encouraging and supporting ICT curricula in pre-service teacher training institutions as recommended by the NCTE. A component of ICT in some form or other, and to different extents, is now an integral part of the teacher education curriculum for all students, either at the diploma level, which addresses the needs of elementary education, or at the degree level, which addresses the needs of secondary education. Some degree courses offer an entire paper on ICT as an elective subject and the number of institutions doing so is on the increase.

The teacher education curricula in ICT have been shaped to a significant extent by the document of the National Council of Educational Research and Training (NCERT) titled 'Information Technology in Schools – Curriculum Guide and Syllabus' which addresses the needs of the school system in the country. It also spells out the competencies required of both the students and teachers for transaction of the curriculum.

IV Programme Development and Methodology

1 Differences in ICT Training for Elementary & Secondary Teachers

In most teacher training institutions no regular informatics course is offered to pre-service teacher trainees. Since the duration of the elementary training programme is two years as against one year for the secondary programme, it is not surprising that there is little difference between the ICT curricula for the two at present. However, till recently the elementary programme did not include any ICT component. There was only a component on audio-visual aids and equipment pertaining mainly to the pre-ICT era. As for ICT training for secondary teachers, the ICT related elective course, where offered, is more akin to an informatics course than the compulsory component.

2 Differences in ICT Training for Informatics & Non-informatics Teachers

At the mainstream school level, ICT training needs are of the non-Informatics type and as such, the conventional teacher training institutions focus largely on providing this type of training. However, polytechnics, technical schools and similar institutions that require teachers qualified in informatics courses such as Computer Science & Engineering meet their needs from among teachers trained by Technical Teachers Training Institutes (TTTIs) a number of which have been set up at the regional level by the government of India.

The training for informatics subject teachers is of a rigorous type involving in-depth studies of computer hardware, software, programming skills, digital electronics, mathematics, etc. The training for non-informatics subject teachers involves only the bare essentials of theory and practice. This includes learning to use common hardware such as PCs and their accessories, application and generic software, educational

software resources, etc. The elective course available in some secondary teacher training institutions is of an intermediate variety.

3 Level of Educational ICT usage in Training Programmes

Most teacher training institutions are equipped with a 'Computer Lab' consisting of 3 to 10 PCs, often of the outdated pre-Pentium variety, some peripheral devices such as dot matrix printer, TV, VCD player, some pre-installed generic application software, some multimedia educational software and a backup short duration power source. Overhead and slide projectors are also generally available. The usage of the facilities is mostly confined to the lab, occasionally extends to the seminar hall and very rarely to the classroom. Although a multimedia computer system is generally available, the much-needed LCD projector to go with it for mass viewing is still too expensive to afford.

4 Training Methodology

It is logical to expect that any training in ICT tools and techniques would be most effective if it were done employing the very tools and techniques that are the subjects of teaching. However, the ground realities are different. The instructors do not employ these tools and techniques as often as the circumstances require and generally rely on the long established 'chalk and talk' lecture method, one that requires the least amount of preparation on their part. This happens even in institutions that have a good infrastructure and instructional facilities by way of commonly needed items of hardware, software and support material. It is not that the instructors lack the abilities and skills required for the purpose, but that they often prefer the easy, beaten track.

5 Usage in Distance Learning Systems

Some open universities such as the Indira Gandhi National Open University (IGNOU) offer pre-service secondary teacher education courses in the distance education mode. While they do employ a variety of electronic media, including TV broadcasts and Web-based programmes, much of the teaching-learning process still takes place through printed material exchanged through the national postal services and short duration contact programmes. The NCTE has laid down some stiff requirements and guidelines for such distance education programmes.

6 Duration of Programmes and Courses

The elementary pre-service teacher training programme used to be of one-year duration till recently, but it has been changed to a two-year course in almost all states on the initiative of the NCTE. Also, the entry qualification for students has been enhanced from matriculation (successful completion of 10 years of education) to pre-university (successful completion of 12 years of education). Successful candidates are awarded a diploma (D Ed).

The secondary pre-service teacher-training programme continues to be of one-year duration (leading to a B Ed degree of the affiliating university), with a university de-

gree as the entry qualification. The four regional institutes of education under the NCERT and a few university colleges offer a four-year integrated teacher education programme for which the entry qualification is pre-university. However, the number of students graduating from these courses is a very small fraction of those coming out of the system as a whole. The regional institutes of education have recently replaced their one-year programme by a more purposefully designed two-year programme.

The ICT components of the D Ed and B Ed courses vary widely from state to state and system to system. Some have only a notional representation in the overall curriculum while others have a strong and well-designed component. However, the courses are generally of the non-informatics type.

Master degree programmes in education leading to the M Ed degree have also started introducing a component of ICT in their curriculum; some institutions also offer a more advanced version of it as an elective.

7 Profile of Teacher Educators

The NCTE has specified the minimum qualifications and, in certain cases, the prior experience required of the staff working in teacher education institutions throughout the country. Generally they should have a university master's degree in a school subject together with a master's degree in education (M Ed). They should preferably have some prior school teaching or teacher training experience. In the case of the head of the institution (principal) such experience is mandatory. These requirements came into effect after the establishment of the NCTE in the early nineties. The NCTE has also prescribed that the student-teacher ratio in any programme has to be about 16:1.

When faced with the challenge of introducing ICT in the teacher education curricula most institutions were unprepared and most of the existing staff members very reluctant to taken on the additional responsibilities. Neither the infrastructure nor the human resources existed. It has taken more than a decade to remedy this situation and build up some level of basic resources.

In the last year or two there has been an explosive growth of teacher education institutions in the private sector, especially in the southern states. Hundreds of new institutions have come up despite the rather stringent norms set by the NCTE. It has not been easy for these new institutions to find teaching staff. As a result of the sudden spurt in demand, the quality of teacher educators in these institutions has suffered.

Despite the impressive paper qualifications, the competence of teacher educators and hence the quality of teacher education have long been regarded as poor in the country, poorer than in any other sector of education. Institutions catering to teacher education have generally been the slowest and most lukewarm in adapting to anything that is new and off the beaten track, especially to the demands of ICT in the revised teacher education curricula. This has severely affected the quality of teacher education in the country, with major repercussions on the quality of education imparted in

schools and colleges. However, a younger generation of new entrants to the profession holds some promise for the future.

The situation with regard to (informatics) teacher trainers in Technical Teachers Training Institutions is a great deal more encouraging. They are generally engineering graduates, often in informatics subjects, well trained and motivated.

8 Key Programme Elements

The non-informatics pre-service teacher education programme varies considerably from system to system and has basically the following content organized and sequenced in a variety of different ways:

- Major developments in ICT in a chronological order
- Concepts of hardware and software
- Principal hardware components and peripherals of a multimedia and Internet-ready system
- Distinction between system software and application software
- Basics of WINDOWS operating environment
- Essential programming *concepts*; but not the formal learning of any programming language except a simple graphics-oriented language like LOGO
- Word processing, document preparation and printing
- Spreadsheet applications, including graphical and statistical analysis of data
- Fundamentals of database design, creation and management
- Creation of multimedia presentations and slide shows using Power Point
- Computer Aided Teaching & Learning
- Interactive use of Multimedia educational software on CD-ROMs
- Basic networking concepts, including the Internet
- Using the Internet for e-mail and file transfer
- Surfing the Internet for searching and selecting educational content and ideas for teaching

The informatics programme also varies considerably from system to system and, in addition to all of the above components, has components like

- A detailed study of the operating system features
- A more in-depth study of hardware, peripherals and accessories
- Networking
- Computational Algorithms
- System Programming
- Application Programming
- Study of a structured programming language such as PASCAL, C or C++
- Object Oriented Programming concepts

- File Management
- Database Management
- Principles of Communications Technology
- Internet and Web Technology

9 Programme Development Initiatives

Initiatives for developments and reforms in ICT pre-service teacher education curricula can be traced directly or indirectly to various sources such as the NCTE, NCERT, the State Councils for Educational Research & Training (SCERTs), State Boards for School Education, Universities, TTTIs, etc. They are also influenced to some extent by developments in other countries. For example, the well-known CLASS (Computer Literacy and Studies in Schools) project initiated nationwide in the mid-eighties, which necessitated a large-scale in-service training of schoolteachers in Computer Education, was in collaboration with the UK government.

Private sector initiatives have also been playing a significant role in ICT training for teachers. Prominent among them are Intel's 'Teach to the Future' initiative nationwide and Microsoft's Project *Shiksha* in Maharashtra state. Intel's initiative is based on the conviction that '....all the educational technology is worth nothing if teachers don't know how to use it effectively'.

V Programme Participants

1 Profile of Participants

There are thousands of teacher education institutions in the country with a student population of hundreds of thousands. The exact figures are uncertain because of the recent explosive growth of such institutions in the private sector. The NCTE approved student intake for the elementary course is 50 per section and for the secondary course 100 per section. A large number of institutions have been permitted to run more than one section for each course.

2 Pre-entry Qualification Requirements

The minimum qualification for the elementary course entrants is a pass in the class XII examination of state and central boards of school education. For the secondary course entrants, the minimum requirement is a university degree in any school subject. Selection is usually made through a common entrance examination conducted every year, generally at the state level.

3 Participant Performance during Training

Student performance during training is evaluated through a combination of formative and summative evaluation procedures. The evaluation is partly internal, through a process of continuous comprehensive evaluation, and partly external, through an annual (or semester end) external examination.

4 Post-programme Certification

At the end of a two-year programme of elementary teacher training the successful candidates qualify for a Diploma in Education (D Ed) in most states. At the end of a one-year programme of secondary teacher training the successful candidates qualify for a Bachelor's Degree in Education (B Ed) of the university to which the concerned institution is affiliated. A postgraduate one-year Master of Education (M Ed) course is also available in most university departments of education and other institutions.

5 Employment Opportunities and Salaries

For candidates with a diploma qualification, employment opportunities are mainly as teachers in elementary schools most of which are run by the state governments. Opportunities also exist as teachers in the elementary sections of central schools such as *Kendriya Vidyalayas*, *Navodaya Vidyalayas*, etc. For candidates with a degree in education, employment opportunities are mainly as teachers in government, government-aided or private secondary schools. Opportunities also exist as teachers in the secondary sections of central schools. The NCTE has made these qualifications mandatory for all teachers. Candidates with a master's degree in a school subject and a degree in education can become teachers in higher secondary schools at both the state and central levels.

Candidates with an M Ed degree can become either teachers in secondary/higher secondary schools or teacher educators, either in the elementary or the secondary teacher education institutions.

Salaries paid to teachers and teacher educators vary widely from system to system and even from state to state. Teachers in government and government-aided elementary and secondary schools get a salary as prescribed by the concerned state government. Their counterparts in unaided private schools are paid salaries that are generally much lower and variable greatly from school to school. Only elite and reputed schools in the private sector pay salaries comparable to or more than government schools.

Salaries payable to teacher educators, whether in the government or private sector, are governed by NCTE regulations. Teacher educators in government run or government-aided institutions are paid salaries comparable to those paid to their counterparts in other colleges. In reality, salaries paid to teacher educators in privately managed teacher education institutions are significantly lower than the salaries paid in government and government-aided institutions.

6 On-the-job Performance

Mechanisms for appraisal of on-the-job performance of teachers and teacher educators do exist on paper but appear to be non-functional in practice. In effect, after the training phase, the performing teacher or teacher educator hardly ever gets evaluated in a regular and systematic manner. The system does little to discriminate between the effective and ineffective performance. There is also no effective reward / punishment mechanism.

VI Programme Resources

Most pre-service teacher education institutions are equipped with a 'Computer Laboratory' and/or 'Educational Technology Laboratory' with the following minimum items of essential ICT hardware and software as required by NCTE guidelines and regulations:

- 3-10 Multimedia PC Systems, with monitors, hard disk drives, floppy drives, UPS, common printer (dot matrix and/or inkjet) – rarely networked [Older institutions with pre-Pentium systems]
- Windows 95/98/2000/XP Operating System software
- MS Office Suite, including Word, Excel and Power Point
- Some items of supporting software, including Antivirus software
- Some educational software pertaining to school subjects on CDs
- CD/VC Player
- TV
- AM Radio-cum-Cassette Recorder
- Audio/Video Cassettes
- Over Head Projector
- Slide Projector
- Public Address System
- Projection Screen

Additionally, some or all of the following items may be found in some of the better-provided institutions:

- Scanner
- Laser Printer
- Networking
- Dial-up Internet Access
- DVD/VCD Player
- CD Writer
- LCD Projector
- Language Learning Software with Headphones
- Electronic versions of common Encyclopedias
- Audio System
- Camera (Film and/or Digital)
- Video Camera (Cassette/Digital)

VII Programme Providers

1 Role of Government and Private Sectors

Most of the early initiatives and financial support for the inclusion of ICT in teacher education programmes came from the Government of India and the state govern-

ments. As stated earlier, the CLASS project that began in the mid eighties was the first major initiative in this regard, with technical support coming from the UK government. Government funds have been provided adequately for the development of ICT infrastructure and facilities in most government and government-aided institutions. Privately managed teacher training institutions have relied heavily on their own resources and support from non-governmental agencies.

IT enterprise giants such as Intel and Microsoft have provided substantial inputs into both schools and teacher training programmes selectively. Indian commercial IT enterprises such as NIIT (National Institute for Information Technology) have played a major role in creating infrastructure and human resources in some states such as Karnataka where a massive programme of providing Computer Education in secondary schools was initiated about a decade ago.

2 Stakeholder Participation

Stakeholder participation is confined mostly to government agencies and organizations and the managements of institutions in the private sector. Parents and community members who evince a fair amount of interest in school education, especially in the private sector, seem to show little or no interest in teacher education, though the parents pay considerable amounts of money to the managements of private institutions to get their wards admitted to the training courses.

VIII Programme Quality

1 Accreditation Systems

All teacher education institutions in the country that conform to certain essential requirements and standards laid down by the NCTE are recognized by the NCTE to run teacher-training programmes. A component of ICT or separate courses in ICT related subjects have now become an integral part of the curricula in these programmes. The elementary teacher training institutions are affiliated to a designated board of education and examinations in their respective states. The secondary teacher training institutions are affiliated to a university under whose jurisdiction they come. The diplomas and degrees awarded to their outgoing students are valid and recognized for purposes of employment throughout the country.

2 Standards

Standards with regard to infrastructure, instructional facilities, entry-level requirements, teacher educator qualifications, etc., have been established by the NCTE and generally accepted by all stakeholders. The examining boards and universities implicitly set student performance standards. Provision for periodic revision/renewal of teacher education curricula, including the ICT components, ensures conformity with changing scenarios and global developments.

IX Programme Funding

1 Running Costs & Funding Responsibilities

In government teacher education institutions the entire running costs, nearly 95% of which goes towards staff salaries, are met by the government. The government also meets capital expenditure, including expenditure towards setting up of ICT facilities. A small fraction of the overall expenditure is recovered through student fees, which are nominal. In government-aided institutions the general practice is for the government to meet the entire expenditure towards staff salaries and other costs are expected to be met from student fees and institutional resources. Privately managed institutions depend heavily upon student fees and institutional resources to meet both the staff salaries and running costs. Generally, no separate distinction is made in respect of the costs of procurement and maintenance of ICT hardware and software. Private institutions often charge a separate fee from students towards the capital expenditure on ICT infrastructure.

2 Programme Sustainability

In government and government-aided teacher education institutions the sustainability of the ICT programme is not in doubt since the government bears practically all the costs and the demand for admission to these institutions is high. However, the question of sustainability is a pertinent one in privately managed institutions since the resources have to be raised mainly through student fees and these are generally high. Only those students who cannot get into the government supported institutions generally end up in private institutions, incurring high costs. In view of the recent explosive growth of teacher training institutions in the private sector, especially in the southern region, and the lowering demand for admission to privately managed institutions, the long term sustainability of the programme in such institutions is definitely in question.

X Programme Needs Analysis

1 Future of ICT in Pre-service Teacher Education

ICT has taken deep roots in school education at all levels throughout the country. The demand for teachers who can teach ICT as a discipline, generally in the garb of 'Computer Education', and more importantly, teachers who can integrate ICT seamlessly into the teaching of various school subjects is growing rapidly. This in turn has fuelled the need for well-trained teachers, both in-service and pre-service, thereby ensuring a bright future for ICT in teacher education.

The future of informatics type courses in technical teachers training institutions is also very bright in view of the ever increasing need for technically qualified human resources in the country to meet the needs of a rapidly growing economy.

2 Impact Assessment

No reports of formal studies assessing the impact of ICT in pre-service teacher education on any aspect of school education in the Indian context are available. However, on the basis of an impressionistic assessment, it is reasonable to conclude that ICT has significantly influenced school teaching practices in a positive way.

XI Critical Analysis

1 Strengths

Some of the strengths of the ICT pre-service teacher-training programme are

- Strong government commitment and support
- The regulatory role of the NCTE and accrediting bodies
- Increasing awareness of the usefulness of ICT for enhancing the quality of the teaching-learning process
- Influence of a strong knowledge based economy of the country
- Ready availability of hardware and software resources within the country
- Widespread technical expertise available within the country
- Liberal support from non-governmental organizations in the spread of ICT

2 Weaknesses

Some of the weaknesses of the ICT pre-service teacher-training programme are

- A large urban-rural imbalance in infrastructure, instructional facilities and human resources for the use of ICT. In a large number of villages no electricity is available and where available, even in urban areas, the supply is available only for limited periods of the day
- High costs of hardware, software and other infrastructure facilities – An LCD projector is still very expensive and unaffordable to most institutions
- Inadequate and often poor utilization of existing resources, including Radio and TV, in the instructional process
- Obsolescence of hardware and need for replacement after just a few years of use
- Slow pace of acceptance and assimilation of new developments/initiatives within the teacher education profession
- Continued emphasis on learning *about* computers and other ICT tools rather than learning *with* them as tools of a powerful technology
- Low level of integration of ICT with the teaching of school subjects
- Tools of ICT still being treated as novelty rather than necessity

3 Innovations

Intel's 'Teach to the Future' nation-wide initiative that is targeted at teacher training using the tools of ICT in a comprehensive and novel manner is an innovation worthy of mention. Also deserving mention is the use of two-way audio and one-way video conferencing strategy used in providing in-service training to teachers at the primary level on a large scale by some states, first pioneered by Karnataka.

While there are many innovations in ICT usage at the school level very few exist at the pre-service teacher education level.

4 Opportunities

ICT in pre-service teacher education is a relatively new phenomenon in the country and plenty of scope and opportunities exist for its further growth. The following are some notable ones:

- With the recent launching of India's own dedicated educational satellite, the 'EduSat', an extraordinary opportunity has opened up for achieving a major transformation in the distance mode of education in all sectors of education, including providing learning experiences on ICT for teacher educators. However, no concrete plans have been drawn up so far.
- With the advent of broadband Internet connectivity at affordable costs, it should be possible for most teacher training institutions to provide on-line interactive learning opportunities for their students and teachers.
- With the on-going massive expansion of educational opportunities in all spheres, an excellent opportunity exists for the deployment and use of ICT infrastructure and tools on a proportionately massive scale.
- With the IT software industry in India already established as a global leader and growing further, there is great scope for large scale collaborative efforts between industry and education sectors in ICT for teacher education.

5 Threats

Some of the major threats to the success of ICT programmes in teacher education are:

- The generally poor quality of the existing ICT infrastructure in most older teacher training institutions, in both government and private sectors.
- Lack of adequately trained staff to undertake new and innovative ICT programmes in teacher education.
- Lack of motivation as well as opportunities for teacher educators to take up research and developmental work in ICT related areas.
- An attitude of complacency and indifference on the part of some educational administrators and teacher educators

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