Lessons from the Application of Communication Technology in Higher Education in India

Usha Vyasulu Reddi, Audio Visual Research Centre
Osmania University, India

INTRODUCTION

The successful use of communication technologies for education requires the optimal deployment of resources, comprising policy, structures, funding, human resources, production, research and evaluation, and planning for the future. Keeping in mind the ability to use technology to make a quantum leap from non existent terrestrial systems to the most sophisticated satellite based systems, almost every country in the world has had its own reasons for using communication technology to educate its citizens.

Contemporary education systems in most developing countries have been based on models in the developed world. As a follow-up to the process of colonisation, educational systems retained the patterns of the mother country, whether British or European. The legacy has been carried forward to the post independence era as both the structures and the problems of education in developing countries reflect. India is no exception.

A BRIEF BACKGROUND

Since the focus of this presentation is on higher education and the lessons learned from the application of technology, a brief description of the Indian scenario becomes essential, if only to place the discussion in perspective.

India has always been desirous of having a stated policy but given the often contradicting conditions of the country, and the highly politically conscious citizenry, as well as the diverse and conflicting social and demographic conditions, it has been difficult for the country to lay down and to implement a national education policy.

Both central and state governments are involved in educational planning and administration. To assist the central government (especially at the tertiary or post secondary level) the University Grants Commission, a statutory body, is a conduit for the flow of funds from centre to state. Also established are the All India Council for Technical Education (for professional courses), the National Council for Teacher Education (for teacher training), and the Distance Education Council of the Indira Gandhi National Open University (IGNOU) for distance education.

A high drop-out rate (from about 96% enrolment at the primary level to .04% at the undergraduate and graduate level) is another feature of the Indian educational system. The term "'drop-out" includes both those who have left the educational stream because they have failed to meet academic standards and qualified persons who could not be accommodated in the formal educational system because of infrastructure limitations and lack of facilities.

For higher education, funding comes from both the state government for state universities and central sources such as the University Grants Commission for central universities as well as some other institutions of higher education. Grants in aid also come to state universities from central government sources.

The percentage of gross national product spent on education has been increasing since independence from 1.2% in 1950 to 4% in 1986/87, but it is still well below the general target of 6%. In contrast, the growth in enrolment has been from 360,000 in 1950/51 to 4.75 million in 1989/90.[1]

There are about 5,000 colleges for general education; and about 196 universities and institutions of higher learning.

1.Aggarwal, J. C. and Aggarwal, S. P. 1992. *Educational Planning in India.* New Delhi: Concept Publishing.

It is argued by the educational administrators that if India is able to reach her goals of universal education by the year 2000, we would need a minimum of one school every three minutes and a college every seven minutes. Schools and colleges as formal institutions of learning take time and resources to build. Both are in short supply and India has no alternative but to turn to new ways to educate her youth.

There is also wide concern about the quality of the higher education to which students are exposed. The education sector is conservative, slow to change, and uneconomical. Obsolescence of curricula, an unequal distribution of poor and non existent facilities and instructional materials, politicisation of campuses leading to a disruption of academic schedules, and an overburdened and outdated system coupled with the market demand for vocationally trained human resources—all add to the urgent need to explore new and different ways of teaching and learning.

The central issue of whether communication technology is being applied appropriately emerges out of a relationship between the educational goals and the processes being used to achieve them. The questions being raised about higher education include "Are students obtaining the type and quality of education needed for the twenty-first century? What are the trade offs between money and quality; that is, the cost and quality? What are the links between education and the workplace?"

Educators typically place process before outcomes, while non educators are usually more interested in outcomes. There is an undercurrent of opinion among educators that education, as an intangible, cannot be measured in money terms while non educators share a different view. Debates about quality, role differentiation, and accessibility are founded on different assumptions. There is an undercurrent of opinion among educators that education, as an intangible, cannot be measured in money terms while non educators hold a different view. And in an era of shrinking financial resources, the debates become more pronounced, more acrimonious.

USING EDUCATIONAL TECHNOLOGY

In a scathing comment on Indian educators during a conference on new technologies and higher education, the late Professor. G. Ram Reddy, doyen of distance education in India, remarked in 1985[2]

> *For long, we in education have remained indifferent to new technologies—most of the time making such cynical remarks as "new fads in education." All other branches of life such as industry, commerce, medicine, and engineering are adopting and integrating new technologies into their profession; education alone has maintained distance from new technologies. As one commentator pointed out, the way teaching is done today in most institutions, it appears as though the printing press has not been invented.*

Dr Reddy proceeded to identify the problems faced in education as those of *equality*, *quantity*, and *resources*. And it is precisely these issues which the new communication technologies can be used to address.

The driving force behind innovative experiments in development and education has often been technology—whether the printing press, films, radio, and television, or the satellite and computer based media of the 1980s and 1990s.

Educational broadcasting of a broad enrichment variety is as much a part of educational technology as the more structured curriculum based broadcasting that is targeted to narrowly defined target audiences or closed user groups.

Our concern here is with the selection and utilisation of media—more as a process than as a product. As a process, the study centres around the choice and effectiveness of selecting some media over others, with the mixing and blending of media to provide multimedia packages to learners.

There are four major kinds of activities being undertaken in India: educational broadcasting, the dual mode universities offering distance education, the single mode open universities, and private industry just entering education. At present, there is both one-way transmission of educational content as well as teleconferencing (although at a limited level).

2.Reddy, G. R 1985. "Keynote Address" in *New Technologies in Higher Education.* New Delhi: Association of Indian Universities.

Marketing and distribution continue to be the perennial problems for the video industry in the country. Correspondingly, one of the major issues debated in India today is not production but the marketing and distribution of materials to those most in need but least able to afford.

Educational Broadcasting

Although Doordarshan was involved in educational broadcasting since 1959, this broadcaster's role in education really increased with the Satellite Instructional Television Experiment (SITE) in 1975. SITE was a year long multipurpose communication project designed to study the effectiveness of television as a medium for education and information. A major focus of the SITE experiment was on school education and teacher training, especially for teachers in geographically dispersed areas. Broadly educational in character, programmes produced and broadcast during this one year experiment addressed a wide range of issues from developmental to specific teacher training.

The SITE experiment was heavily oriented towards testing of hardware and the technology involved. The experiment did not attempt to test adequately the developmental spin off of the project in terms of economic growth or social change in the communities involved.[3] Still, all evaluations of the SITE experiment showed that, without exception, television could be used as a valuable aid in creating awareness and in enriching the quality of education received both by children and adults. Consequently, the Indian government continued educational programmes even after the experiment was over, with educational television being a very important component of the educational scenario in India ever since.

The setting up of massive communication infrastructure began with the launching of India's own satellite INSAT 1B in 1982. An awareness that such a potentially large network of electronic media could be harnessed for education led to initiatives to establish special telecasts for school and college students.

Teleschool was the project for school children; for college students the University Grants Commission (UGC) transmission called the "Countrywide Classroom" (CWCR) commenced transmission on August 15, 1984. Imported programmes telecast during the first few months of inception quickly gave way to Indian programmes so much so that today, CWCR telecasts consist of 80% Indian programmes, largely generated by the more than 15 media centres established by the UGC for the purpose throughout the country. Of the programmes telecast, 20% are imported by choice, not by necessity.

The media centres located in universities throughout the country produce programmes which are then sent to a UGC established autonomous institution, the Consortium for Educational Communication (CEC) for capsuling and forwarding to Doordarshan for transmission. The CEC does more than serve as an intermediary agency; it also co-ordinates other mass communication activities of the UGC.

Countrywide Classroom programmes aim to upgrade, update, and enrich the quality of education while extending their reach. Attempting to be interdisciplinary in nature, the programmes seek to provide insights and to show the inter-relatedness of the various disciplines to student audiences in resource poor locations.

Independent audience surveys have shown a sizeable audience of about four million each day for these educational programmes, an audience consisting not only of the primary target—students—but also a secondary target of generally interested adults, employed and unemployed, professional, and retired.[4]

Also in the pipeline is a UGC project to produce video lessons in 15 different subjects for distribution to colleges teaching at the undergraduate level. This project called the "non broadcast video lessons" (NBVL) and nearing completion will make available curriculum based video lessons as a support for teaching in resource poor locations.

Dual Mode Universities

Correspondence based distance education programmes were initiated in Indian universities in the 1960s to address the increased demand for higher education and as a system of award of university degrees for students who study on their own and appear for equivalency examinations conducted by universities. Encouraged by the success of study programmes by Delhi University in

3.Mody, Bella. (1978) "Lessons from the Indian Satellite Experiment", *Educational Broadcasting International* (11:117–20)

4.Admar. 1993. *Viewership Survey for UGC/CEC.* New Delhi: Unpublished Report, CEC.

1962, India's University Grants Commission formulated guidelines for introducing such courses. By 1980, more than 21 universities had introduced programmes, primarily at the undergraduate level. This number has grown to more than 40 by the mid 1990s with universities such as SNDT, Mysore, Andhra, Annamalai, and Madurai adopting open admission policies.

In parallel, professional institutions such as the Institute of Electronic and Telecommunications Engineers (IETE), the Chartered and Financial Accountants of India, and the All India Management Association have also been offering correspondence based courses for individuals desiring to join their professions.

The total enrolment in universities and colleges in India in 1989/90 was about 4.2 million out of which almost 500,000 students were enrolled through the distance mode. Of this enrolment, 80% was through the correspondence courses of various universities and 17% through single mode open universities.[5] The Education Commission (1964 to 1966) had recommended a goal of enrolling one third of all students through the distance mode by 1986. For the first time, this target appears achievable by the year 2000.

Single Mode Institutions

The first open university in the country was started in 1982 in Andhra Pradesh. Called the B. R. Ambedkar Open University (BRAOU), it was set up to provide access to higher education to adults to upgrade skills, improve their quality of life, equalise educational opportunities, and encourage lifelong education (IGNOU Project Report 1985). Within four years, this university had enrolled almost 40,000 students.

Following the lead of Andhra Pradesh, other state governments established open universities: Rajasthan (Kota), Maharashtra (Nasik), and Bihar (Nalanda) already have operational institutions while other states are examining the possibilities.

The encouraging success of this experiment prompted the national government to establish the Indira Gandhi National Open University (IGNOU) with the responsibilities of providing educational opportunities to large segments of the population on a national scale, to develop an open and distance education system using all communication methodologies and to co-ordinate activities and determine standards in such systems (IGNOU Act 1985).

IGNOU's brief history is monumental when one considers the geographic and population base it is designed to cover. Its facilities are located in New Delhi heading up a three tier organisation with regional and local study centres forming the other two tiers. Totalling more than 200, study centres are located in local colleges and equipped with libraries, audiovisual facilities, computers, and classroom and office space. These centres are staffed by full- and part-time counsellors, who provide tutorial and other student support services.

Instructional packages consist mainly of print based materials, with supplementary audio and videotapes mainly available at local study centres for use by students. Further IGNOU broadcasts 30 minutes of programming on Doordarshan three times a week, while BRAOU has a daily radio programme.

Private Industry Involvement in Educational Technology

Cable teaching and coaching is the latest trend in India. Several private cable companies in large cities like Bombay and Bangalore have already started offering distance education through lessons taught by cable to their subscribers. The most adventurous of these operations is probably an idea from the Bangalore based company called 4M. It is planning an Indian Institute of Management (IIM) certified diploma in Business Management in 167 half hour sessions, which are reinforced with weekly kits of video, audiotapes, floppy discs, textbooks, and reading materials. Many professors from the Indian Institute of Management (Bangalore and Ahmedabad) are associated with the programme, which is at present seeking time slots on several transnational satellite television channels. Apart from the management programme, the Bangalore based company, Marketing and Advertising Associates (MAA), which is marketing the package, is planning one and half hour computer courses, three times a week, through 4M for high school students. Others such as Globo Star and Universal Network, which reach about 15,000 students in the Greater Bombay region, have coaching classes on cable in the arts and sciences. Computer education classes on the international satellite channel, ZEE TV part of the STAR TV(Satellite Television Asian Region) in collaboration with computer education institutes have also commenced for the general public. ZEE TV has, in fact, set up an organisation to work out the

5.Singh, Abhimanyu. 1992. *Perspectives on Distance Education: Distance Education in India.* Vancouver: Commonwealth of Learning.

details of a open learning system called "University of the Sky".

SPECIFIC CASES IN TECHNOLOGY APPLICATION

By 1991, Indian undergraduate students had access to a minimum of 12 hours of educational programming a week. Audience size for the Countrywide Classroom had stabilised at an average of four million per day.

Yet problems persisted relating to insufficient reach, lack of awareness of programme content, unsuitable times, language of telecast, and perceived relevance. Some of these problems, it was felt, could be addressed through the application of satellite based communication technologies, especially interactive television.

World-wide teleconferencing is being used on a regular basis by a large number of educational institutions to provide curriculum content to distant learners.[6] The effective use of this technology is dependent on any number of factors, from a total systemic approach in the planning and design of the experiment, the identification of target audiences, the successful collaboration of diverse agencies, the use of educational pedagogy in content design, and materials production to effective evaluation. For the inclusion of all these elements in the field of educational broadcasting, India is unique in using teleconferencing to introduce Indian audiences to both general and curriculum specific programming.

In an attempt to reach out to audiences in a better way by extending the reach of the Countrywide Classroom, and because the one way mode of broadcasting has pedagogical and communication limitations (some of which can be minimised with interactivity), and to test the feasibility of using teleconferencing as an educational tool Indian experiments began in a small way in 1991. Using one way video and two way audio as the basic teleconferencing format, these experiments over the past four years have explored the technical feasibility and the educational effectiveness of using a national satellite based system for education. Extending the reach of television and access to educational content has put useful information in the way of those who might otherwise have no access to it.[7] In the educational wasteland that many of Indian students live in, any kind of information or intellectual stimulation makes a deep impression in the mind.[8] Research findings from all the experiments have shown appreciation for interactivity, reflected in a better understanding of both the programme content and the subject taught among all the targeted beneficiaries.

Among the educational broadcasters, while the has maintained its interest in television teleconferencing, that is, live to air, IGNOU, for instance has operationalised the teleconferencing format for closed user groups and for distance education links with its regional centres as also for the conduct of business meetings of the institution.

Institution and situation specific configurations have been experimented with and the results from each experience have been used to improve the subsequent application. For instance, when the early experiments showed that time for interaction (talkback) between the expert and learner was inadequate, the latter exercises varied the time in order to provide maximum interaction. Similarly the number of telephone lines at the teaching end was increased and the possibility of asking questions by fax and even e-mail were introduced in the later experiments. In target audience definition, the latter CEC exercise deliberately moved away from metro and capital cities to the more geographically remote and rural locations and moved from organised viewing to a more flexible, voluntary, and diffused viewing condition.

Table 1 provides a bird's eye view of each of these experiments in terms of target beneficiaries, objectives, configuration, content, media utilisation, and outcomes, while Figure 1 gives a general system configuration of the experiments.

6.Bates, Tony. 1993. *The Use of Television in Higher Education: Conditions for Success.* Burnaby: Open Learning Agency, unpublished paper.

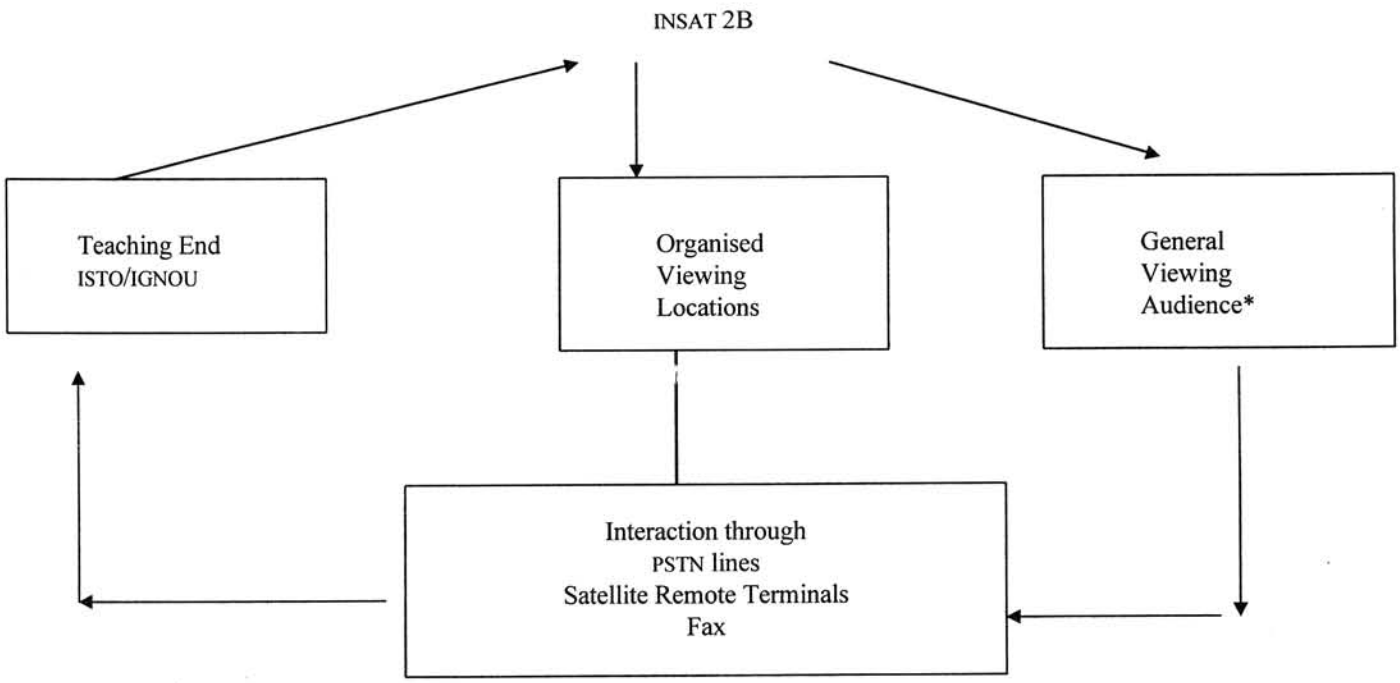
7.Mody, Bella. 1978. Op. cit.

8.Ninan, Sevanti. 1992. ""Educational Television: Area of Darkness" in *The Hindu* April 26, 1992.

TABLE 1. FEATURES OF DIFFERENT TECHNOLOGY APPLICATIONS IN HIGHER EDUCATION IN INDIA

Features	UGC Talkback	IETE	IGNOU Talkback	UGC Talkback	Course
Year of Experiment	1991	1992	1993	1994	
User Group	Open to all	Closed	Closed	Open to all	
Target Beneficiary	U.G. students	IETE students	Students and IGNOU academics	U.G. students	
Organising Agency/ies	UGC/ISRO	IETE/ISRO	IGNOU/ISRO	CEC/ISRO IGNOU	
Major Objectives	To test technical aspects	To test technical aspects	To test technical aspects	To test package concept	
	Evaluate learning outcomes	Evaluate learning outcomes	Evaluate learning outcomes	Explore size of audience	
	Evaluate attitude	Evaluate attitude	Evaluate attitude	Establish costs	
Configuration	One way Video, Two way audio	One way video, two way audio	One way video, two way audio	One way video two way audio	
	Talkback through phone	Talkback through satellite remote terminals	Talkback through phone and fax	Talkback through phone & fax	
Nature of Content	Enrich-ment only	Audience specific curriculum	Audience specific curriculum	Enrichment package of programmes	
Medium and Format	Televised on national network	Dedicated channel	Dedicated channel	Televised on national network	
Nature of Viewing	Organised and open	Organised	Organise	Organised and open	

FIGURE 1.GENERAL SYSTEM CONFIGURATION FOR INDIAN TELECONFERENCE EXPERIMENTS



In the case of the Countrywide Classroom, a live telecast on Doordarshan has taken place. Uplink was through ISRO facilities and transmission through Doordarshan. Interaction in the first experiment in 1991 was through both normal long distance telephone lines and two satellite remote terminals. The latter experiment used telephone lines and fax for interaction.

In the case of IETE, uplink has been through a dedicated transponder from ISRO facilities at Ahmedabad and interaction through satellite remote terminals.

In the case of IGNOU, uplink has been from a mobile facility placed at IGNOU for the purpose. DRS AT different regional centres provided a downlink on a dedicated extended C Band transponder on INSAT.

LEARNING FROM THE APPLICATIONS

The Indian experience has been with both closed and open user groups and on dedicated and open to all transmission channels of Doordarshan, with a variety of interaction mechanisms from satellite remote terminals to normal telephone lines, fax, and to a much lesser extent, e-mail. The results of the evaluations of each of the experiments throw up important indicators for any developing country institution venturing into educational teleconferencing.

The lessons learned from the various experiences in teleconferencing can be evaluated in terms of:

- the specific objective of each exercise;
- technical, operational, cost, and institutional issues (including duration) and
- content issues.

The Specific Objective of Each Exercise

The results of the quantitative data gathered from any of the four exercises given in Table 1 do not permit us to make any conclusions about the effectiveness of the teleconferenced mode of teaching and learning as a one way transmission. While undoubtedly there is greater access possible, there was no clear cut evidence to show that interaction through the one way video, two way audio approach produced higher learning outcomes or that it was more effective than the mere one way transmission of information.

The novelty effect of the first time experience for many of the students wore off quickly, and general patterns of television viewing were observed, including significant drops in attendance and attention, and disturbances in and around the room.

There was greater appreciation for this mode of learning. Findings of the evaluations relating to learning outcomes and perceptions reiterate that access and participation are both desired and recognised as helping students learn. Attitudes and reactions towards teleconferencing as a mode remained favourable throughout all the exercises. Such unqualified support must be tempered by other findings from audiences, who state categorically that future or regular use of teleconferencing by targeted beneficiaries will depend upon improvement in timing, access to telephone facilities, and high quality programme content.

Such results which indicate that teleconferencing is no more or less effective than one way telecasting does not necessarily lead to conclusion that it is unnecessary. What has to be recognised is that learning gains from television are not instant, obvious, or linear in fashion. What is apparent is that a real viewing situation, which is entirely voluntary, consists not of rapt attention but of an dynamic activity taking place in a variety of social settings. Such social situations are in themselves important causes for change, as well as the outcomes of exposure to educational content through this mode.

Technical, Operational, Cost and Institutional Issues

Findings from all the exercises showed that there is much to be improved in the technical quality of the teleconferences. Generally speaking, there were fairly good facilities at the teaching end whether at the ISRO facilities in Delhi or Ahmedabad or at the IGNOU facility in Delhi. The same could not be said of the receiving end where there was inadequate space for viewers, disruptions in power supply, and an undependable telephone line, resulting in a varying reception quality of video and audio quality in transmitted programmes and interaction.

One aspect which stood out through all the exercises was the varying quality of "medium or camera friendliness" of the subject experts who interacted with the students. Anchoring of the teleconferences was of very good quality; a substantial number of subject experts, however, appeared uncomfortable with the medium, could not pace their responses or talk to their audiences (either because of lack of time, academic level or style of speaking).

Across all experiments, students and other viewers complained of inadequate interaction time (whether 15 minutes or one hour) to ask questions and seek clarifications; insufficient number of telephone lines at the teaching end; long waiting time before the call would go through, difficulty in reaching the teaching centre to ask questions; poor quality of audio in the telephone call; and the audio noise of the telephone line coming through the transmission because of not muting of the television set when asking questions.

Viewers also raised issues relating to the varying quality of production aspects; from varying production quality to insufficient and poor use of graphics, difficulties in understanding the subject experts, and a mismatch between camera movement and the expert speaking. Such issues related as much to the pre-recorded programmes which would be shown before the interaction as to the period of interaction.

Once the infrastructure of teleconferencing is in place, cost is no longer an issue. The production of programmes remains the same as for regular educational programmes. Transmission costs are also low. For the educational agency, the major additional expenditure related to research and evaluation of the exercises and not to either production or provision of infrastructure facilities.

For the receiving end at organised viewing locations, costs related to provision of downlink facility (in the case of IGNOU), mobilising of viewers, local hospitality, costs of telephone calls to the teaching end, and so on.

There remains the question of whether viewers and students (watching independently and not at the organised viewing locations) have access to telephones and are willing and able to pay for the costs of telephone calls to the teaching end. Evaluation of the UGC course in 1994 showed a flood of telephone calls from individual viewers from many parts of the country (waiting on a long distance line for almost eight minutes at peak hour rates), to ask questions implying that there is both a willingness and an ability to pay for relevant information.

Taking potential reach and viewership into consideration, and irrespective of duration or distance, the cost of providing high quality educational input through teleconferencing is substantially less than 50 paise per head.

Implicit to the effective use of teleconferencing is close inter-institutional co-operation and co-ordination in planning, execution, and evaluation. All the exercises

mentioned above had these elements to the extent that all the teleconferences were executed with clockwork precision and attention to organisational details. Absence of such institutional co-operation can have disastrous effects; and one of the major experiences gained is in the area of team work and close co-ordination between very different agencies—technical or academic.

Content Issues

Since the primary purpose of educational teleconferencing is to disseminate particular contents in the form of educational packages, the single most important element in educational teleconferencing is the content of the programme or packages of programmes. The contents of packages are rarely, if ever, unique to the medium of television.[9] Such topics and programmes as were used in the experiments could have served for educational programmes whether telecast or in a non broadcast mode. Thus, to the extent that it takes place, learning is equally attributable to the transmitted contents as to the system or the technology of transmission.

The first UGC experiment varied content by using a potpourri of programmes from the available kitty of already produced programmes. The IETE and IGNOU experiments both had specially designed and prepared programme content and the last UGC telecourse had a specially designed and produced package of nine programmes. From the first to the last exercise discussed in this paper, there was a visible improvement in the planning and production of programme content. And while a distinction has to be made between the curriculum based programming of the ISRO–IETE experiments and the general awareness and enrichment orientation of the Countrywide Classroom experiments, all the research findings indicate that much has to be done in bringing about uniformity in programme content, information overload, and production quality. Viewers reiterated that their own learning from the various teleconference experiments would have been greater had they received material in advance, and been provided guidance and motivation at the learning end. It is also critical that supplementary reading material be made widely available to registered and other viewers before the teleconference so as to maximise benefit.

The language of the programme and the experts, the speed of reply by some of the experts, the use of technical language, differences in accents and the communication skills of the experts, and the use or lack of graphics were seen as contributing to the effectiveness of the experiment.

All told, there is a great need for attention to detail in the planning, designing, execution, and evaluation of educational teleconferences. What is clear is that teleconferencing is economically and technically feasible and can serve as an important educational tool provided the snags in the system are worked out.

IN SUMMING UP

The most important issue in any technology utilisation is institutional planning, followed by an evaluation of technology and cost benefit analyses.[10] Absence of strategic short and long term planning has added another dimension to policy formulation in this area, one which requires an examination of other issues. The policy initiatives to date indicate a support for the use of communication technology in education. But the optimism which such support engenders is dampened by other issues in education.

India's educational problems are not because of the absence of strategic long or short term planning; but with the translation of planning to implementation. Most developmental projects in India can be accused of this weakness, where the problem is often well defined by policy makers and missions or projects drawn up to address these problems, funds identified and set aside; and organisations created to deal with the issue. Implementation gets tied up in knots of administrative politics, bureaucracy, "secure" government jobs, unionisation, and other social issues so that both the goals, targets, and times frames for implementation are lost in the process.

India's issues in technology application have to be undertaken as economies of scale because of the growing youth population and the inability of the system to cope with rising demands for education. The Indian student, traditionally, is also young, part of a small group of less

9.Salomon, Gavriel and Del Campo, Alicia Martin (1981) "Evaluating Educational Television". In Holtzman, W.H. and Reyes-Lagunas, Isabel.*Impact of Eeducational Television on Young Children.* Paris: UNESCO.

10.Humphries, James. 1988. "Planning for Technological Change in Post Secondary Institutions". In Tobin J and Sharon, D (eds.). *New Technologies in Canadian Education: Paper 17:Issues and Concerns.* Toronto: TV Ontario Office of Development Research. pp. 64–68.

than .04% of the population having access to higher education. Generally living in a rural area, the student has little or no access to good teaching, libraries, laboratories, and other resources which are the supports for the urban student. The student is also, in a sense, the "out of school" youth who wishes to have an education but cannot be accommodated in the conventional system. This young person is neither illiterate nor unskilled; he or she simply does not possess marketable skills. Uneducated, unemployed, and frustrated, this young person forms part of a lumpen group, suffering from both neglect and pressure—and is a group least addressed by educators who generally see the conventional on-campus student as their focus of attention. It is precisely this group that future technology applications must seek to address.

The synthesis of the satellite with the computer, aided by deregulation of telecommunications, resulted in the information superhighway, dramatically changing our understanding of the world (in much the same way as the telegraph, telephone, and automobile had transformed earlier societies). For educators, this has meant an unparalleled opportunity to provide access to quality education at significantly lower costs. For learners, this has meant wider exposure to different media and more varied information.

In the centralising effect of technology lies the greater danger for educators. There is danger here of ignoring local language, problems, and needs and unless Indian educators move towards increasing decentralisation in the planning and execution of technology experiments, technology will not be learner driven.

Educational use of technology is but one component in the educational system. The role ascribed to technology depends upon the purposes to which it is applied, and the success of such application depends upon how well we match technology use to audience needs.