Educational Technology in India

An Exploration of the Current Situation & Future Needs

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Executive Summary

Purpose of Study

The purpose of this Educational Technology (ET) Assessment is to identify gaps, hurdles and opportunities in educational technologies that are currently in use in India, with particular attention to information and communications technologies (ICT). The emphasis of the assessment is on the effectiveness with which existing technologies are being used to deliver educational content that improves learning, builds capacity of teachers and education administrators, and provides relevant (employment oriented) skills training. Annexure 11 provides the complete Terms of Reference for the assessment.

Methodology

The study commenced in the last few weeks of 2004 and continued throughout January 2005. The two investigators referenced various project documents, examined government policy papers, accessed the research evaluation literature, visited numerous sites where ET/ICT programs were being or had been implemented, and held many structured discussions with key implementing agents and other stakeholders in the government, non-government and corporate sectors.

Organisation of the Report

The main body of the Report is organized in six chapters. In Chapter 1, a brief description of the education sector structure and key performance indicators is given to provide the context for examining the role of educational technology in the new information age. Chapter 2 explains what educational technology (and information communications technology – ICT) means for the purposes of this study. The principal analysis of the study starts in Chapter 3 with a description of the various ET and ICT activities undertaken by the government, NGO and corporate sector. Chapter 4 builds on this with a synthesis of project level knowledge, first-hand observations, stakeholder discussions and the other research and evaluation data to draw some conclusions about the impacts of ET and ICT programs. These conclusions are further synthesized in Chapter 5 where lessons learned are presented along with issues that derive from these. Chapter 6 concludes the report with a series of suggestions for ways the QUEST Alliance could help address important needs in the ET/ICT sector.

Summary of Findings

The following list of findings is only provided in summary form. For more detail, the reader is referred to chapters 4 and 5 of the Report.

General Findings

- There is very limited evidence to support the widespread belief that ICTs can and will create graduates who will be better prepared for the demands of the 21st century. The positive impact of ICT use in education has not yet been proven.
- There is a persistent problem of putting technology before education. Most interventions are for the sake of introducing ICT in education rather than using the ICT for complementing the curriculum, teaching, learning, and skill development.
- ICTs are very rarely seen as central to the overall learning process.
- Comprehensive policies and plans for the effective use ET/ICT in education are missing at the state level.
- Computer-aided instruction has been seen to slightly improve student performance on multiple-choice, standardized tests in some areas.
- ICTs motivate students and the users believe that ICT makes a positive difference.
- ICTs can promote learner autonomy.
- While ICT's role in general education is steadily increasing, vocational and livelihood education are still relatively untouched by ICT.
- ICT use often promotes English language use.

- While radio-based instruction has enjoyed long-term and wide use, the satellite-based delivery system remains more hype than a proven alternative.
- New Internet technologies such as Wi-Fi and Wi-Max hold promise, but are not yet operational in the education sector.

ET/ICT Program Design & Implementation

- There is a need for clearer goals in ICT programs.
- Many projects are initiated at the state level because of the enthusiasm and initiative of an individual administrator. As a result, if the initiator goes, the project often languishes.
- A mismatch exists between methods used to measure effects and type of learning promoted.
- ICTs need to be used differently in different school subjects for optimal results.
- Access to ICT outside of school positively affects user confidence and impact.
- Where computers are physically placed in the school setting makes a difference.
- Models for successfully integrating ICT use during both in-school and after-school hours are still emerging.
- Positive impacts are more likely when linked to the pedagogical skills of the teacher.
- In many places, teachers' training is a one or two time affair. In this regard, there is an urgent need for competency development at the cluster and block levels.
- ICT use in student testing and performance assessments requires new processes.
- The debate about the appropriate age for first introducing computers to students is not settled.
- There are differential effects of ICT interventions depending on the gender of the student.
- An important question that needs an urgent answer is the extent to which ET/ICT projects are sustainable.
- Intellectual property issues are very real and require careful attention by program designers.
- Guidelines are lacking on the funding required to produce a program with given specifications.
- The Internet is not widely available; radio and TV are.
- Radio and TV can have high start-up costs and tend to reinforce existing pedagogical styles.
- The use of handheld devices is just now receiving serious widespread attention, but more research is needed.
- Community telecenters are popular, but successful, replicable models have not yet emerged.

Lessons Learned from Ongoing & Past ET/ICT Programs

- Most ICT interventions in the education sector have been through small, uncoordinated pilot projects.
- There has been little done to consolidate or rationalize the various ET/ICT efforts.
- There is no central database that can guide stakeholders and policy makers about which of the diverse kinds of ICT tools work best under given conditions.
- Quite often, projects are too expensive and remain only promising pilots.
- Many states are implementing radio projects, but there is little interaction or learning from each other – this is true of other types of ET/ICT interventions as well.
- There has been no organized attempt to establish the lessons learned from the projects executed in the past.
- There is a lack of comprehensive planning and execution in ET/ICT, resulting in utilization of resources and infrastructure that is often not appropriate or effective.
- There is a need for more on-the-ground evaluation, research and analysis.
- Government projects tend to concentrate on radio and TV, whereas corporate and NGO interventions rely more on using computers, multimedia, Internet, and interactive media.
- Access to information is considered to be one of the most important benefits of the uses of ICTs in education.

- Students use ICTs in much more sophisticated ways than teachers.
- Contact time between ICTs and teachers and ICTs and students vary widely.
- A number of educational initiatives utilizing mobile Internet centres have been piloted but little cost and impact data have emerged from such projects.

Educational Content and Software Related

- In all interventions, there is a dearth of content, and where it exists the content is generally stale and unimaginative.
- The absence of educational content directly linked to curricula is one of the key inhibiters of ICT use by teachers and learners.
- Official guidelines and directives enhance use of ICT-enabled content
- Content development is lagging due to funding needs, insufficient number of experts with the right mix of pedagogical, subject matter, script-writing and media competence.
- There is a particularly acute need for development of local content in local languages.
- Many government offices and NGOs are working in the area of content development, but no systematic attempt has been made to record the details and progress.
- Guidelines are lacking for the cost of software development in education, particularly content.
- Creating digital/electronic educational content is difficult and expensive.
- Evaluation of 'imported' content for cultural relevance must not be neglected.
- Digitizing content has important equity implications in terms of minority populations and their languages.
- Public-private partnerships are often crucial for the development of digital content.
- "Free" software holds promise, but real costs and impact are still not well documented.

Summary of Recommendations for QUEST Involvement

The following two lists provide areas where QUEST could usefully engage itself in the ET/ICT sector, both as an advocate for positive change and as a resource/implementation agent to further program-level advances.

Issues that Require Advocacy

- When ET/ICT programs are designed and planned, a comprehensive, rigorous needs assessment process (based on real data) is required as a first step.
- When choosing the ET/ICT intervention model, it is imperative to study the appropriateness of the technology with particular regard to cost, maintenance, sustainability, local environment and infrastructure.
- There is a need to encourage programs that especially target out-of-school youth.
- With regard to certain proven models, there is a need to scale up existing facilities (or add minimum new facilities) to ensure their successful expansion through government support and endorsement.
- Mapping of available content against certain parameters such as target, subjects, concepts, issues, type of materials (print, audio, video, multimedia) is essential.
- Action is required for using existing teleconferencing facilities for effective In-service and pre-service teacher training.
- Strong research inputs (qualitative and quantitative) are required in most if not all of the on-going ET/ICT interventions.
- At least in some states, there is a need to develop an advocacy group to develop ET/ICT policy and implementation guidelines in the context of education and skills/livelihood training.

Areas for Direct (Program-level) Support

- Strengthen the channels already established by different agencies at the national and state levels so that time taken for initiating a project can be reduced and commitment on the part of the cognizant state agencies for expansion can be obtained.

- In-depth study is required to assess the available content available in the marketplace and derive the additional needs that are yet to be covered.
- EduSAT has a lot of potential that will not be fully realized unless and until institutions such as NCTE, ISRO, SIETs, NCERT, CEE, and State Departments of Education get more involved in content generation and overseeing its effective utilization.
- Work is needed on the promising technology tools like mobile devices and the educational content for the same.
- Elementary Teacher Training Institutes have ET curriculum in pre-service programs. Attempts should be made to develop ET packages to support pre-service training programs.
- One-way video and two-way audio teleconferencing facilities could be more effectively used for teacher training and training of teacher educators, as well as for monitoring various other activities.
- The following technology models show a lot of promise for the education sector, provided they are adopted according to the principles and needs suggested in this report: Wi-Fi, Wi-Max, Internet Machines (by AMD), web-based portals, EduSAT, mobile phones with enhanced capabilities, educationally enhanced Information Kiosks, operating systems and applications enabled for local languages, and open source based content and software.

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ACRONYMS

AIR	All India Radio
APTEC	Appropriate Technology
BRC	Block Resource Centre
CALC	Computer Aided Learning Centre
CDAC	Centre for Development for Advance Computing
CEP	Computer Education Program
CIEFL	Central Institute of English and Foreign Languages
CIET	Central Institute of Educational Technology
CIIL	Central Institute of Indian Languages
CIPE	Centre for International Private Enterprise
CLASS	Computer Literacy and Studies in Schools
CLC	Computer Learning Centre
CLR	Centre for Learning Resources
CLTC	Community Learning Technology Centre
CRC	Cluster Resource Centre
DBMS	Database Management System
DEP	Distance Education Program
DIET	District Institute of Education and Training
DIT	Department of Information Technology
DPEP	District Primary Education Program
DSERT	Directorate of State Educational Research and Training
EDC	Education Development Center
EduSAT	Education Satellite
EFA	Education For All
ET	Educational Technology
HiWEL	Hole in the Wall
ICT	Information and Communication Technology
IIT	Indian Institute of Technology
IITE	International Institute of Technology in Education
ILI	International Literacy Institution
INSAT	Indian National Satellite
IRC	Interactive Radio Counselling
IRI	Interactive Radio Instruction
ISRO	Indian Space Research Organization
ITP	Interactive Training Program
KVS	Kendriya Vidyalaya Sangathan
LDC	Linguistic Data Consortium
LMS	Learning Management System
MNC	Multi-National Corporation
NAAC	National Assessment and Accreditation Council
NCERT	National Council of Educational Research and Training
NCTE	National Council for Teacher Education
NIIT	National Institute of Information Technology
NVS	Navodaya Vidyalaya Sangathan
SDMC	School Development and Management Committee
SIET	State Institute of Educational Technology
SITE	Satellite Instructional Television Experiment
SSA	Sarva Shiksha Abhiyan (Education for All)
T4	Technology Tools for Teaching and Training
TDCC	Training and Development Communication Channel
UPE	Universal Primary Education
VEC	Village Education Committee

Chapter 1

Status of Education in India

India has the potential to provide the largest workforce in times to come and the developed world sees a huge opportunity in reducing its labour costs by utilizing the skills of this workforce.

India's greatest strength is its young population. Around 53% of the Indian population is below 35 years out of which 43% is below 25 years of age; and unlike Europe and other developed countries, the percentage of young people in its population is very likely remain high for another 50 years.

The entire world, especially in places like the US, Europe, Japan, and several other developed nations, is looking forward to the emergence of this young workforce.

To tap this opportunity, it is clear that India's challenge is huge in the information and knowledge age where the potential workforce needs to be well educated and empowered enough to be appropriately employed.

But India's dismal education record, despite some recent achievements, raises several serious questions. Although the dropout rates in the country have decreased over time, the data available about the status of education in India (according to the Seventh All-India School Education Survey – 2002) portray a sector that is facing huge challenges for itself and the country. For example:

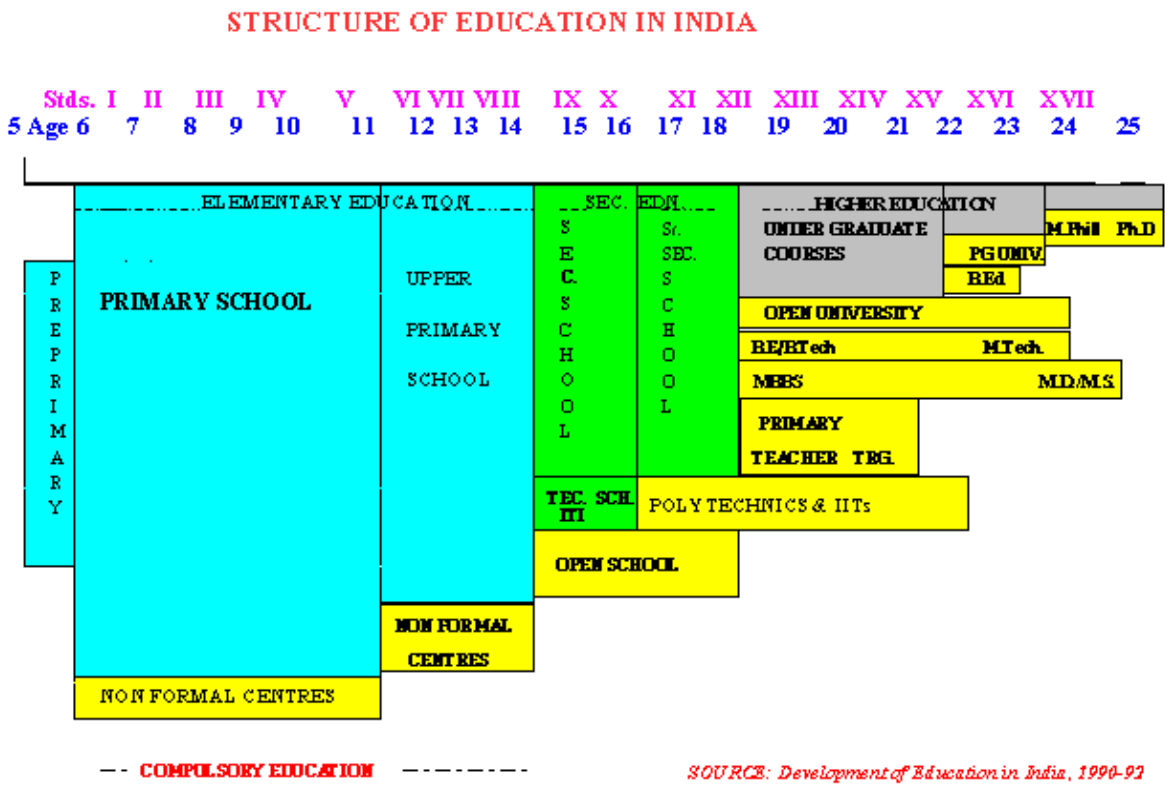
- Only 53 percent of rural habitations in India have primary schools – (Class I – V).
- Only 18 percent of rural India has upper primary (Class VI – VIII) schools.
- Only 18 percent of primary schools in rural India have four or more teachers.
- There are less than 64,000 secondary schools in rural India (Class IX – X).
- There are less than 23,000 higher secondary schools in rural India
- The average dropout rate at a primary level still (in 2000) remains high at around 40%, despite dropping from 65% in 1960.
- Also, the average dropout rate at the upper primary level (in 2000) was 55%, dropping from 85% in 1960.

Figure 1: Indian Education – Some Key Statistics

- Adult Literacy Rate: 59.5%
- India has 180 million adult illiterates
- 4.1% of GDP spent on education, likely to go up to 6%
- 1.1 million schools
- 6 million teachers
- 180 million school children
- Only 68% children reach grade V
- In the age group 6-14 yrs, 18.5% children remain out of school
- Only 47 out of 100 children enrolled in Class I reach Class VIII
- Dropout rate at primary level is 40% and 55% at upper primary level
- India is unlikely to achieve Education for All goal of 100% enrollment in primary schools by 2015 (UN)
- Unemployment Rate (2003): 9.1%

The following chart provides a useful overview of the structure of India's formal education system, from pre-primary through higher education.

<u>Figure 2</u>: India's Formal Education System



The above cited indicators on the status of Indian education are particularly disturbing in the context of an educational system that must prepare its next generation for an economy and employment opportunities that are rapidly shifting, as the following chart illustrates.

Figure 3: Future Workplace Needs

Skills Needed in the Work Place of the Future

Digital Age Literacy	
Functional literacy	Ability to decipher meaning and express ideas in a range of media; this includes the use of images, graphics, video, charts and graphs or *visual literacy*
Scientific literacy	Understanding of both the theoretical and applied aspects of science and mathematics
Technological literacy	Competence in the use of information and communication technologies
Information literacy	Ability to find, evaluate and make appropriate use of information, including via the use of ICTs
Cultural literacy	Appreciation of the diversity of cultures
Global awareness	Understanding of how nations, corporations, and communities all over the world are interrelated
Inventive Thinking	
Adaptability	Ability to adapt and manage in a complex, interdependent world
Curiosity	Desire to know
Creativity	Ability to use imagination to create new things
Risk-taking	Ability to take risks
Higher-Order Thinking	Creative problem-solving and logical thinking that result in sound judgments
Effective Communication	
Teaming	Ability to work in a team
Collaboration and	Ability to interact smoothly and work effectively with others
Personal and social	Be accountable for the way they use ICTs and to learn to use ICTs for the public good
Interactive communication	Competence in conveying, transmitting, accessing and understanding information
High Productivity	Ability to prioritize, plan, and manage programs and projects to achieve the desired resultsAbility to apply what they learn in the classroom to real-life contexts to create relevant, high-quality products

SOURCE: Adapted from EnGauge. North Central Regional Educational Laboratory. **Available Online at http://www.ncrel.org/engauge/skills/21skills.htm. Accessed 31 May 2002.**

Echoing the global call of "Education for All", India formulated *Sarva Shiksha Abhiyan* (SSA) envisioning "to provide useful and relevant elementary education for all children in the 6-14 age group by 2010, and also to bridge social, regional and gender gaps, with the active participation of the community in the management of schools." Yet, despite some notable progress, India is unlikely to achieve the Education for All goal of 100% enrolment in primary schools, even by the year 2015.

The current situation is that India does not have the basic school infrastructure in place to educate or "educationally empower" the *342 million children of ages 5-19 years* who need to be productively employed in the next 15 years.

It is therefore imperative as well as urgent for India to invest heavily in education. However, considering the available finances, and the challenges of educating the Indian masses under the age of 19 years, traditional bricks-and-mortar based school systems will not suffice to solve the problems of the sector in the short term.

There is a greater need to leverage the power of Information Technology to supplement inadequate instructional behaviours and content knowledge with more interactive teaching and learning strategies. Both what children learn and how they learn it will have to change. The following table illustrates some of the differences in pedagogy required by the information society compared to the industrial society.

Figure 4: Overview of Pedagogy in the Industrial versus Information Society

Aspect	Less ('traditional pedagogy')	More ('emerging pedagogy' for the information society)
Active	• Activities prescribed by teacher • Whole class instruction • Little variation in activities • Pace determined by the program	• Activities determined by learners • Small groups • Many different activities • Pace determined by learners
Collaborative	• Individual • Homogenous groups • Everyone for him/herself	• Working in teams • Heterogeneous groups • Supporting each other
Creative	• Reproductive learning • Apply known solutions to problems	• Productive learning • Find new solutions to problems
Integrative	• No link between theory and practice • Separate subjects • Discipline-based • Individual teachers	• Integrating theory and practice • Relations between subjects • Thematic • Teams of teachers
Evaluative	• Teacher-directed • Summative	• Student-directed • Diagnostic

SOURCE: Thijs, A., et al. Learning Through the Web. Available Online http://www.decidenet.nl/Publications/Web_Based_Learning.pdf Accessed 31 May 2002.

Undertaking such changes will in many cases require good broadband connectivity. Initially this is only practical for those cities and districts with adequate infrastructure, but eventually all areas of the country will have to be covered.

Chapter 2

Educational Technology – What Does it Mean (in the Indian Context)?

General Definitions

According to a web-based glossary, Educational Technology (ET) is about "using multimedia technologies or audiovisual aids as a tool to enhance the teaching and learning process."

The other definition of ET is "a complex, integrated process involving people, procedures, ideas, devices, and organization, for analyzing problems, and devising, implementing, evaluating and managing solutions to those problems, involved in all aspects of human learning." However, for some, it "includes all components of informational technology used in the delivery of educational materials."

ET and ICT Tools

Education Technology (ET) tools are generally thought of as encompassing radio, television, satellite radio, FM radio, cinema, narrowband devices (e.g., cassettes), and (recently) EduSAT. Figure 5 to the right illustrates some of the ET related facilities currently operating in India.

ICT tools are often differentiated from ET tools, and generally include computers, multimedia devices, CD and DVD media, the Internet, handhelds, and mobile phones. Applications using the ICT tools can include email, World Wide Web, mediated "chat-rooms", online discussions, and wireless transmissions using WiFi and WiMax connectivity.

In India, across all government-run schools, the most common application of ET is the use of radio and TV for education and community outreach. In the case of private schools, increasingly common uses of ET span across interventions mediated by computers, internet, multimedia, and mobile devices.

Figure 5: ET Uplink Tools & Facilities

Uplink Facilities for Radio, Teleconferencing (Audio, One Video, Two way Video)

Nature of Facility	Location of facilities	Remarks
Radio Broadcast	All India Radio has in Most of the Districts and in all States	Available on for hiring (About Rs.2000 to 4000 depending the nature of Radio Station)
Audio Teleconferencing Video Broadcast	All India Radio has in Most of the Districts and in all States (available on for hiring) DoorDarshn provides the facility. SIETs are using DDs facility for broadcasting their Programmes in A.P, Orrissa, Maharastra, Bihar, U.P,Delhi, Gujarath. Hyderabad Kanataka has the facility under EDUSAT	Available on for hiring (About Rs.2000 to 4000 depending the nature of Radio Station Now it is broadcast by DDs without any charge
One way Video Teleconferencing	Ahmedabad, Bhopal, Delhi, Goa, Gandhinagar, Hyderabad, Mysore,	Available on for hiring (Rs.35000 per day)
Two way Video (computer) Teleconferencing Two way Video (computer) Teleconferencing under EDUSAT	National Informatics Center provides the facility at most of the Districts 100 Centers (list by NCERT) places include Teacher training institutions 100 Centers by IGNOU, places include their Regional Centers and Study Centers, State Open Universities,	Available on for hiring No Charges

Vision and Plans of the Government of India

The government of India has devised a scheme called "Computer Literacy and Studies in Schools (CLASS)", subsequently modified and renamed the *Revised Scheme of CLASS 2002*. The aim of this scheme is "to create awareness among school students about the computer and its usage in the teaching-learning process and in the modern world so that they make full benefit of information and communications technology in their daily life and in education at every level."

Objectives:

- To promote the usage of ICT especially in secondary and higher secondary government schools in rural areas.
- To ensure the availability of quality content on-line.

- To enrich the existing curriculum and pedagogy by employing ICT tools for teaching and learning.
- To enable students to acquire skills needed for the Digital world for higher studies and gainful employment.
- To provide an effective learning environment for children with special needs through ICT tools.
- To promote critical thinking and analytical skills by developing self-learning.
- To promote the use of ICT tools in distance education including the employment of audio-visual medium and satellite-based devices.

Components:

- The partnership with State Governments and Union Territories Administrations for providing computer-aided education to secondary and higher secondary government schools.
- The establishment of "SMART" schools which shall be technology demonstrators.
- Universalization of Computer Literacy through the network of KVS and NVS to neighbouring schools.
- The activities of State Institutes of Education Technology (SIETs).

Financial Parameters:

- 75% of financial assistance to State/UTs by the Union Government.
- Balance 25% of funds to be contributed by the State Governments/UTs
- Overall budget ceiling of Rs.6.70 lakh per school of which Central Government's share to be restricted to Rs.5.00 lakh per school
- A grant of not more than Rs.25 lakh per SMART school
- A sum of Rs.2.5 lakh as recurring costs which includes maintenance, consumable, Internet usage & monitoring costs
- Kendriya Vidyalayas and Navodaya Vidyalayas to be given funds at the rate of Rs.20,000/- per neighbourhood school to impart computer literacy to not more than ten neighbourhood schools within a radius of 3 to 4 km
- Financial assistance to SIETs in the project mode.

Illustrative List of Activities:

- Production of audio, video and multimedia programs in the project mode by the SIETs.
- Assessment of need for multimedia programs, preparation of profiles of target groups, design and development of audio-video programs and other teaching aids, training of state level personnel in the process of educational technology by CIET/SIET.
- Training of teachers and teacher trainers in the production of low-cost audio-visual aids, help in script development, media production, editing, communication research, setting up and operation of audio and video studios and computerization of its various processes by CIET/SIET.

Figure 6: Number of receiving systems available across States for Teleconferencing

States	No. of Systems Available
Andhra Pradesh	32
Assam	10
Bihar	11
Goa	25
Gujarat	265
Himachal Pradesh	5
Haryana	17
Madhya Pradesh (Jhabua)	1038
Madhya Pradesh (Excluding Jhabua)	184
Orissa	132
Rajasthan	33
Karnataka	290
Kerala	32
Tamil Nadu	7
Uttar Pradesh	25
IGNOU	187
AIMA	56
AOU	20
NEC	12

Note: During 2003, 516 ITPs programs were organized by 38 departments. The main users were Karnataka (172), Madhya Pradesh (154), Gujarat (100), Rajasthan (44), Orissa (35) and Others (11).

Source: Manual for Utilization Study on Interactive Training Program, DECU, ISRO, Ahmedabad, March 2004.

- Organizing Educational Film Festivals/Multimedia contests. Financial support to States/UTs on the basis of their Computer Education Plans (CEPs).
- Development of multimedia content for use in schools.
- Digitization of video and audio cassettes produced by SIETs on the basis of fresh assessments and in partnership with non-governmental agencies so as to make them viable and self-sufficient.
- Development of teaching tools and designing training modules for teachers. Financial support for conversion of content into regional languages. Projects for introduction of use of technology for the education of children with special needs.
- Training of teachers and master trainers/resource persons in the use of ICT tools.

Current Situation & Additional Possibilities

The following figure shows at various levels of the education system current availability of ICT tools as well as future, expanded possibilities.

Figure 7: ICT Tools & Applications across Educational Institutions

Levels	Roles	Interventions for ICT			Training	
		Tools available at present	Tools that could be made available	Amount allocated which can be utilized	Additional knowledge	Skills
School	• Imparting Quality Education • Ensuring Community participation in UPE	RADIO RCCP	TV / OHP Computers	Teacher - Rs. 500/- School – Rs.2000/-	• IRI • Computer Education	
CRCs	• Monitoring & maintenance of Tools / Materials • Providing academic support for teachers	Radio / RCCP TV / OHP	Computers Telephone		• IRI • Computer Education	
BRCs	• Training CRC/Teachers on curricular & contextual issues • DBMS	Radio / RCCP TV / OHP Computers Telephone	Internet LMS facility		• CAI • Supervision • Data input • Simple analysis	
DIETs	• Planning, Monitoring and Evaluating • Conducting Pre and in-service Teacher Training Programmes • Providing support to BRCs • DBMS • Feeding the State agencies	Radio / RCCP TV / OHP Computers Telephone Facility for Video Conferencing	Internet LMS facility	SSA funds of Rs.15 lakh for Computer Education in Schools	• CAI • Supervision • Data analysis • Facilitating Teleconferencing • Use of LMS facility • Planning	
DSERT	• Planning • Training of DIET faculty • Development of Materials • Monitoring & Evaluation	Radio / RCCP TV / OHP Computers Telephone Facility for Video Conferencing	Internet LMS facility		• Development of Materials (Content for Audio/Video/ MM) • Use of LMS facility	

The Implications of ET & ICT – the Indian Context

The choices and implications for effectively applying educational and information communications technologies range over all of their elements: hardware, software, human resources, physical settings and delivery systems. In addition, since the starting point for fostering real change in the teaching-learning process is the curriculum, ICT and ET must be made an explicit part of the syllabus, both as a transaction medium as well as a subject for learning. And, in this role they both have their own challenges:

1. Enabling education and curriculum with ET and ICT for:
   a. facilitating education outreach
   b. reaching distance education centres, schools, and institutions
   c. achieving interactivity in education
   d. motivating and enthusing students
   e. achieving efficiency, transparency, accountability, monitoring, and management

f. offering additional and complementing content through ICT as technology as well as medium
g. connecting different locations
h. training teachers and capacity building
i. helping stakeholders of education system
j. offering digital content to distance education programmes.

Challenges & Opportunities of Improving Education with ET and ICT

- enabling and preparing the content for the particular technology and medium
- capacity building for using and managing the medium and technology
- make the technology serve education and not vice versa
- use of ET and ICT can accelerate the reach of education to the un-served and under-served masses.

2. Incorporating ICT and education technologies in the education system with curriculum: The purpose of ET and ICT being incorporated in the curriculum would create awareness among the students and teachers. It would also equip the students and teachers alike for better skills, competencies, and readiness for the demands of the modern workforce.

   Challenges & Opportunities of Incorporating ICT & ET in Education System, Curriculum & Courses

   - business opportunities for ICT companies
   - opportunities for MNCs to market their products
   - the need to be rigorous and objective in selecting applications that truly demonstrate educational and/or cost advantages over more conventional approaches.

While improving education with ET and ICT" is essentially a government responsibility, its appropriate introduction and use in the sector is so urgent and compelling that many non-government actors must be involved. Success in this arena will require collaboration and cooperation among the various stakeholders, including private non-profit and profit-making entities.

Chapter 3

Analysis of Education Technology in India

One of the thematic studies under the EFA 2000 Assessment (UNESCO) states that in the last decade of the last millennium, computers and interactive radio instruction have been put to much use in schools. New technologies have been used not only for regular students and teachers, but also for children in remote areas, street children, war victims and refugees. Distance education for teacher training has proved quite effective. The outcome of the application of technologies has been the widening of access, improving quality and changing the curriculum.

In today's knowledge society, ET tools, such as radio, telephone, audio-cassettes, television, video-cassettes, films, computer, multimedia and satellite, are being put to good use in school education – for students as well as teachers; for teaching as well as training; for content development as well as content delivery.

The swift and unprecedented technological changes have resulted in structural modifications to education. Realizing the potential of ET in helping especially the marginalized sections of the community to access education, UNESCO has established the International Institute of Technologies in Education (IITE).

The Department of Information Technology (DIT) in India took a significant step in this direction by instituting the Computer Literacy Excellence Awards for schools in 2002 to encourage the use of ICT in the learning environment. More than the award, this action indicates that the Indian government recognizes the need for promoting ICT as a learning tool in the education sector, starting with the lowest levels of educational pyramid.

The following examples of interventions attempt to cover the entire canvas of the education sector – government, private/corporate, NGO and others. They also offer interventions across diverse medium, such as radio, TV, computers, multimedia, Internet, satellite and the like.

GOVERNMENT PROJECTS **RADIO & NARROW BAND**

All India Radio (AIR)

Radio was the first of the telecommunication technologies to be used for education in India. All India Radio educational broadcast commenced in 1927 when the Madras Corporation started broadcasting its own transmitter programs in Tamil for primary schools. At present, programs for schools are broadcast from over 75 stations in their respective regional languages during the school hours. There have been some special radio projects like a 13-part weekly serial of Methods of Science (1989) in 17 languages, and 130 episodes of Human Evolution (1993) in 17 languages. Premier educational bodies, like NCERT, entrusted with the task of steering school education in the right direction, have also produced several audio programs for radio broadcast. *Teaching of First Language at the Primary Level* was produced by CIET of NCERT for daily broadcast through All India Radio (AIR) to 500 rural primary schools of Jaipur and Ajmer in Rajasthan (1979 – 82). This was repeated in 450 rural primary schools of Hoshangabad in Madhya Pradesh (1987 – 90) through non-broadcast mode.

The Department of Pre-School and Elementary Education of the NCERT produced 180 audio programs on environmental themes for children of 3-5 years. These were broadcast by AIR from Kota during 1988-89 for Anganwadis. Similar programs for Anganwadis were produced by the Department of Women and Child Development in collaboration with NCERT and broadcast from the AIR stations of Hyderabad, Bhubaneshwar, Rohtak and Lucknow in 1992-93. The impact of the above programs has been positive as revealed in an evaluation of the programs.

Indira Gandhi National Open University

IGNOU has started a significant Distance Education Program (DEP) in 18 States that were under the District Primary Education Program (DPEP) in India. The main focus of DEP-DPEP has been the training of primary school teachers and other functionaries in the field of primary education. A number of radio programs in the primary school curricular areas, mainly language, mathematics and environmental studies, have been promoted in the different States of India by the DEP-DPEP.

Interactive Radio Counselling (IRC)

IRC was started on an experimental basis from the Bhopal regional centre of AIR in October 1999. This facility is now widely available across AIR listening areas. The program is broadcast live and subject experts are present in the studios during broadcasts. Students can ask questions by dialling the number of the studio during the program and the experts reply to the questions on the spot. The one-hour national broadcast is transmitted in Hindi from Delhi and in English from Kolkata.

Over time, there has been an evolution in radio instruction from the delivery of lessons in a lecture mode. With the phone-in component, the learning process benefited from two-way, real-time audio communication. Pre-and post-broadcast activities made the lessons more interesting and, importantly, required the involvement of both teachers and students. The teacher training and teacher's manual made the lessons more meaningful and purpose-oriented.

Keli-Kali Radio program in Karnataka (Govt. of Karnataka, AIR)

The project was initiated in 2000 – 01 in two districts (Raichur and Gulbarga) of northern Karnataka to provide support to classroom teaching. About 250,000 grade 3 students from 5000 schools have benefited from the lessons that are broadcast from two radio stations. The process of development of radio lessons involved:

- identification of hard spots
- teachers' training in script development
- development of scripts and editing
- production of programs by AIR
- preparation of teachers' handbook and orientation of BRCs and CRCs
- training of all teachers by the BRCs and the CRCs
- provision of funding by the state government for purchase of radio sets/radio cum cassette players and dry cells
- discussion in CRC meetings about stocktaking, reporting and sorting out the problems related to listening to the radio lessons
- organization of audio teleconferencing with teachers and BRCs/CRCs for getting feedback
- documentation and research to determine the effectiveness of the project.

Earlier the project focused only on grade 3 and 4 students, but in 2004-2005, grade 5 and 6 students also became targeted beneficiaries.

Radio Broadcasts in Andhra Pradesh, Himachal Pradesh (State Governments, AIR) – *Vindam Nerchukundam* (Listen and Learn) in Andhra Pradesh

Similar to Karnataka's Keli–Kali program, Andhra Pradesh also initiated a radio project in Vishakhapatnam in 2002 for grade 3 students. In 2003, it was extended to grade 4 and in 2004 to grade 5. The programs were broadcast from four AIR Stations. The program benefited about 29 lakh students and 1.5 lakh teachers. Similarly, in Himachal Pradesh since the year 2000, a radio program called Gyankalash has been broadcast to students of grades 1 to 5 during evening hours.

Interactive Radio Instruction (IRI)

Over the past three years, interactive radio instruction (IRI) has been introduced in different parts of the country, providing yet another way to keep students actively engaged in the radio broadcast. IRI offers additional advantages over IRC in that it can be used to reach generally hard-to-reach populations. One such IRI project targeting marginal and remote primary student audiences is presently being implemented through funding from USAID and the cooperative efforts of state governments and the Education Development Center (EDC). The project, called Technology Tools for Teaching & Training (T4), operates in different ways in its four focus states. While its main intervention modality is IRI, in Karnataka it is also supporting the production of instructional videos.

IRI and video programs under T4 in Karnataka

The project is being implemented in four blocks in a total of 342 schools. In Chamrajnagar, Raichur and Gulbarga, 90 schools each; and in Bangalore, 72 schools are covered. Schools have been supplied with radio sets and/or TV sets and video cassettes. The program called 'Chukke Chinna', is broadcast thrice a week (through a half hour module) and is not just a listening program – teachers and students perform activities based on the very friendly instructions given by the central character in the IRI modules and are therefore active participants in the goings-on in the classroom, not just passive listeners.

EDC organized several rounds of discussions and workshops among experts and teachers and thereby master plans and scripts were developed for teaching of hard spots in science, social studies and mathematics for grades 4 and 5. The actual programs (72 radio programs and 40 films) have been produced by private producers in the audio and video digital studios set up by EDC in the premises of the Directorate of State Educational Research & Training (DSERT), Karnataka. Each module was formatively evaluated by independent, local NGOs and the necessary improvements were incorporated while finalizing the modules for broadcast/screening.

The project has a very strong monitoring component – both teacher practice and student learning are assessed pre and post intervention through very well designed assessment tools. Qualitative data are also collected to see the impact on student attendance. At the request of the Karnataka government, IRI modules are also being developed for grades 1 to 3 and the entire program for grades 1 to 5 will be scaled up to the entire state in the coming academic year. Regarding the educational films, EDC hopes that the Karnataka government will soon telecast them state-wide using the EduSAT satellite.

The materials that have been produced under T4 are being archived through a digital library and discussions are underway with national organizations about the most suitable location of this library.

IRI (English) under T4 in Chhattisgarh, Jharkhand and Madhya Pradesh

The project has developed 132 IRI programs for teaching English language to grades 1 and 2 in these states. The programs are broadcast in Raipur, Kanker, Bastar and Durg districts of Chhattisgarh; Ranchi, Hazaribagh and Sarai Kalan districts of Jharkhand; and Jhabua and Mandla districts of M.P. In these states, each half hour module is broadcast 6 days a week and a weekly 15 minute teacher training program (called 'Hello Teacher') is also broadcast. A total of 740 schools (350 in Chhattisgarh, 300 in Jharkhand and 90 in M.P.) are covered under the program in these three states.

GOVERNMENT PROJECTS TELEVISION; VIDEO FILMS & CASSETTES

In India, television was introduced in 1959 and Doordarshan and since then the national television of India has been broadcasting various educational programs from time to time. The School Television Project launched in the early eighties addressed specific problems in the

teaching of science in 800 schools in Delhi. The problems included a new science curriculum, inadequately trained science teachers and poorly equipped laboratories. Targeted at higher secondary level, the program gave encouraging results over five years; subsequently, programs for secondary schools levels were also developed and telecast.

Country-wide Classroom is an educational TV program of the University Grants Commission (UGC) started in the year 1984. Under this program, different academic subjects are covered. Here the target audience is mainly the higher secondary students. .

The centrally sponsored scheme on educational technology under SIET has provided colour television and radio-cum-cassette players to almost all elementary schools. National level evaluation studies indicate that the majority of the television sets and radio-cum-cassette players are in working condition though not necessarily in use. Such facilities are available in secondary schools almost in all states.

DPEP/Andhra Pradesh, made use of cable TV for some of its teacher training programs. DPEP/Karnataka used a film '*Malka'* created by filmmaker M.S. Sathyu for telecast in Doordarshan; this film focuses on the education of the girl child.

Audio cassette players, usually with built-in radios, have been effective in listening to educational programs, and recording radio programs to listen to again and again. For example, audio-cassettes of nursery rhymes are very common in schools and homes. There are cassettes of poems in the different languages taught in primary schools. Educational institutions like CIEFL, (Hyderabad), CIIL (Mysore) and NCERT (Delhi) have produced audiocassettes of educational programs. When English was introduced in standard 5, SIET/Maharashtra prepared English audiocassettes for standards 5, 6 and 7 titled 'Listen and Learn'. The cassettes became very popular in all the schools – both urban and rural. The difference in the quality of spoken English before and after the introduction of the cassettes was tremendous: not only the English of the teachers and the students improved, but also that of the parents. Cassettes were also produced under the auspices of DEP-DPEP in some of the States like Haryana, Bihar and Kerala.

Teacher training programs

Teacher training programs used to be telecast by all the six State Institutes of Educational Technology (SIETs) of Bihar, Orissa, Uttar Pradesh, Maharashtra, Andhra Pradesh and Gujarat in different languages and by the Central Institute of Educational Technology (CIET) in Hindi. The program has since been discontinued.

DEP – DPEP

This project made good use of the video technology in training primary school teachers and other educational functionaries. From the many video programs developed by CIET of NCERT and a market agency, ET&T, sixteen were selected and duplicated, and the cassettes were distributed in the states of Bihar, Haryana, Himachal Pradesh, Madhya Pradesh, Rajasthan and Uttar Pradesh along with a user manual. Mathematics, science, environmental studies, art education, creativity, activity-based teaching, attitudes of teachers and multi-grade teaching formed the content of these video programs. In addition, 19 videos, each 10-15 minutes long, were developed. These videos provided methods and procedures for developing the teaching and learning materials, and demonstrations on their use in actual classrooms.

EDUSAT Program of Karnataka (Video broadcast)

This program was initiated in 2002-03. Based on the hard spots identified by teachers, content outline was developed by experts. This was given to scriptwriters for developing script outlines. The state department then identified the content producers. After giving orientation to the producers, the scripts were shared with them in order to produce the programs. An expert

committee reviewed the programs. A teacher handbook was prepared to support the video programs and supplied to teachers of Chamarajanagar district.

The Indian Space Research Organization (ISRO) arranged for installation of receiving facilities in each of 851 schools of the district. The system included TV, solar backed power, and a digital receiving system. A studio was installed on the DSERT premises. An evaluation plan has been established. The program was launched officially in Feb, 2004.

State of Maharashtra

In Maharashtra, a multi-media package (containing 25 self-learning print materials for distance education, six audio programs and six video programs for use in contact sessions) was used for training in-service primary school teachers both in the urban and rural areas. It has proved to be effective: the exposed teachers have achieved results equivalent to conventionally trained teachers. It was also realized that for changing classroom practice, self learning materials alone are not sufficient: it is easier to assess knowledge and understanding of trainees through distance mode, but not their pedagogical skills, which calls for observation and authentication.

GOVERNMENT PROJECTS COMPUTERS, MULTIMEDIA & INTERNET

In October 2002, the Indian government launched a Rs. 6,000 crore project called Vidya Vahini to provide for ICT and ICT-enabled education in 60,000 schools over three years. A pilot covering 150 schools in seven districts with a budget of 15 crore is currently underway. It was originally proposed that all of the project schools would be provided with a computer lab and that the computer lab will also be equipped with Internet, Intranet and television to facilitate video-conferencing, web-broadcasting and e-learning. Schools across the states of Andhra Pradesh, Gujarat, Jharkhand, West Bengal, Maharashtra and Uttar Pradesh have been provided with computers and internet connectivity using VSATs to provide learning materials in a distant education mode.

Head Start in Madhya Pradesh (Computer Aided Instruction)

A computer aided learning project named “Head Start” was started in 2002 in Madhya Pradesh. At present, there are 2,718 schools covered in the Head Start program, with each school having been given a minimum of three computer systems, including 3-hour back-up power equipment.

The computer-equipped classrooms are located in clusters centres (located in primary school buildings). The content is developed and provided on CDs by the Rajiv Gandhi Shiksha Mission in Bhopal and distributed to all the participating schools. The programs deal with the hard spots identified by the teachers.

The Mission has trained the teachers of these schools to effectively use the CDs in the classrooms. The topics cover all the subjects being taught in the schools, namely science, mathematics, social science, English, and Hindi. The Program is interactive in nature and has self evaluation elements built in.

Research conducted recently indicates that the students have gained significantly in mathematical skills followed by science and social science. Language is another area where students have been found to improve significantly.

Computer Aided Instruction in Kerala (State Government)

The IT @ School Project was started in Kerala as a Computer Aided Project in 2003 for the benefit of grade 8 students but was later extended to grades 9 and 10. The state has developed a syllabus for computer education. The project is implemented in about 2,735 schools. About 25,700 computers systems have been provided with an average of three students sharing one

computer. Each student gets four hours per week including two hours for theory and two hours for practical applications. Students also take examinations online. The funding for this project has come from different sources, including the MPs/MLAs fund. So far about Rs 18 crore have been spent. Each student is charged not more than Rs.25 per month, and in the case of SC/ST students, the State reimburses the entire amount.

Teleconferencing for Training Teachers and other Primary Education Personnel

From 1996 to the present, one-way video and two way audio programs (teleconferencing) have been organized in most of the states. The programs are primarily meant for the orientation and training of teachers and other education officials. So far, more than 150,000 people have been provided orientation or training. More than 2,000 persons have been trained as facilitators and panelists. The states that have conducted teleconferencing programs include A.P., Assam, Bihar, Gujarat, Himachal Pradesh, Orissa, Rajasthan, Karnataka, Kerala, Tamil Nadu, and Uttar Pradesh. There are up-link facilities available in different regions of the country and down-link facilities in almost all the districts headquarters (in some states even at the block level).

Mahiti Sindhu (State Government, NIIT, APTEC, EDUCOM)

This program was initiated in 2000 and is being implemented in about 1000 secondary schools of Karnataka. Each class is exposed to computer-based instructional modules an average of four periods per week, with a ratio of computers to students of about 1:30. The instructional content is provided on a CD in various subjects. An external evaluation of the project has been conducted, but issuance of the final report is still pending.

Aarohi Project, Uttaranchal

This perhaps the only project where the government has covered all the government primary schools by installing from three to five computers on each campus. All the computer labs are also backed up by a generator. Gradually, each of the labs is getting connectivity as well. The project is going through a mid-term assessment, which will throw light on the gains as well as the challenges. However, at the moment the project is planning to use the infrastructure to build a portal for both students and teachers, where the users themselves would create content for access by others.

Central Institute of Educational Technology

CIET has a mandate to produce 150 programs each in audio and video formats every year. To date, CIET has produced more than 2,000 video programs and more than 3,000 audio programs. Since EduSAT is now available, the Institute is working on piloting 100 interactive monitors at one of its locations to test the maximum leverage EduSAT can offer for imparting education in a two-way, interactive mode.

GOVERNMENT PROJECTS SATELLITE

Satellite-based communication has been creating waves in the education sector. India launched the Satellite Instructional Television Experiment (SITE) using the American Satellite ATS-6 in the mid-seventies. SITE was instrumental in telecasting educational programs in the morning hours for the children aged 5 –12. It covered 2,400 remote villages across six states and helped train 48,000 teachers. The training had a good impact on science teachers at the primary level. However, school children did not demonstrate any significant gains in learning as a result of television viewing, except in the case of languages where some learning gains were noticed.

With the commissioning of Indian National Satellite (INSAT) in the mid eighties, Institutes of Educational Technology were set up at the centre and in some states for producing educational software at the school level. The INSAT-ETV telecast programs for children during the week

days and for teachers on Saturdays. Assessment of the INSAT-ETV experience revealed the following:

- Lack of regular power supply
- Inadequate orientation of teachers
- Lack of capacity building
- Lack of integration of the TV period in the school timetable
- Lack of expeditious repair and maintenance of TV sets
- In 60% of the TV programs, emphasis was on the teaching techniques and educational innovations
- In the majority of cases, the objectives of improving attitudes and boosting interest were realized
- In 40% of programs had information overload leading to lack of assimilation of facts
- In 40% of programs, visuals were flashed without giving sufficient time for observation
- In 40% of cases, there was lack of synchronization of the visuals with the commentary.

Interactive Television Programs – Training and Development Communication Channel (TDCC)

In the mid-nineties, there was yet another landmark in the history of the use of satellite-based communication in the educational sector. In 1995, the Indian Space Research Organisation (ISRO) dedicated a channel exclusively for interactive television programs, known as the Training and Development Communication Channel (TDCC). With such a satellite communication facility, DEP decided to adopt the teleconferencing mode for its training programs. DEP opted for one-way video and two-way audio teleconferencing.

The teleconferencing programs organised by DEP could be broadly classified into four categories: building awareness (e.g., alternative schooling systems, training of VECs, strengthening of BRCs, monitoring of information systems, formation of SDMC, child census); contextual issues (e.g., multi-grade teaching, tribal education, gender issues); curriculum areas (e.g., activity-based teaching, basic concepts in mathematics, teacher training program in English, learning theories, development of teaching-learning materials); and State-specific needs (e.g., *Chinnara Angala* and *Keli-Kali* in Karnataka). Most of these programs were at the state level. There were two national level teleconferencing programs: interaction with DPEP personnel regarding Distance Education Program; and planning, implementation and monitoring of the national SSA program.

Many States had conducted evaluation studies and obtained feedback on the teleconferencing programs. Teleconferencing as a mode of training has consistently proven to produce positive results.

Effectiveness of Alternative Technology Options for Training Primary Teachers

NCERT initiated a project called 'A Study on the Relative Effectiveness of Alternative Technology Options for Training Primary Teachers'. In this project, three modes of training were used: teleconferencing, face-to-face and multi-channel (face-to-face using video inputs). In all the three modes, a total of 1300 teachers were trained and 126 resource persons/facilitators participated. The major findings of the study were:

- the gain in achieved scores was almost the same in all the three modes
- training through the teleconferencing is not more expensive than the other two methods
- the teleconferencing mode is more effective than the other two modes with respect to:
  - participants' involvement, motivation and interest
  - nature and quality of interaction between participants and experts, and
  - punctuality and adherence to the schedule by the participants.

Educational Satellite - EduSAT

At the end of the last millennium, ISRO agreed to a channel dedicated to education: TDCC. With the onset of the present millennium, it has dedicated a satellite itself – EduSAT – to cater to the various needs of the education sector. The State Government of Karnataka, deciding to derive maximum benefits from EduSAT, has been supplying television sets to select schools in all the districts; and to all the schools in Chamarajanagar – an educationally backward district. Solar power as a backup for erratic electricity has been of great benefit to the users. DSERT has been preparing video films in all curricular areas for classes 3 to 7; the telecast of these films has just commenced. The impact of these films on the achievement of the students and on the teachers will be known after the planned assessments are undertaken.

In addition to its IRI interventions in Karnataka, T4 (EDC) is taking advantage of the educational satellite by telecasting a few instructional films catering to classes 4 and 5 in Karnataka.

CORPORATE

Most of the examples of corporate ET interventions are in the area of computers and multimedia. Therefore, despite their obvious and significant differences in approach and application, all of the initiatives spearheaded by the corporate sector are discussed under one heading without any further attempt at categorization.

Lead by IT companies, corporate interest in education has been increasing exponentially. Since India has a large pool of youth and potential human resource, there is a general consciousness among the corporate houses that they should invest in education as a way to create a better workforce environment. Invariably, all the companies discussed here have a focussed intention: to create more and more skilled and educationally empowered population.

Shiksha India

The revised CLASS scheme of the government was evaluated by Shiksha India, a non-profit initiative of the Confederation of Indian Industries (CII) and World Economic Forum (WEF). The review showed that the overall response in the various states has been extremely encouraging. Some states like West Bengal, Andhra Pradesh, Tamil Nadu, Chhattisgarh and Manipur have achieved remarkable progress.

But there are certain areas which need attention. The evaluation report has shown that there is a need for teacher training, monitoring, development of digital content and continuous power supply to optimize the utilization of resources made available under this scheme and to expand them further. In this context, one also needs to have a look at various innovative initiatives which are the result of a partnership between the government and private sector.

Intel Teach to the Future Program

Intel's Tech to the Future Program is a computer-aided instruction executed in coordination with twelve state governments. The program includes professional development for in-service and pre-service teachers. The course helps teachers use technology to support project-based learning and to encourage active inquiry and higher order thinking. Participating teachers receive extensive training and resources incorporating Internet, multimedia, and assessment tools aligned with the local board's curriculum framework. More than 400,000 teachers have been trained so far. The program was started in February 2000 in India. The program has reportedly shown positive impact in curriculum, pedagogy and various aspects of education policy in Gujarat, Uttaranchal, Delhi, Karnataka and Kerala.

Intel is also working with over 25 universities and SCERT for ICT integration in B. Ed and D. Ed. courses. In addition, it is involved with apex education organizations like NCTE, NCERT and NAAC.

Intel also supports 22 associations of Teach to the Future trained teachers (MT clubs) in various cities across the country. There are two thousand institutional members and over 6,000 individual members in these associations. The master trainers and members of the club conduct regular trainings, workshops, contests, etc., and promote use of online tools to enhance student learning. They support implementation of technology aided learning and act as social change agents.

Indian Market Research Bureau (IMRB) conducts macro analysis of the end-of-training feedback (questionnaire provided by Intel) collected from every trained teacher. The results are shared with all stakeholders in each state on a quarterly basis. In addition, IMRB conducts a yearly quantitative and qualitative study on program implementation and impacts on student learning. The results of the 2004 study report show a significant improvement in usage of technology in the teaching and learning process across the country. Around 1,800 teachers (who were trained between January 2000 and January 2004) were interviewed with the help of a highly structured questionnaire. Some of the findings are as follows:

- about 70% of the teachers are using computer-aided activities
- there has been very high impact on students and there are no discernable negative impacts of the program
- the teachers are found to be innovative and useful during the program
- public school teachers face bigger challenges in implementation compared to private school teachers
- the biggest problem is inadequate time for planning and preparation
- in more than 90% of the schools, there are no computers in the classroom; but almost all of them have computers in the lab
- the use of computers by students is higher in public schools compared to private schools
- despite larger challenges and fewer computers, more students in public schools use computers to gain basic knowledge and learn computer programs, whereas in private schools the usage is for project work and improving computer knowledge.

Intel/India has joined hands with a few educational and social institutions in India to support community needs:

- *Bhartiya Vidya Bhavan*: Intel has set up a Technology Training Center at Hyderabad. The objective of the centre is to provide job-oriented training to students and unemployed youth.
- *Cyberskool Program*: started in association with the National Council of Science Museums, the program aims at providing training to people who do not have easy access to technology.
- *National Association of Blind:* Intel has set up a Technology Training Lab at the NAB in Delhi that offers basic courses in computer usage and screen reading software for the visually impaired.

The Intel Learn program is another initiative of Intel. Launched in November 2004, the program focuses on technical skills through hands-on training to build technology literacy and 21st Century skills for youth living in rural communities with little or no access to technology. In India, the program was piloted in collaboration with the Kerala IT Mission and was implemented through 100 community technology centres under the Akshaya scheme in Malappuram district.

I-shiksha

Wipro and Intel have jointly launched “I-shiksha”, a low-cost technology solution to meet the needs of education in India. The I-shiksha is a network of computers that enhances teaching and learning experience with the latest sophisticated tools to assist educators in accomplishing their instructional goals. It is pre-loaded with MILS (Multimedia Interactive Learning Software), a teaching, learning and assessment software that enriches the learning experience in an interactive learning classroom environment. The software has features such as screen

broadcasting, video/audio broadcast and interactive communication that enhance both teaching and learning.

Microsoft India

The mandate of Microsoft's work in the education sector is, by targeting schools, to create the maximum number of human resources skilled in information technology applications. Since the target audience is the government schools, Microsoft's strategy is to work closely with government.

Under their Partners in Learning (PIL) program, the company targets schools with three initiatives: Project Shiksha, Grants, subsidized OS and IT Academy Centres for Teacher Training. Started in 2003 with funding of US $20 million, Project Shiksha has a target to train 80,000 teachers and 3.5 million children in IT in five years. Microsoft is also looking to offer certification to those who successfully complete the full certification program. Future plans include targeting dropouts and out of school children.

The company is working in Uttaranchal, Maharashtra, Andhra Pradesh, and West Bengal, Assam, Karnataka, Madhya Pradesh and Goa.

CISCO Systems – India

Cisco believes: "India is the best country for human capacity in the knowledge society." With the intention of having a large proportion of IT skilled human resources in general, and networking professionals in particular, Cisco has been working in this area for the last four years. With an investment of US$ 10 million, Cisco has produced 23,000 networking professionals in India. Cisco's target is to produce 100,000 Cisco certified networking professionals by 2008.

In addition, Cisco works with Banasthali University in Jaipur, where they are training 1000 girls for networking certification. Cisco also runs basic IT courses in various institutions, for example the Arya Orphanage in Delhi.

ICICI Bank

The Social Initiatives Group (SIG) of ICICI Bank exclusively targets the social sectors, including education. Focusing on the education "lifecycle" since 2000, ICICI has been working in the following areas:

- *Pre School Initiative*
  - focus on 3-6 years of children
  - physical and cognitive development
- *Focus on teachers*
  - training teachers
  - academic support system
  - curriculum
  - examination system

SIG works in close partnership with 40 selected organizations across the country. Some of the organizations are:

- Eklavya (Bhopal)
- Vidya Bhavan Society (Udaipur)
- Digantar and Bodh (Jaipur)
- Pratham (Mumbai & Delhi)

SIG has had extensive experience in using ICT and ET for various educational activities. But they feel that ET has limited potential to make a substantial dent in enhancing learning competencies and skills development. This conclusion is based on their experience using all mainstream media like radio, TV and online learning.

Some of the projects that ICICI bank supported were: NIIT's "Hole in the Wall", SchoolNet, RadioFM of CLC, and the TV program "Khullam Khulla."

ICICI supported five schools under the SchoolNet program for content digitization and teacher training. Some of the lessons from that were:

- there always seems to be mismatch between the hardware capacity and software needs; the computers were found to be under powered for the learning software provided
- teachers were not sufficiently trained to use the computers even after training
- many teachers in the schools worked in poor lighting conditions for using computers
- content and software did not complement the curriculum
- there were problems with content since it was delivered in English.

These findings were discouraging enough to convince ICICI that the effort was not producing sufficiently significant positive impacts.

The ICICI Bank also invested in experiments in education using radio as the medium. Partnering with the Pune based Center for Learning Resources (CLR), ICICI supported development of radio programs in municipal schools in Mumbai, Delhi and Pune. Targeting the students of classes 5 to 7 in Pune and Mumbai, and classes 3 to 5 in Delhi, the program reached 900 municipal schools in Delhi, 500 in Pune, and 800 in Mumbai.

Though this program, each school received one to three radios depending upon the size of the school. There were three broadcasts per week, each for 15 minutes. The program was divided into two parts: 12 minutes of broadcast, and 3 minutes for teachers to question the students about the lesson content. In a span of two years, it was found that the radio can be a useful medium for language learning and vocabulary development.

In 2001, ICICI supported an 18 episode program on Doordarshan called "Khullam Khulla". The program was produced along the lines of "Sesame Street" with the purpose of motivating children to go to school. The weekly program was spread across 30 weeks and was broadcast on all Doordarshan channels.

Oracle India

Oracle's interest in the education sector falls under their Corporate Social Responsibility (CSR) mandate for community development. The focus of Oracle has been to work with government and government aided schools for the age group of 7 – 15 years. Their initiatives are online and web-based. They aim to create online global communities of interested children.

Cisco's current CSR/Education projects are Think.com and Thinkquest.org. Think.com is a web-based pedagogical tool whereas Thinkquest.org is a platform where IT skill development is encouraged through competitions amongst participating students. Think.com offers the advantage that student notes can be published and shared with other students around the world. The tools behind Think.com are extremely flexible and highly customized, offering great flexibility in terms of content publishing.

Oracle started with two schools in Kolkata and Gurgaon on a trial basis. Gradually it reached out to 25 Kendriya Vidyalaya Schools. At present, about 900 Kendriya schools have invited Oracle to partner with them to integrate Think.com into each of their schools.

Hole in the Wall Education Limited (HiWEL) – NIIT

After experimenting for several years, NIIT's famous "Hole-in-the-Wall" project showed enough promise for the project to be taken to scale. The Hole in the Wall experiment proved that with minimum or no interference, children can learn faster, better, and in turn teach other members of their peer group. Based on HiWEL experiments across the nation, NIIT came up with a unique

concept called “Minimal Invasive Education”, which is now the learning model being used for its learners.

In a related development, an analysis conducted by NIIT found that for every 100 rupees spent on education, generally only 15 will reach the beneficiary. Based on this, it has proposed to the government that with wide use of its HiWEL model, this investment pattern can be reversed: 85 rupees would reach the beneficiary while only 15 would be consumed by the supply chain.

MetaLearn – Learning Management System

MetaLearn is a technology and services company working in the “e-Learning” sector. Over a period of the last 4 years, they have undertaken applied research and developed various products and applications. These include Learning Management System, Query Management System, Test and Assessment Engines, and Content Management Modules. In services, they provide content creation, content re-purposing, content compliances, and graphics and animation services.

NON GOVERNMENTAL ORGANISATIONS

Byraaju Foundations (two way video instruction to primary students)

Funded by the World Bank, this project was initiated by the foundation during 2004-05. Expert teachers use two way video teleconferencing technology to teach students of two schools located in West Godavari District of Andhra Pradesh. Teleconferencing takes place for about four hours per day covering different subjects in grades 8 to 10. The cost of the installed equipment for the three nodes (one at the teaching end and two at the learning ends) is about Rs. 5 lakh. The students are able interact during presentations by the expert teachers.

Digital Equalizer – American India Foundation

The American India Foundation uses ICT to implement its Digital Equalizer (DE) program. The mission of DE is to provide learning through the use of digital technology and the Internet. They have been implementing this program for the last three years in underprivileged schools. In the DE context, ICT is used to:

- teach core curriculum topics through the use of technology
- encourage students to learn through inquiry based/project based learning
- enable online collaboration.

After 3 years, the schools are expected to be able to use ICT in their day-to-day teaching-learning processes.

Some constraints that the project has experienced are:

- power shortages
- lack of power backup
- insufficient IT equipment
- lack of technical support
- lack of ICT-based software and content
- insufficient training on how to teach using ICT
- connectivity
- sustainability.

Despite these problems, some positive effects have been observed:

- IT capable teachers have been produced
- students have been empowered with ICT skills.

Bridges to the Future Initiative (BFI) in India

In its effort to leverage the potential of ICT to improve literacy and life skills in poor and disadvantaged communities, BFI has established a collaborative partnership with key governmental and non-governmental organizations in Andhra Pradesh. Principal co-sponsors of the BFI include: the GOAP, UNICEF, J.P. Morgan Chase, the World Bank, Spencer Foundation, and the University of Pennsylvania.

Following its launch in 2003, prototype multimedia content was produced and pilot tested. A preliminary evaluation showed that children were strongly motivated by the program. In November 2004, the program was expanded to 13 sites in the Hyderabad/Ranga Reddy region of Andhra Pradesh, with more than 250 participating youth. ILI and CITE are now cooperating with BFI to create a comprehensive multi-media curriculum, with a focus on out-of-school youth.

Two major strands of software have been produced to date: 1) innovative and interactive multimedia material in Telugu that supports the rapid learning of basic reading, writing and math skills; 2) cross-sectoral content in health/sanitation that weaves literacy into the health arena. Further work on the health strand is expected to focus on HIV/AIDS information, financial literacy, and other high-impact social issues.

The BFI teacher-training program will focus on providing improved teaching quality and help transfer ICT skills among teachers who will be able to serve as facilitators at the CLTCs. Teacher/Facilitator Training for CLTC sites has been carried out by ILI in collaboration with GOAP, IIT and Tera Soft-Hyderabad. Further development of this work is expected to be undertaken within a partnership between ILI and the Azim Premji Foundation.

Both formative and summative evaluations are currently underway with the BFI.

GE Elfun Volunteers (GEEV)

GEEV is setup by GE India with the sole intention of promoting volunteerism for various social works and responsibilities. The mandate of GEEV is to recruit a maximum number of volunteer members from the company and involve them in community development activities on the weekends. With a volunteer cadre of 1500 employees, of which 300 are active, the program's most significant activity is the EOTO program – Each One Teach One – involving volunteers teaching children, youth and adults. Besides achieving remarkable results with the children and youth, it has linked beneficiaries with livelihood opportunities. They already have 3 beneficiaries employed with the Call Center of GE.

Pratham

Based on a survey of 2000 schools in Maharashtra, the NGO Pratham selected 60 schools (40 of which are in or near Mumbai) for introducing computers. Pratham initiated the intervention with the help of local cash donations and donated computers. Later, they got a Rs. 35 lakh donation from an NRI. The agency has also reached 21 schools in partnership with IBM. Pratham's program covers primary and secondary school children. The program is aimed solely at government schools, with particular focus on the children from Mumbai slums. Some of their programs in Dharavi have links to livelihood programs as well. In addition, Pratham has reached four schools in Delhi and two schools in Allahabad.

The content software available for the primary level includes: mathematics, language, science, music, social science, EdMark, RiverDip, MS Office Tutorial CD (in Marathi), School Management Tools, Project Management Tools (Pratham-developed), and 40 games (also Pratham-developed).

Azim Premji Foundation (APF)

The APF Foundation targets prominent issues in the education system, primarily educational content. Started with school based Computer Learning Centres (CLCs) bundled with in-house developed content, APF has demonstrated good success. APF implements its interventions with local and state governments and integrates them into existing school programs. Many of their centres in Karnataka also double as computer learning kiosks for use during after school hours, offering the schools opportunity to earn additional revenue. Following are a few of the conclusions drawn from various evaluation studies conducted by the organisation:

- There has been an increase in enrolment and improvement in attendance in the schools having CLCs.
- The performance of students in mathematics is better in CLC schools than in control schools in classes 4, 5 and 6.
- Children have learnt enough to use many applications and have themselves created enormous content.
- However, this content is generally unused and not shared. There is a potential to leverage the content to create a children's portal.

In the West Godavari District of Andhra Pradesh, APF supports e-Seva Kendrams and Rural Service Delivery Points rendering citizen-to-citizen and citizen-to-government services – representing a start at e-governance. During the daytime, 140 of these centres permit the nearby government school students, accompanied by the teachers, to use their computers. Azim Premji Foundation has trained the persons in charge of these centres to facilitate the computer-assisted education of the children. APF has also developed CDs in mathematics and science that use Telugu as the medium of instruction.

In another initiative based in Byatarayanapura Higher Primary School in Bangalore, APF has demonstrated the feasibility and cost-effectiveness of assembling a learning system with single PC (connected to three monitors, three keyboards and three pointing devices) that to the user appears to operate as three independent computers.

Beyond introducing the computers in the primary classrooms, APF has undertaken efforts to strengthen the Education Management Information System (EMIS) in Andhra Pradesh and Karnataka. The foundation's software is aimed at enabling the Education Departments to monitor the sector performance and aid the decision making process.

Agastaya International Foundation (AIF)

The Agastaya International Foundation was established four years ago to work in the area of education. The foundation has been working to change the way learning and teaching is practiced. The organization believes that the education system requires lots of interactivity, face to face interactions and the practice of learning by doing. AIF has been using mobile labs, science fairs, and lots of experiments to propagate high impact learning and teaching practices.

The foundation has been working on integrating ICT into their model as a way to increase program impact, using tools such as EduSAT, mobile computer labs and multimedia PCs in science fairs.

Equal Access

The organization has had success in building Community Listening Groups for Satellite Radio. Based on their good experience in Nepal, they are now working in Uttaranchal where they are building capacity to develop audio based programs.

OTHERS

World Links

World Links is the lead NGO in the World Economic Forum's Digital Divide Initiative for India – a program for integrating ICT and Internet in Indian schools. World Links has three pilot initiatives:

- providing computers to secondary schools
- providing basic computer literacy to secondary school teachers of rural and underserved areas of Delhi, Karnataka, Gujarat, Maharashtra, Kerala, Punjab and Andhra Pradesh
- providing professional development training to teachers in classroom applications of IT.

It also uses the Internet to connect schools in India with schools all over the world for collaborative learning projects.

Goa School Computers Project

The Goa Schools Computers Project (GSCP) is a citizens' initiative to introduce computer-aided education in 100 percent of the schools in Goa. Started in 1995, GSCP has been raising funds mostly from NRI-Goans from USA, UK, UAE and Canada. These funds are used for purchasing new and used computers and for maintenance. The project has conducted teacher training workshops in Goa, Gujarat and Maharashtra under the auspices of the Computers for India Coalition, of which GSCP is a member.

K-Yan

K-Yan has developed a compact multimedia centre that is operated by a remote control-cum-mouse and requires only a power connection and white wall, and no air conditioning. The system costs only Rs.14000. It was developed by Kirti Trivedi, a professor in IIT-Mumbai. At present, 150 such devices are being used in schools in Tamil Nadu, Maharashtra and West Bengal. A set of 4500 lessons in English, Tamil, Kannada, Marathi and other languages is also provided along with K-Yan.

Information Kiosks

There are about 10,000 information kiosks across the country offering services like e-governance, education as well as many commercial services. It has been found that the two most used services offered at the information kiosks are education and e-governance. However, the education services offered at such kiosks are not well organized. The content and applications offered at the kiosks are basic Microsoft Office applications, games, and random CDs. Some of the major companies that are exclusively targeting the rural sectors through the information kiosks are n-Logue, Drishtee, E-Choupal – ITC, Akshaya's Entrepreneurial information Kiosks, and E-Seva's Entrepreneurial information Kiosks.

Chapter 4

Impact of ICTs in Education

General

There is widespread belief that ICTs can and will empower teachers and learners, transforming teaching and learning processes from being teacher-dominated to student-centred, and that this transformation will result in increased learning gains for students, creating and allowing for opportunities for learners to develop their creativity, problem-solving abilities, informational reasoning skills, communication skills, and other higher-order thinking skills that will better prepare them for the demands of the 21st century. However, there are currently very limited data to support this belief.

ICTs are very rarely seen as central to the overall learning process
Even in the most advanced schools in OECD countries, ICTs are generally not considered central to the teaching and learning process. Many ICTs in education initiatives in less developed countries seek (at least in their rhetoric) to place ICTs as central to teaching and learning.

An enduring problem: putting technology before education
One of the enduring difficulties of technology use in education is that people think of the technology first and investigate the educational applications of this technology only later.

Impact on student achievement

The positive impact of ICT use in education has not been proven
In general, and despite thousands of impact studies, the impact of ICT use on student achievement remains difficult to measure and open to reasonable debate.

Positive impact more likely when linked to pedagogy
It is believed that specific uses of ICT can have positive effects on student achievement when used appropriately to complement a teacher's existing pedagogical skills.

'Computer Aided Instruction' has been seen to slightly improve student performance on multiple choice, standardized tests in some areas
Computer Aided (or Assisted) Instruction (CAI), which refers generally to student self-study or tutorials on PCs, has been shown to slightly improve student test scores on some reading and math skills, although whether such improvement correlates to real improvement in student learning is debatable.

Need for clear goals
ICTs are seen to be less effective (or ineffective) when the goals for their use are not clear.

There is an important tension between traditional versus 'new' pedagogies and standardized testing
Traditional, transmission-type pedagogies are seen as more effective in preparation for standardized testing, which tends to measure the results of such teaching practices, than are more 'constructivist' pedagogical styles.

Mismatch between methods used to measure effects and type of learning promoted
In many studies, there may be a mismatch between the methods used to measure effects and the nature of the learning promoted by the specific uses of ICT. For example, some studies have looked only for improvements in traditional teaching and learning processes and knowledge mastery instead of looking for new processes and knowledge related to the use of ICTs. It may be that more useful analyses of the impact of ICT can only emerge when the methods used to

measure achievement and outcomes are more closely related to the learning activities and processes promoted by the use of ICTs.

ICTs are used differently in different school subjects
Uses of ICTs for simulations and modelling in science and math have been shown to be effective, as have word processing and communication software (e-mail) in the development of student language and communication skills.

Access outside of school affects impact
The relationships between student in-class computer use versus out-of-class computer use and student achievement are unclear. However, students in OECD countries reporting the greatest amount of computer use outside school are seen in some studies to have lower than average achievement (the speculation is that high computer use outside of school is disproportionately devoted to computer gaming).

Users believe that ICTs make a positive difference
In studies that rely largely on self-reporting, most users feel that using ICTs make them more effective learners.

Impact on student motivation

ICTs motivate students
There appears to be general consensus that both teachers and students feel ICT use greatly contributes to student motivation for learning.

Access outside of school affects user confidence
Not surprisingly, students who use a computer at home also use them in school more frequently and with more confidence than pupils who have no home access.

ICT use in education

Where to place computers has an impact
Placing computers in classrooms rather than separate computer laboratories enables much greater use of ICTs for ‘higher order’ skills. Indeed, fewer computers in classrooms may be more advantageous for learning than more computers placed in separate labs.

Computers during or after school hours
Models for successfully integrating ICT use during both in-school and after-school hours are still emerging. However, there are few successful models for the integration of student computer use at home or in other 'informal settings outside of school facilities with use in school.

The appropriate age for introducing computers to students is hotly debated
On a general level, appropriate ages for student ICT use in general are unclear. However, it is clear that certain uses are more or less appropriate, given student ages and abilities. Emerging research cautions against widespread use at a very young age.

ICTs can promote learner autonomy
Evidence exists that use of ICTs can increase learner autonomy for certain learners.

Gender affects impact
In many cases, effectiveness of ICTs in education seems to be affected by the gender of the learner.

Chapter 5

Lessons Learned & Issues for Consideration

The discussions with people working in the area of ET/ICT, review of literature, and field visits to several interventions, indicate that there are a number of innovative and successful pilot projects using various ICT and ET tools quite effectively. However, the successes are visible only at a pilot level. So far, there is no example of the successful scaling up of a promising pilot project. Some of the bigger projects in education using ET or ICT tools are: Keli-Kali in Karnataka, Akshaya in Kerala, Azim Premji Foundation, Aarohi in Uttaranchal, NIIT Hole-in-the-Wall, and a few others. The projects which have been studied during this research show following:

- Task managers of education projects often have incomplete knowledge of uses of ICTs for education. Most ICT interventions in the education sector have been through small, uncoordinated pilot projects, presumably because ICTs are not seen by many as a priority for use in education.

- While ICT's role in general education is steadily increasing, vocational and livelihood education are still relatively untouched by ICT.

- In general, we know that there is limited contact time per month using ICTs by both teachers and students, and even less time spent with reliable internet access. Contact time between ICTs and teachers and ICTs and students vary widely.

- There has been little done to consolidate or rationalize the various efforts of the agencies of the state or central government, NGOs, corporations, etc.

- Students use ICTs in much more sophisticated ways than teachers. Students themselves are figuring out ways to take advantage of the communication potential of ICTs for learning in a self-organized, ad-hoc manner that correlates closely with their own personal exposure to ICTs in their daily lives. Communication tools and applications (such as chat, e-mail and SMS) appear to be under-utilized in education environments.

- There is no central database that can guide stakeholders and policy makers about which of the diverse kinds of ICT tools work best under given conditions for the educational enhancement of children.

- Quite often, projects are too expensive and remain only promising pilots.

- Many states are implementing radio projects, but there is little interaction or learning from each other. This is also true of other types of ET/ICT interventions as well, e.g., teleconferencing, computer education.

- While efforts to start new ET/ICT projects and initiatives continue unabated, to date there has been no organized attempt to establish the lessons learned from the projects executed in the past.

- There is a lack of comprehensive planning and execution in ET/ICT. This means that the utilization of resources and infrastructure is often not appropriate or effective.

- There is no consistent, broad-based evidence in India about the positive impacts of ET/ICT on achievement in teaching and learning.

- There is a need for more on-the-ground evaluation, research and analysis.

- Government projects concentrate more on using radio and TV as ET/ICT tools, whereas corporate and NGO interventions rely more on using computers, multimedia, Internet, and interactive media.

- In all interventions there is a dearth of content. Where it exists, the content is generally stale and unimaginative. Content is not developed dynamically. There is a particularly acute need for development of local content in local languages.

- Many government offices and NGOs are working in the area of content development. No systematic attempt has been made to record the details and progress.

- Guidelines are lacking for the cost of software development in education, particularly content.

- There is a significant gap between what needs to be done and what is being done. There is a disparity in ICT's required role (demand driven) and the actual role that it is playing (supply driven). Most of the interventions are for the sake of introducing ICT in education rather than using the ICT for complementing the curriculum, teaching, learning, and skill development.

- In many places, teachers' training is a one or two time affair. In this regard, there is an urgent need for competency development at the cluster and block levels.

- Comprehensive policies and plans for the effective use ET/ICT in education are missing at the state level.

- Many projects are initiated at the state level because of the enthusiasm and initiative of an individual administrator. As a result, if the initiator goes, the project often languishes.

- Too much time is lost in initiating projects and doing preliminary research and analysis. As a result, often synchronization with the school calendar does not take place resulting in less than optimal results.

The Question of Sustainability

One of the most important questions that needs an urgent answer is the extent to which ET/ICT projects are sustainable. How long would it take the participants to reach a stage where they can run the project without much external help?

So far, the aspect of creating a feasible revenue model that could assimilate the social objectives while utilizing ICT and ET as tools in the field of education has not been given adequate importance. One of the prime reasons for this is the fact that the education sector in India has always been highly subsidized by the government. In fact, right from primary school to higher educations, the focus has never been on sustainability.

But, the education sector is undergoing a slow transformation. Government, the voluntary and corporate sectors and all others involved in programs related to promotion of education through ET/ICT, are increasingly compelled to think about sustainability for these projects. Education, being a state responsibility in India, leads to a diversity of approaches and complicates the process of coordination and consolidation. While, especially in the fast developing ICT sector, there will never be a universal application or approach, it would help the current situation to have a set of regional-specific solutions within a broad regulatory framework.

Content: The Big Issue

At first glance, content issues related to ICT use in education might seem to some to be of minor importance. After all, access to the Internet (to cite one example) means access to an entire

world of educational resources. Access to the Internet provides access to seemingly endless educational resources -- and indeed it does. However, experience shows that there is a dearth of educational resources in a format that makes them easily accessible and relevant to most teachers and learners in India and other less developed countries, especially as they relate to a given country's current curriculum. See figures 8 and 9 below.

Experience tells us that unless electronic educational resources are directly related to the curriculum, and to the assessment methods used to evaluate educational outcomes (especially standardized testing), lack of appropriate and relevant educational content is actually a significant *barrier* to ICT use in schools.

Current Knowledge Base

Accessing information is the main use of ICTs in education
Access to information is considered to be one of the most important benefits of the uses of ICTs in education. Besides providing a tool for the development of basic computer literacy skills, accessing information – rather than using ICTs for communication purposes – is the most common use of the Internet in schools.

Learning materials in electronic format are most useful when they are directly linked to the curriculum
The absence of educational content directly linked to curricula is one of the key inhibiters of ICT use by teachers and learners.

Creating digital/electronic content is difficult and expensive
Adapting and/or digitizing curricular content for access via ICTs is a lengthy and expensive process. This holds for digitized content accessible on PCs, and is especially true with regard to educational television and video production. Radio dissemination may offer cost savings. The large up-front costs related to the adaptation and/or digitization of curricular content for access via ICTs may make such initiatives attractive for donor aid.

Digital clearing houses and evergreen curricula are useful
Establishing a clearing house or digital libraries of ready-to-use and customizable ICT-based resources promotes better use of ICT in teaching and facilitates quick and easy access to resources for making lesson plans and for teaching.

Figure 8: Educational CDs by Type

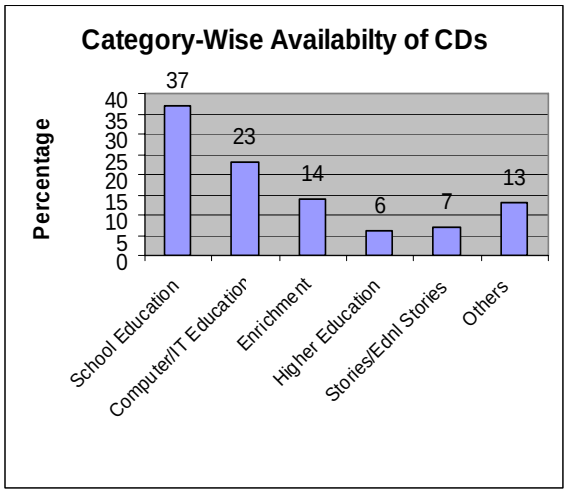
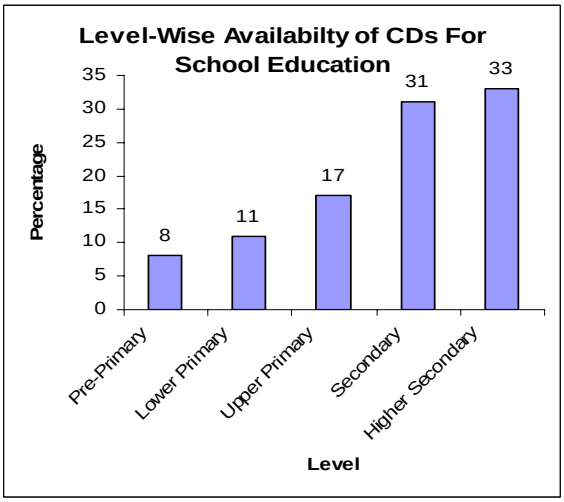


Figure 9: Availability of CDs by Level



Evaluation of 'imported' content for cultural relevance must not be neglected
Guidelines, resources and mechanisms for evaluation of imported content are critical if such content is to be culturally and educationally relevant.

Digitizing content has important equity implications
Because of large up-front costs in digitizing content, minority language use may suffer when ICTs are introduced in education, further marginalizing minority language users. Because of limitations in using minority languages to disseminate content via the Internet, radio may provide a more appropriate mechanism for disseminating content in minority languages.

Content & Curriculum Issues

ICT use in testing requires new processes
When ICTs are introduced into student testing and assessment, the existing processes and procedures need to be evaluated and possibly reconfigured.

Public-private partnerships can be key
Public-private partnerships are often crucial for the development of digital content.

ICT use often promotes English language use
ICT-enabled teaching and learning is often seen as an important vehicle for the development of English (and other *lingua franca*) language competencies by teachers and learners. This is especially true with science and mathematics instruction, which are delivered in English in many countries where English is not an indigenous or dominant language. This raises important issues related to learner equity and access to education.

Intellectual property issues are very real
Intellectual property issues are of tremendous importance when developing digital content for use in education. Ownership of the content developed is a key issue to consider. Licensing of content is often an option, but may contain hidden costs.

Official guidelines and directives enhance use of ICT-enabled content
Guidelines from the Ministry of Education, especially relating to the integration of ICTs in the curriculum, greatly facilitate the use and impact of ICTs in schools.

Reasons for non-availability of quality content

- Lack of guidelines on the funding required to produce a program with given specifications such as target learner, subject, learning objectives, delivery medium and duration.
- Lack of sufficient funding
- Insufficient number of content (subject) experts with media knowledge
- Lack of content experts with basic understanding of concepts
- Absence of a dedicated group for developing the outlines of required content
- Inadequate number of professional script writers
- Lack of understanding of the pedagogical implications of integrating of technology tools
- Lack of understanding by producers of content of students' characteristics and how these relate to appropriate choices for the media employed
- Lack of a database regarding the content (software) available in different institutions and available for sharing, e.g., networking with a video library.

Specific ICT Tools – Current Use and Knowledge Base

The Internet is not widely available; radio and TV are
Broadcast technologies such as radio and television have a much greater penetration than the Internet throughout India and much of the developing world, and this substantial gap is not expected to be closed soon.

Radio and TV can have high start-up costs, and reinforce existing pedagogical styles
Educational initiatives that utilize radio and television typically have quite high initial capital and other start-up costs; but once they are up and running, on-going maintenance and upgrade costs are much lower. One-to-many broadcast technologies like radio and television (as well as satellite distribution of electronic content) are seen as less 'revolutionary' ICTs in education. Their usage is seen as reinforcing traditional instructor-centric learning models, unlike computers, which many see as important tools in fostering more learner-centric models.

Radio instruction has been used widely
Radio instruction in formal education has been in long use, especially radio in combination with school-based educational resources and a variety of pedagogical practices.

It is unclear where to place computers to make sure they are used most efficiently
There is very little research on the most appropriate placement of computers in schools, or in the community, to achieve various learning objectives.

Multi-channel learning is a useful concept
"Multi-channel learning" is a relatively new and increasingly popular model for improving learning. By employing multiple media and delivery modes to connect learning in various ways (with information, knowledge, and stimulation), learning outcomes are enhanced according to the enthusiasts. Its use is providing valuable insights into how blended learning approaches can be delivered and tailored in areas of great resource scarcity.

Satellite is much hyped, but under-studied
While satellite broadcasting of electronic educational resources is thought to hold much promise, there are few case studies of successful implementation (in terms of learning gains) of satellite broadcasting.

New Internet technologies hold promise, but are not yet operational
Emerging Internet technologies, especially recent and emerging wireless protocols (including 802.11, and shortly WiMax), are thought to hold much promise for providing connectivity to remoter areas; but projects utilizing such technologies are for the most part only in the pilot or planning stages.

Mobile Internet centres (vans, etc.) are being deployed as a way to reach rural areas
A number of educational initiatives utilizing mobile Internet centres have been piloted but little cost and impact data have emerged from such projects.

Community telecenters are a hot topic, but successful, replicable models have not yet emerged
Community telecenters (sometimes based in schools) have been touted as important tools to provide access of learners (including teachers engaged in personal enrichment and professional development opportunities) to ICTs outside of the formal school schedule.

The use of handheld devices is just now receiving serious widespread attention
Little research has been done on uses of handheld devices (including personal digital assistants and mobile phones) in education.

'Free software' holds promise, but costs and impact are still not well documented
The uses of 'free' software is widely touted as a cost effective alternative to the uses of proprietary software (especially Microsoft products), but research in this area is largely advocatory in nature.

Chapter 6

Possibilities for QUEST

One thing that this study has highlighted through various meetings, field visits, available research and reference materials, is the need to form a group or alliance to work on the macro issues related to education in general, and educational technology in particular. Clearly, the formation of QUEST at this stage responds to a timely need, and this alliance is well placed to look at various possibilities and challenges which have been revealed in this study.

This chapter has been divided into two parts, starting with a set of suggested principles and needs derived from the general outcomes cited in the previous section, and followed by suggestions for QUEST involvement in issues surrounding some of the more promising technology-based models.

Principles and Needs Surrounding the Application of ET/ICT

- When programs are designed and planned, a comprehensive, rigorous needs assessment process (based on real data) is required as a first step.

- When choosing the ET/ICT intervention model, it is imperative to study the appropriateness of the technology with particular regard to cost, maintenance, sustainability, local environment and infrastructure.

- Mapping of available content against certain parameters such as target, subjects, concepts, issues, type of materials (print, audio, video, multimedia) is essential.

- There is a need to encourage programs that especially target out-of-school youth.

- With regard to certain proven models, there is a need to scale up existing facilities (or add minimum new facilities) to ensure their successful expansion through government support and endorsement.

- Action is required for using existing teleconferencing facilities for effective In-service and pre-service teacher training.

- Strong research inputs (qualitative and quantitative) are required in most if not all of the on-going ET/ICT interventions.

- At least in some states, there is a need to develop an advocacy group to develop ET/ICT policy and implementation guidelines in the context of education and skills/livelihood training.

- Work on the channels already established by different agencies at the national and state levels so that time taken for initiating a project can be reduced and commitment on the part of the cognizant state agencies for expansion can be obtained.

- Further in-depth assessment of the current ET/ICT programs is required to guide the future course of action.

- In-depth study is required to assess the available content available in the marketplace and derive the additional needs that are yet to be covered.

- EduSAT has a lot of potential. Presently, the states are working more on the hardware. Work with NCTE, ISRO, SIETs, NCERT, CEE, and State Departments of Education is required for content generation and its effective utilization.

- Work is needed on the promising technology tools like mobile devices and the educational content for the same.

- Elementary Teacher Training Institutes have ET curriculum in pre-service programs. Attempts should be made to develop ET packages to support pre-service training programs.

- One-way video and two-way audio teleconferencing facilities exist throughout the country. This could be effectively used for teacher training and training of teacher educators, as well as for monitoring various other activities.

- In view of the changes in the policy on vocational education, a competency based curriculum with different levels could be developed and offered to out-of-school students with certification from NIOS/State Open Schools (SOS). The certification from government institutions enhances the acceptability across the states and individuals.

Promising Technology Models for Education

Technological innovation and its rapid usage across the developmental sector have truly opened the door for solutions to many existing problems in Indian education.

The currently researched projects in the area of educational technology show the huge interest of the corporate sector, NGOs, individuals and government in educationally empowering the nation. The scores of interventions also suggest that ICT is being accepted as an integral part of strategies aimed at improving the education and skills training of the children and youth of India.

The following technology models show a lot of promise for the education sector, provided they are adopted according to the principles and needs suggested above.

1. Wi-Fi, Wi-MAX

a. Wi-Max technology is being pushed aggressively my many international companies like Intel to offer wide area networking and connectivity without any hard wiring. And, it offers high speed connectivity, especially in the campus environment.
b. The Uttaranchal Government has decided to enable its two universities with Wi-Max in order to offer connectivity for information exchange.

2. Internet Machine

a. AMD has released an Internet PC costing just Rs. 10K, as small as a tiffin box and highly portable. Using this device, AMD promises to reach the entire developing world as a way to connect the disadvantaged masses.
b. Kolkata-based Xenitis Infotech has introduced a branded computer at a cost of Rs. 9,990, and aspires to have this technology reach the doorsteps of the common man.
c. NIIT is working on a cut-down machine for optimal usage. The company believes that today most of the machines are vastly over-powered for the applications they are using. Developing a scaled-down model can reduce down the cost significantly.

3. Web Based Portals

a. Language specific efforts are required to further possibilities for making web-based portals. Success will come only if the content is created by the children and teachers on their own. This would lead to innovativeness, sustainable content generation, and knowledge sharing potential, peer group learning and self learning.
b. The portals could be specific to school, state, region or even nation. It has been learnt in many CALCs that children create a lot of content using applications like Microsoft Office. However, this content is rarely or never shared beyond its creator.

4. Enable Information Kiosks With Structured Content

a. All across the country, the existence of information kiosks that offer e-governance and other commercial services at the village level has been found to instigate ICT learning

among interested youth and children. Such use becomes a high revenue earner for the kiosk operators. However, none of the kiosks has a structured curriculum to offer. They all are invariably imparting general ICT awareness only of the software applications that happen to be loaded on the computers, such as MS Windows, MS Office, Paintbrush, etc.

b. One possibility could be to offer structured content to these Information Kiosks, targeting approximately 50,000 villages with coverage of about 10 million people, many of them in-school and out-of-school children and youth.
c. Since most of the applications are running without proper licenses, Open Source based applications like Open Office could be offered as a legal alternative.

5. Development/Enablement of Local Language ICT Tools for Education

a. Easy to use local language enabled operating systems.
b. Local language enabled applications.
c. Local language enabled specialized email, chat and peer-to-peer applications for children.

6. Adoption of Open Source based Content, Software and Applications

a. The Centre for Development for Advance Computing (CDAC) has launched the "Janabhaarti Project" for the localization of free and open software. Possibilities may exist for expanding this effort beyond the current operational areas.

7. EduSAT

EduSAT offers many possibilities for two-way information exchange and outreach. It offers high speed connectivity, audio and video possibilities, and convergence infrastructure for high impact learning and teaching possibilities.

8. Mobile Devices & Wireless Connectivity

The mobile phone is one of the fastest growing information access devices spreading across the nation. It would be a worthwhile effort to explore possibilities for using this device for education purposes, especially in the area of school assessments and data collection. Advantages include:

a. Voice based – it has no language barrier
b. Devices are relatively inexpensive
c. Devices can be multimedia enabled
d. There exists widespread connectivity

ANNEXURE 1

The Annexure 1 is attached as a separate Excel file. Please refer Sheet 1 and Sheet 2 for the entire consolidated list of field Visited projects and its analysis on various parameters.

Expenditure/Cost of Training of Teachers through Teleconferencing

Based on the Research *Satellite Based Primary Teachers Training vis-à-vis Other Models: A Comparative Study* conducted by Dr. B. Phalachandra. The detailed research report is available)

Always an impression is created that the training through teleconferencing will be the most expensive in comparison to face-to-face training. However, one has to estimate to the cost of training of large number of resource persons and their opportunity cost. Further one cannot overlook the quality dilution in the face-to-face program. If the program is repeated, number of centers increased or in one centre two rooms are arranged, the unit cost will definitely come down drastically. The observer reports have indicated that the participants' motivation/enthusiasm and active involvement in activities, the scope provided by teleconferencing program to participants to listening to the problems of participants of other districts and solution, etc. benefiting most of the participants, and time required to train large number of teachers in shortest possible time cannot be costed. Rough estimate of expenditure could be made for organizing training program through different modes with few assumptions as illustrated below:

Assumptions:

7 Resource Persons required for organizing face-to-face training 5 for face-to-face with video inputs per centre, and 7 Resource Persons for Teleconferencing (Teaching Centre) and 3 facilitators per centre (in case of Teleconferencing Program).

- Material inputs excluding video is common to al the 3 modes.
- TA/DA, etc. distribution common to all participants of the three modes.
- DR system could be used for a period of 5 years with 15 days program per month.
- Teleconferencing program could be organized effectively for 25 centres.

<u>Calculation below is made for 25 centers</u>

Model 2: Face-to-face

TA/DA, etc. for Training of RPs (175) @ 7 per centre	Rs. 5, 00,000.00
TA/DA/Honorarium for participation of RPs (175) in the 5-days training program (Rs. 1500/- per head)	Rs. 2, 62,500.00
Graphics/Teaching Aids (Rs. 1000/- per centre) for 25 centers.	Rs. 25,000.00
TOTAL	**Rs. 7,87,500.00 ($17,500.00)**

For repeating the program, the cost will be about Rs. 2, 62,500/- ($ 5,834.00)

Mode 3: Face-to-face with Video Inputs

TA/DA, etc. for Training of RPs (125) @ 5 per centre	Rs. 3, 00,000.00
TA/DA/Honorarium for participation of RPs (125) in the 5-days training program (Rs. 1500/- per head)	Rs. 1, 87,500.00
Video Program (Production/Video Cassettes for distribution to 25 Centers @ Rs. 1250/- per set of about 5 to 8 programs.	Rs. 5, 00,000.00
Generator hiring (Rs. 250/- per day for 5 days) for 25 centers.	Rs. 31,250.00
TV/VCR hiring @ RS. 200/- per day For 5 days for 25 centers.	Rs. 25,000.00
Graphics/Teaching Aids (Rs. 1000/- per centre) for 25 centers.	Rs. 25,000.00
TOTAL	**Rs. 10, 68,750.00 ($ 23,750.00)**

For repeating the program, the cost will be about Rs. 2, 68,750/- ($5,972.00)

Mode1: Teleconferencing Program

TA/DA, etc. to train Facilitators (75) And 7 experts.	Rs. 1, 25,000.00
TA/DA/Honorarium for Facilitators and experts to participate in the Teleconferencing	Rs. 1,00,000.00
Video Program (Production)	Rs. 5, 00,000.00
Generator hiring @ Rs. 250/- per day for 5 days per centre for 25 centers	Rs. 31,250.00
TV hiring @ Rs. 100/- per day for 5 days for 25 centers	Rs. 12,500.00
Telephone charges @ Rs. 200/- per day for 5 days per centre for 25 centers	Rs. 25,000.00
Graphics and Teaching Aids	Rs. 1,000.00
Hiring of unlinking facility with studio @ Rs. 3500/- per hour for 4 hours per day for 5 days	Rs. 70,000.00
Cost of DR systems for 5 days (after taking into consideration of its use for 180 days in a year for 5 years, about Rs. 40/- per day)	Rs. 5,000.00
TOTAL	**Rs. 8,69,750.00 ($19,328.00)**

For repeating the program, the cost will be about Rs. 2, 44,750/- ($5, 439, 00)
The initial cost difference between the face-to-face program and teleconferencing is about Rs. 80,000/- ($1778) presuming 5 lakh ($11,000) spent on video production. The production cost could be reduced from Rs. 5 lakh to 2 lakh by concentrating on live demonstration and minimizing the production of video programs. In such an eventuality, the teleconferencing program is cost efficient than face-to-face training programs.

ANNEXURE 3

Teleconferencing a cost effective alternative to other modes of Teacher Training – A Study

The three modes of trainings with same training curriculum and duration (5days) were organized as part of the NCERT Project titled *A Study on the Relative Effectiveness of Alternative Technology options for Training Primary Teachers' by Dr B. Phalachandra*

A brief summary of findings are given below:

1. Overall Teleconferencing mode (708 teachers) of training is more effective than face-to-face (381 teachers) and face-to-face with video inputs (344 teachers) training with respect to:

   a) Participants' involvement, motivation and interest.
   b) Nature and quality of interaction between participants and experts.
   c) Punctuality and adherence to schedule by participants.
   d) Multiple channels for learning.

2. Mean difference in achievement of participants in all the modes are statistically significant and gain in scores in all the 6 themes (MLL, Place Value, Addition, Subtraction, Multiplication, and Division) is almost same.

3. Quite a few Resource Persons in Mode-2 & 3 were unable to give a) Demonstration Lesson, b) Relevant answers to questions, and c) Sticking to schedule, hence there is a need to support face-to-face training program through video inputs to concretize abstract concept, bring `classroom' to `training situation' (in face-to-face).

4. In face-to-face training, participants had opportunity of seeking the resource person's response to supplementary questions without difficulties.

5. The face-to-face training program depended least on hardware/technology, hence never had scope for chaotic condition due to technology failure, so there was no need for developing alternative strategies (However, during this teleconferencing program, there was no technology failure).

6. Number of competent and qualified resource persons required more in face-to-face and least in teleconferencing and reduces the unnecessary strain of identifying large numbers and training them.

7. Simultaneously about 1200 teachers assembled in 20 to 25 centers could be reached/covered through teleconferencing and be given uniform and undiluted information and deliver on the spot of demonstration.

8. Cost of conducting training through teleconferencing is less expensive in comparison to face-to-face training program, if one looks at the cost of training large number of resource persons and making provision for their TA/DA/Honorarium, etc. to participants in face-to-face training program and the time taken in the face-to-face mode to cover a large number of teachers (about 1200).

Further the additional value, the teleconferencing program has in terms of giving opportunities to participants to multiple channels for learning and qualitative impact it has on participants cannot be accounted in terms of money.

ANNEXURE 4

Charges for Production and facility for hire ICT related Programs

(Charges shown below based on the rates (year 2005) prevalent in Govt. and Private Sector)

Type of the Program	Preparation of Content outline	Script Development	Production	Broadcast	Remarks
Audio (30mts) Audio Teleconferencing (Phone in Prog (Only broadcast charges required)	Rs 200- 300	Rs 1000-1500	Rs 8000-10000	Rs 1200-3000 per AIR Station (Grade I –V)	Better to broadcast on Primary Stations so that more area could be covered. Primary Station reach is 150-200Kms, Local Relay Stations reach is 50 Kms
Charges are Same as above				No Charges on GyanVani	Reach is 50 Kms Only in 17 Locations the facility is available
Charges are same as above				Satellite Radio under EDUSAT No Charges	Cost toward Receiver (Radio) Broadcast facility is being worked out by ISRO.
Charges are Same as above				Satellite Radio under World Space Charges are there	Receiver (Radio) will cost .Rs 3000
Video	Rs.200-300	Rs 4000-5000	65000-1,60,000 Depends on the nature of program, outdoor shooting etc	Cable Rs.1000-2000 TV channel (local, Non prime time) Rs.4000 No Charges on EDUSAT facility in Karnataka	No time will be on National Channel. If available it will be Rs.40, 000-Rs 1,00,000

Video (TV) Teleconferencing (One day program)	Prepared in a workshop mode as it involves more people and it is to be group work. Rs 15,000	No Script is required. Preparation of power {Point is done as part of preparation	Clippings (10-15mts) could be used as part of presents ion Rs. 10,000 to Rs 30,000 (depending on duration and nature of program) Rs 100 per trainee for reading materials	Rs 10, 000 for one Hr on GyanDarshan going C-Band and it could be received through Cable Networking. On TDCC it will be Rs. 35,000 per day Which could be received on Extended C band (in all DIETs)	For GyanDarshan the uplink is Delhi Only. For TDCC the uplink is available in 6-7 Locations (Mysore, Goa, Bhopal, Cuttack, Gandhinagar, Ahmedabad) KU band facility on Mana TV is available at Hyderabad
Two way Video (TV) Teleconferencing through ISDN lines Which UP SSA is using				Rs 3300 for an hour duration between two nodes	Facility available in all most all the districts Facility by NIC (National Informatics Centre)
Video (Computer) Teleconferencing (web based)	Prepared in a workshop mode as it involves more people and it is to be group work. Rs 15,000	No Script is required. Preparation of power {Point is done as part of preparation	Clippings (10-15mts) could be used as part of presents ion Rs. 10,000 to Rs 30,000 (depending on duration and nature of program	No Charges as of now Facility under EDUSAT	Only 300 locations are likely to have in couple of weeks (facility by NCERT,CEC-UGC,IGNOU)
Multi Media	Rs 200-300	Rs.4, 00,000 to 6,00,000 Depending on the complexity of production		----------	Hand book and any add ional materials Rs. 100 per user

The cost does not include the travel / per diem etc to be paid to Participants

List of Content Service Providers (Multimedia)

Learnet India Ltd.
The IL & PS Financial Centre
Plot No,. C-22, G Block
3rd Floor, D-Quadrant
Bandra Kurla Complex
Bandra (East)
Mumbai 400 001

CIET
NCERT
17-B, Sri Aurobindo Marg
NEW DELHI-110 016

EMPC, IGNOU
Maidan Garhi
New Delhi-110 068

Edurite Technologies Pvt Ltd.
L-3, Hauz Khas Enclave
New Delhi-110016

Designmate
401, Hi=Scan House
Near Mithakali Underbridge
Navrangpura
Ahmedabad-380 009

Media Education Technology Pvt. Ltd.
210, Unique Trading Centre
Opp. P.M.Regency
Sayajigung,
Vadodara-390 005

JIL Information Technology Ltd.
64/4, Site No.4,
Adhibabad Industrial Area
Dist Ghaziabad-201 010

MindLogicx Infotech Ltd.
Unit I, TECHLLANO
10/1B, Graphite India Road
Hoodi Village
K.R. Puram, Hoobli
Bangalore 560 048

Online Infochem
248, Lane 13,
Sathyagrah Chhavni Satellite
Ahmedabad—380015

N.S.E iT Trade Globe
Andheri Kurla Road
Andheri (E), Mumbai-40059

Argusoft India Limited
A=66, GIDC, Sector 25
Gandhinagar=382 016

Kalzoom Technologies
1, Hiremath Park Road
MIT enclave, Kalyani Nagar
Pune-411 014

Enigma Digital Concepts
Enigma villa
ITPL Road,
Next to Brooksfields
Bangalore-560 066

Excel Soft Technologies Pvt. Ltd.,
1/B, Hootagalli Industrial Area
Mysore-570 018

IBM Global Services India Pvt. Ltd.,
1st Floor, Birla Towers,
25, Barakhamba Road
Connaught Place
New Delhi-110 001

Learning Links Foundations
1209, Padma Tower I
5, Rajendra Place
NEW Delhi-110 008

CDAC, Anusandhana Bhawan
C-56, /1, Institutional Area
Sector 62, Noida-201307

Consortium for Educational Communications (CEC)
N.S.C. Campus, Aruna Asaf Ali Marg,
New Delhi-110067

Azim Premji Foundation
Bangalore

NIIT K-12 & NIIT Hole in the Wall Education Limited
New Delhi

Rajiv Gandhi Shiksha Mission
Bhopal

Bridges to the Future
Hyderabad

Microsoft India
Gurgaon

MetaLearn
Bangalore

Center for Environmental Education
Ahmedabad

Pratham
Mumbai & Delhi

Jiva Institute
Faridabad

Intel India
Bangalore

n-Logue
Chennai

Akshaya
Kerala IT Mission
Kerala

Agastaya International Foundation
Bangalore

ET Cell
SNDT Women University
Mumbai

Minimal Invasive Education Model

An estimated 300 children can learn to do most or all of the following tasks in approximately three months, using the "Hole-in-the-Wall" arrangement with a single PC:

- ⇒ All Windows operational functions, such as click, drag, open, close, resize, minimize, menus, navigation etc
- ⇒ Draw and paint pictures on the computer
- ⇒ Load and save files
- ⇒ Play games
- ⇒ Run educational and other programs
- ⇒ Play music and video, view photos and pictures
- ⇒ Browse and surf the Internet, if a connection is available.
- ⇒ Set up e-mail accounts
- ⇒ Send and receive e-mail
- ⇒ Chat on the Internet
- ⇒ Do simple troubleshooting, for example, if the speakers are not working.
- ⇒ Download and play streaming media
- ⇒ Download games

In addition to the above task achievement, local teachers and field observers often note that the children demonstrate improvements in:

- ⇒ Enrolment, attendance and school examinations, particularly in subjects that deal with computing skills
- ⇒ English vocabulary and usage
- ⇒ Concentration, attention spans and problem solving
- ⇒ Working together and self-regulation

The Findings

Groups of 6-13 year olds do not need to be "taught" how to use computers. They can learn by themselves. Their ability to do so seems to be independent of their:

- ⇒ Educational background
- ⇒ Literacy levels in the English language or any other language
- ⇒ Social or economic level
- ⇒ Ethnicity and place of origin, i.e., city, town or village
- ⇒ Gender
- ⇒ Genetic background
- ⇒ Geographic location
- ⇒ Intelligence

EduSAT: A Satellite Dedicated to Education

Objectives:

- ⇒ To provide support to education through low cost ground segment.
- ⇒ To reach the unreached people of India in every nook and corner.

Services:

- ⇒ Supports multiple independent and simultaneous networks for education.
- ⇒ Distributed teaching centers.
- ⇒ Interactive remote classrooms with videoconferencing capabilities.
- ⇒ Education material on demand.
- ⇒ Supports web-based self learning.
- ⇒ Ku & Extended C band operations.

Potentials of EDUSAT

- ⇒ Radio Broadcast
- ⇒ TV Broadcast
- ⇒ Night time Loading at Receiving End
- ⇒ Online Education through Internet
- ⇒ Telephone as Return Link
- ⇒ Internet as Return Link
- ⇒ Talk Back as Return Link
- ⇒ Web Cam as Return Link
- ⇒ Voice Chat on Internet
- ⇒ Asymmetric Internet TVRO
- ⇒ Video Conferencing

Ground Configuration:

- ⇒ Low cost satellite uplink for teaching end.
- ⇒ Small size satellite interactive terminal (SIT).
- ⇒ Very small size simple receive only terminal (ROT).

Teaching End Features:

- ⇒ Live lecture broadcast
- ⇒ Live audio-Video interaction
- ⇒ Video conferencing
- ⇒ Electronic multimedia teaching aids like electronic board/touch screen, VCD/DVD clipping and facilities for supporting power point or any other multimedia presentation
- ⇒ Conventional black board teaching with chalk and talk
- ⇒ Off line self learning and self assessment
- ⇒ Storage of live lectures for reuse and editing
- ⇒ Content on demand (delivery of recorded lectures and supplementary materials)
- ⇒ Administrative support like online registration, online examination and distribution of circulars and announcements

SIT (Satellite Interactive Terminal/Classroom):

- ⇒ Reception of live audio-video lectures
- ⇒ Live audio- video interaction
- ⇒ Video conferencing with teaching end
- ⇒ Off line access to teaching end for self learning
- ⇒ Content on demand for reuse and editing

- ⇒ Reception of lectures through other similar networks

ROT (Receive Only Terminal/Classroom):

- ⇒ Reception of live lecture
- ⇒ Automatic storage of live lecture for reuse and editing

Though EDUSAT has so many potentials the Proposals submitted by Various States, NCERT, IGNOU CEC (UGC) mostly talking about Video Conferencing with Satellite Interactive Terminals (SITs) and Receive Only Terminals (ROTs). Exception being Karnataka's TV broadcasting for Schools in Chamarajanagar District, which began in Feb, 2005

Hence there is a need to look for other uses of EDUSAT such as Internet, Radio etc for reaching students, Teachers and community members and enhancing interactivity**.** QUEST could work with States and ISRO for planning programs and Projects for enhancing the utilization EDUSAT.

Government of India Policy document on

INFORMATION AND COMMUNICATION TECHNOLOGY @ SCHOOLS (2004-2005)

Introduction

Information & Communication Technology (ICT) is universally acknowledged as an important catalyst for social transformation and national progress. However, disparities in the levels of ICT readiness and use cold translate into disparities in level of productivities and hence could influence a country a rate of economic growth. Understanding and leveraging ICT is therefore critical for countries striving for continued social and economic progress.

India shows enormous geographic and demographic disparity in ICT use. India has one of the largest ICT workforces in the world. One can find intense ICT use in technology clusters such as Bangalore and Gurgaon or amongst the upper middle brackets of incomes. The other side of the story is that large parts of the country lack even telephone connectivity.

Background

India recognized the importance of ICT in education as early as 1984-85 when the Computer Literacy And Studies in Schools (CLASS) Project was initially introduced as pilot with the introduction of BBC micro-computers. A total of 12.000 such computers were received and distributed to secondary and senior secondary schools through State Governments. The project was subsequently adopted as a Centrally Sponsored Scheme during the 8th Plan (1993-98). During the 8th Five Year Plan the Scheme was widened to provide financial grants to institutions which were given BBC Micros and also to cover new Government Aided Sec Sr. Sec Schools. Assistance included annual maintenance grant for BBC micros and purchase as well as maintenance of equipment for new Schools.

2508 Schools having BBC Micros were covered under the CLASS scheme during the 8th plan providing instructors maintenance of hardware. consumables and text books for students and training of teachers in schools in addition 2371 schools were covered with new hardware and service which included Rs 1.00 lakh for hardware configuration and Rs 1.30 lakh per annum for recurring cross Rs 080 lakh per annum was kept as the recurring costs for schools which had already been covered under the BBC-Micros scheme.

NIC was identified as the nodal agency for finalizing the contract for the supply of hardware. The use and supply of software was limited. Coverage was confined to Sr. Secondary Schools and the student of class XI & XII had to undergo a Computer Course Module.

National Task Force of Information Technology and Software Development (IT Task Force) Constituted by the Prime Minister - in July 1998, has made specific recommendations of introduction of IT in the education sector including schools. The relevant paragraphs are reproduced below.

Vidyarthi Computer Scheme: Shikshak Computer Scheme and School Computer Scheme to enable students, teachers or/and schools respectively, desirous of buying computers to do so under attractive financial package. These scheme will be supported by a suite of initiatives such as lowering the cost of PCs. easy installment bank loans, computer donations by IT companies and other business houses, bulk donations of computers by NRI organizations, large-volume bargain price imports, multi-lateral funding, etc.,

Computers and Internet shall be made accessible to schools, polytechnics, colleges and public hospitals in the country by the year 2003.

The concept of SMART Schools where the emphasis is not only on Information Technology in Schools, but also on the use of skills and values that will be important in the next millennium, shall be started on a pilot demonstrative basis in each State.

The Report recommended provision of computer systems to all educational Institutions up to Higher Secondary Schools by suitable investments (about 1-3%) of the total budget during the next five years.

The recommendations of the Task Force have been approved by the Council of Ministers.
The ICT in Schools scheme is a window of opportunity to the learners in the schools of India to bridge this digital divide. The scheme is not a simple merger of the earlier CLASS and ET Schemes but is a comprehensive and well thought-out initiative to open new vistas of learning and to provide a level playing field to school students, whether in rural areas or in the metropolitan cities. The ICT in Schools Scheme is not a stand-alone scheme but actively solicits the partnership of States. Union Territories and other organizations in a mutual endeavour to bridge the heterogeneous proliferation of ICT across different socio-economic and geographic segments in the country. This partnership is manifest in the structure of financing the initiative, in encouraging the development of long-term Computer Education Plans, the setting-up of Smart Schools by KVSNVS in States as technology demonstrators and in providing for supplementing the States efforts in these areas with no attempt being made to supplant the State Schemes.
The centrally sponsored scheme of Educational Technology and Computer Literacy and Studies in Schools have been suitably modified keeping in view the past experience, the feedback which has been received and changing needs to form the new scheme of Information and Communication Technology in Schools. The component regarding financial assistance o States LT's for purchase of RCCPs and CTVs under the erstwhile Educational Technology Scheme has been weeded out.

Suggestions and Comments by a Principal

Mrs. Neelam Karmalkar is the principal of Amchi Shala, who has also been awarded as the best school teacher award last year. She is open minded, confident, and innovative enough to have one of the few schools where computers for kids have been playing its necessary role. She, however, is not always gung-ho about computers all the time. She knows the necessity and limitations of computers in schools. She says:

- ⇒ computers are necessary for government schools in order to make the children aware of computers, and also build confidence into them so that they do not feel lesser than those kids who can afford everything;
- ⇒ children of our school are very happy, so much so that they do not want to miss school any day;
- ⇒ in learning language and mathematics, computers have been helpful;
- ⇒ computers do not increase skills and competencies, but it is preparing this generation for the future as well as concurrent world where nothing happens without the use of computers;
- ⇒ all computers are enabled with Internet connection but only the students of 9th and 10th are allowed to use the net;
- ⇒ we should try to make content/software which should be related and complementing to the curriculum so that the children could relate to the content;
- ⇒ more and more content should be created, based on current happening like Tsunami, environment, pollution, civic sense, ecology, plants, animals, food and fruits, and so on;
- ⇒ we are using a School Admin Package developed by Pratham; the package takes care of the salaries, scholarships, databases, development of regular reports that is required to submit to government, and general register;
- ⇒ all the school teachers and principals, who have been involved in the implementations of computers in their schools, should meet in a joint gathering to share their experiences, and make a strategy of what should be developed for teaching and learning in schools;

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Institutional

- National Council for Teacher Education
- National Council of Educational Research and Training
- Indira Gandhi National Open University
- State Institutes of Educational Technology
- District Institutes of Education & Training
- State Council of Educational Research & Training
- Indian Space Research Organisation
- Central Institute for Vocational Education
- Central Institute of Educational Technology
- National Institute for Open Schooling
- State Institute of Rural Development
- Rajiv Gandhi Shiksha Mission
- State Open School
- SNDT University for Women
- Educational Development Center
- Center for Environment Education
- Byrraju Foundations
- Dr. Reddy's Foundation
- Intel India
- Microsoft India
- MetaLearn

Resources

- Pratham
- Agastya Foundation
- American India Foundation
- Jiva Institute
- n-Logue
- Drishtee
- Akshaya
- Aarohi Project
- Equal Access
- IBM
- ICICI Bank
- TCS
- NIIT – HiWEL
- UNDP – APDIP
- CISCO
- ORACLE
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