Chapter IX : Integrating ICTs with teacher education

ICT is a very broad domain, and affects all aspects of life, the socio-cultural, the political and the economic. Since education is concerned with preparing learners to become responsible citizens, there is a great need for student-teachers to acquire a basic understanding of ICTs, including the Internet. Hitherto, focus has been on basic proprietary softwares; however, we need to expose student-teachers to a larger gamut of ICTs, so that they have basic understanding and can develop skills in areas that interest them. The course curriculum should hence cover the following :

(a) Basic hardware knowledge - Computers – laptops, net-books, tablets, radio and audio recorders, camera, Printer/peripherals; Cell phones
(b) Basic software knowledge - Public operating systems (e.g. GNU/Linux) - virus free, free of cost/free to share which support most languages, and basic software applications that are also free to share, modify and use for office automation, web browsing etc.
(c) Basic knowledge of Internet and web based tools and resources including of cyber security – avoiding dangers and risks as well as basic website and web tools use (for creating and maintaining institutional resource portals etc)
(d) Larger socio-cultural, political and economic implications of the emerging network society, an effect of ICTs.

9.2 The goal in ICT literacy must be to expose teachers to a wide variety of ICT resources – hardware, software as well as digital learning resources . This requires an emphasis on using available free / public digital resources. Teachers must not treat ICTs as a black box – they should be taught to install even the operating system, open up hardware to study components. Programs that have done this (e.g. Kerala's IT@schools programme) have seen enormous confidence developed in teachers. Learning to install software and freely installing it on multiple computers (without such act being a violation of law) serves as a significant inhibition destroying process and encourages teachers to begin a journey of learning in the digital world. Teachers become learners and teachers instead of being consumers/users who have no idea and no right to study, share or customise resources. Inexpensive computers / devices that support access and participation in the digital space, need to be promoted on large scale.

ICT Aided Learning / integrating ICTs into subject teaching-learning

9.3 The biggest drawback so far in ICTs has been to treat it as a stand-alone subject. However, ICT it is a new and powerful method for mediating teaching-learning and hence needs to be integrated into different subjects. To integrate, the steps of accessing, reviewing, creating and sharing resources are to be structured into formal curricular experiences.

9.4 Existing digital resource repositories from governments and NGOs including audio resources (EDC), video resources, animation movies etc. should be made widely *accessible*. It is important to make the resources available in district repositories linked to state repository. Student-teachers also need to learn how to access the world wide web for resources, including principles governing quality, authenticity of resources, rules of fair use etc. Student-teachers need to integrate ICTs into their subject teaching-learning, using varied *digital methods to create* learning resources, using public *educational software applications, such as*

(i) Maths – Geogebra, Bruch, K Turtle, carMetal
(ii) Languages - SCIM (multi-language typing), K Hangman etc. (language), K Anagram, K Letters
(iii) Science – K Stars, Stellarium etc (astronomy), Kalzium, STEP, PHET etc
(iv) Social Science - Marble (geography), KGeography, OpenMaps
(v) other subjects - Freemind (creative thinking) for creating concept maps
(vi) *web tools* like wiki, blogs
(vii) *digital tools* like video camera and video/photo/audio software applications including recordmydesktop, Kdenlive, Audacity etc. as well as CBTs such as spoken tutorials (www.Spoken-Tutorial.org)

Blended learning in Teacher Education

9.5 Complementing physical workshops/meetings with virtual interactions over a mailing-list or an e-learning forum such as moodle provides new models of teacher education through ICTs. For instance, the TISS MA Education program (www.tiss.edu/maee) which is 5+ years old is able to offer the program to students across the country and also access faculty from across the country, because each of the four semesters consists of a 3 week contact period (on-site) followed by a 12 week course transaction over Moodle. Since Moodle is a public software, the course has freely customized it for its own specific requirements. Similar programs need to be offered by DIETs to teachers which can allow learners to learn at their own pace (relatively) and also reach a larger number of teachers than is possible through purely physical interactions.

9.6 Blended models also allow for greater possibilities for addressing the diverse and heterogeneous learners needs, since the teaching-learning is not restricted to the classroom and virtual learning spaces allow for greater one-to-one interactions, at space and time convenient to the teacher-educators and student teachers. Thus blended models can allow for catering to diverse learning needs, contexts and aspirations.

9.7 It is also important to note that the distant modes have been an integral part all over the globe in Teacher professional Development and distance education is merging

into blended learning, more effectively combining contact period and on-line interactions. In the context of teacher education, distance learning has more than one aim and audience. It has been used as a *pre-service* teacher preparation method with "teacher candidates," mostly with extensive face-to-face preparation. In developing and developed-country contexts, it has been deployed as an *in-service* vehicle to fulfil a mandate to upgrade the knowledge, skills and qualifications of an existing teaching force. Finally, and predominantly within developed-country contexts, distance education, mainly in the form of web-based education, serves as a vehicle for *continuing education*, offering enrichment, enhancement and additional certifications for teachers who have attained at least a minimum level of certification in their content/grade-level area. The use of blended models needs to be encouraged in both in pre-service, in-service

Use of Public Software in Teacher Education

9.8 Since the adoption of ICTs in education is essentially an educational issue, rather than a technological one, pre-service teacher education policy and program need to be anchored in sound educational perspectives. Curriculum is the primary process of directing teaching towards fulfilling educational aims and digital learning resources (content) and digital learning tools/ processes (software applications) which constitute curricular resources, need to comply with curricular principles. An important principle of education is that curricular resources need to be publicly owned, so that they are freely available to teacher educators, teachers and students without restrictions. In the case of traditional print media (books), the public education system does not use proprietary curricular resources, since that prevents the schools, teachers and students from freely sharing the resources and from customizing and using them as per their local needs. Proprietary software and content forces the teacher to be a 'mere user'; treating these tools as a 'given'. Teachers, schools and the entire public education system become completely dependent on the vendor for any changes, modifications, enhancements / customizations to these tools and have no right to freely share these resources with one another. Thus allowing for use of privatized digital learning processes (in the form of proprietary software or content) would be detrimental to education and the public education system should use only publicly owned curricular resources.

9.9 There are free software applications for all the areas where proprietary software applications have been used in schools. At a systemic level, public software has been used in a successful "ICT@schools" program in India – the Kerala IT@SchoolsIT@Schools, which is being emulated in Gujarat. The 'Subject Teacher Forum' program of RMSA, Karnataka uses public educational software for mathematics, science and social science teachers.

9.10 In addition, use of publicly owned software has other important advantages. Since publicly owned software can be freely shared, the costs of using freely shareable

software applications would be much lower specially for implementing at a large scale, where support systems are feasible to build. An IIM-Bangalore study estimates that on a conservative basis, Kerala IT@SchoolsIT@Schools program has saved Rs 50 crore on software license fees and India would save Rs 20,000 crore each year by adopting the same.

9.11 The GNU/Linux publicly owned operating system is virus-resistant and this can hugely reduce maintenance and support efforts and resources. A large number of computers in educational institutions tend to be unused due to virus issues and using GNU/Linux would increase infrastructure availability. A large number of educational software applications can be bundled with the GNU/Linux operating system which means they can be available to teachers and schools in a simple single installation process. The Kerala, Karnataka and Gujarat programs use the Ubuntu GNU/Linux operating system which is simple and easy to use, bundled with the educational tools.

9.12 Thus education system should encourage the use of digital tools and resources that are freely shareable and modifiable, in line with other curricular resources and discourage the use of software or content which is privately owned and which teachers and education system is legally and technologically prevented from sharing/customizing. Some of the education tools for various subjects and Language are suggested in Annexure XIII.

Suggested Roadmap for ICT integration into processes of DIETs, etc.

Activity	Resources required	Indicative costs (for a DIET with 100 students)
Create / upgrade required ICT infrastructure in each institution	Computers, Internet, camera, audio recorders, storage devices. Broadband wireless connectivity	100 access devices would cost 20,00,000 and this can be acquired over a 3 year period. Other costs would not be more than couple of lakhs. Various programs of central and state government provide budgetary support for acquiring ICT infrastructure
Build basic ICT literacy capacities in teacher-educators	Master resource persons to train the teacher-educators	Training costs, based on a blended model, combining 10 days workshop based, spread over 3-4 phases and a on-line email/portal based interactions
Build capabilities in teacher-educators	Master resource persons to train	Training costs, based on a blended model, combining 10 days workshop

to use ICTs for their subject teaching-learning	the teacher-educators	based, spread over 3-5 phases and a on-line email/portal based interactions
Build capabilities in teacher-educators to use ICTs for their own continuous and life-long professional development	Master resource persons to train the teacher-educator	Annual program of training for teacher-educators, on a blended model, combining 5 days workshop based, spread over 1-2 phases and a on-line email/portal based interactions
Teacher-educators to work with student-teachers and teachers to support their layered learning for ICT mediation in teaching-learning	Teacher-educators	Part of regular PSTE program.
Maintenance of the infrastructure	Lab attendant, consumables	Around 15% of the capital costs should be provided for maintenance and upgrade of infrastructure
Maintaining a web-portal /e-learning system (can be done as a second phase, after basic capacity building of all teacher-educators in first phase)	One web administrator. Resources for the portal would be created by the faculty as a part of their regular teaching and research work.	Apart from the web administrator, the costs of maintaining the portal would be around 10,000 per year.
Offering blended courses	Course creation and administration costs – largely part of people costs and should subsume into regular activities of the institution	Designing courses offered on a blended model with a large virtual component can be coordinated by SCERT with identified DIETs. Courses and faculty can be virtually shared across institutions

Components of Central assistance under the Scheme

9.13 The central aim of introducing technology in teacher education is to develop and promote openness for new thinking in an atmosphere of innovation through introduction of methods that are interactive, non-threatening and self paced – and move away from mechanical text-based, chalk and talk methods. Integrating ICT into teacher education is also necessary for bridging the digital divide between Government and private teachers, rich-poor, urban-rural, by providing opportunities to effectively use technology to further educational objectives. This will entail hardware support, namely provisioning for satellite transmission facilities in the DIETs. It will also entail provisioning for software support for developing content and orientation of teacher educators and teachers. Following assistance would be made available:

(i) One-time assistance upto Rs 5 lakh per DIET for hardware support;
(ii) Development of 50 teacher modules @ Rs 10 lakh per module (to be developed by the Central Government);
(iii) Upto Rs 70,000 for hub/switch;
(iv) One-time training/orientation of teacher educators upto Rs 1 lakh per DIET;
(v) Cost of additional support, including maintenance upto Rs 2 lakh per DIET per year.

9.14 Several SCERTs and DIETs already have the infrastructure support, including EDUSAT facilities and therefore, above provisioning would be limited only to those institutions which do not have such infrastructure and facilities at present.