

New functions of higher education and ICT to achieve education for all

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I. Introduction

The Jomtien Conference on 'Education for All' (1990) identified the following six objectives to be achieved by the participant countries:

1. expansion of early childhood care and development activities;
2. universal primary education by the year 2000;
3. improvement in learning achievement;
4. reduction of adult illiteracy rate to one-half its 1990 level by the year 2000, with sufficient emphasis on female literacy;
5. expansion of provisions of basic education and training in other essential skills required by youth and adults;
6. increased acquisition by individuals and families of the knowledge, skills and values required for better living and sound and sustainable development.¹

UNESCO and UTLP adopted a broad concept of basic education including adult education with literacy and non-formal alternatives to schooling.²

The Conference also identified four principal requirements for achieving the above objectives. These are:

1. developing a supportive policy context;
2. mobilizing resources;
3. building national technical capacity;
4. strengthening international solidarity.³

Although none of the objectives have been achieved in full because of the failure to meet these requirements, progress has nevertheless been made at least in the following six ways⁴:

1. significant improvements in achieving enrolment, and participation targets for basic education at all levels of education including early childhood care and education;

¹ WCEFA, *Framework of action*. Paris, UNESCO, May 1990.

² UTLP, *Roundtable overview, revised draft*. Philadelphia, ILI, August 2001.

³ Douglas Windham, *Education for all: the requirements*. Paris, UNESCO, 1992 and Bikas C Sanyal, *Achieving basic education for all. The role of higher education and new information technology*. Paris, IIEP, 1995 (IIEP Contributions No. 22).

⁴ Malcolm Skilbeck, *Education for all – global synthesis, EFA international consultative forum documents*.

2. big reductions in some countries in inequities, notably in the area of gender, disability and ethnic minorities;
3. big reductions in a small number of countries in volumes and/or rates of adult illiteracy;
4. new policies, frameworks, legislation and resources in several countries to pursue one or more of the EFA target directions;
5. greater involvement of non-government organizations, community groups and parents in decision making, action programmes and the operation of child care and education facilities;
6. big improvements in educational information and in analytic and evaluative capacity (the knowledge base).

A. Requirements that were not met to the expected extent

In spite of the progress, 125 million people are still out of school and nearly 1 billion are illiterate, not to mention the unsatisfactory progress of early childhood care and development, improvement in learning achievement and the remaining objectives mentioned above. What were the requirements that were not met to the expected extent? We shall examine them item by item.

1. The supportive policy context

The socio-economic context in which the Jomtien targets were set had changed drastically soon afterwards requiring an entirely different supportive policy context. The following six changes have been mentioned as the most dramatic which called for reorganizing the agenda and changing the target directions:⁵

1. the political, social and economic shifts in Eastern and Central Europe;
2. the rapid development of the Internet as a pervasive lever of change for the organization of life, commerce, entertainment and education;
3. the emerging new economy based on intangible capital and calling for much increased adaptability to rapid change and a new repertoire of entrepreneurial capabilities and attitudes;
4. dramatic developments in the life sciences with far-reaching implications;
5. the voluntary and enforced movements and mixing of people and cultures;
6. the growth of poverty and increasing debt around citadels of increasing affluence, and the swift advance of economic and cultural globalization.

In addition, civil conflicts, natural disasters, the devastation brought about by HIV/AIDS and the continued rapid population growth – factors outside of the educational domain and often of the state control – affected the supportive policy context.

2. *Mobilizing resources*

We have already mentioned the growth of poverty and increasing debt, which affected mainly the developing countries. The Director General of UNESCO had the following to say in this respect:

“...basic education has been chronically under-financed both by most countries themselves (less than 2% of gross national product on average) and by the donor community (again less than 2% of development aid); and the distribution of resources and responsibilities between the state, local government, parents and civil society as a whole has not been sufficiently clarified and rationalized”.⁶

Economic crises, coupled in some cases with civil conflicts, played an important inhibiting role in mobilizing resources for education.

3. *Building national technical capacity*

In this respect, the Director General of UNESCO said:⁷

1. Formal schooling has been the main preoccupation in the field of education, entailing neglect of non-formal avenues of learning.
2. Many countries have been slow to redefine their educational needs, in particular concerning educational content reflecting cultural diversity and corresponding to the specific needs of each society.
3. The inequalities within education systems have been increasing, with the result that the poorest of the poor, minority groups and people with special learning needs have hardly been taken into account or may even have been excluded from the mainstream of education.
4. Early childhood education has shown little development and still favours the better-off urban populations, rather than those for whom an educational head start in life would be most beneficial.
5. The “digital divide” has marginalized the poorest social sectors even further, jeopardizing their chances of having the new information and communication technologies serve their specific needs.

4. *Strengthening international solidarity*

There has been sharing of experiences and valuable insights about strategies to achieve EFA in national, regional and international meetings. Whatever new knowledge had been gained, most of it has remained unutilized because of lack of resources as solidarity has been lacking in sharing of resources as mentioned above. Lack of sharing technology and the phenomenon of globalization have both, at least in the short term, widened the gap between the rich and the poor countries.

⁶ Koichiro Matsuura, *Address by the Director General of UNESCO at the World Education Forum, Dakar*. Paris, UNESCO, April 2000

B. What future for Education for All?

The above comments should not discourage the actors in this sphere. Let us note some of the resolutions taken by the powerful actors in this domain. I begin with the Director General of UNESCO – the main international organization with responsibility for education – who has said the following:⁸

“I have given a clear and strong understanding that Education for All will be the foremost priority of this Organisation, its most urgent but also its noblest challenge. I intend to fight this fight with all the resolve and all the moral and intellectual force that I can muster with the aid of all UNESCO’s partners”.

He continued to specify four strategies to assist the member states of UNESCO to strengthen their capacities for action:

1. “To create an education whose *contents and methods are geared to your social and cultural realities*. Your linguistic heritage and your endogenous potential with regard to skills and practices, and the values that underpin your society must all be central to this education if it is to secure the wholehearted approval of the populations for whom it is intended. But this education must also be *modern*. It is essential in this regard to strengthen science teaching from primary level, this being a precondition for the autonomy of each individual in a globalized society.
2. To develop basic education services accessible to all, including the poorest, illiterate adults, children outside the school system – whether at work, in the street or refugees – through a strategy involving both the formal education system and all the alternatives offered by the non-formal sector. Basic education must become a field which is free of *all forms of exclusion and discrimination*.
3. To harness the *modern information and communication technologies* for all. The potential of these technologies must be exploited in order to broaden the reach of basic education, particularly in the direction of the excluded and underprivileged groups; and to enhance and improve classroom teaching.
4. To replace costly, rigid and culturally alienating educational structures with less expensive delivery systems *that are more flexible, more diversified and universally affordable, without ever sacrificing quality*.

These four ways of achieving an education that is authentic, accessible to all without exclusion or discrimination, modern and universally affordable, will provide each individual with the keys to diversified and virtually limitless knowledge.”

Another powerful actor in this domain is the President of the World bank. The Bank has doubled its lending for education from US\$ 918.7 million a year to an average of US\$1.9 billion since the Jomtien Conference. Lending devoted to basic education has increased from 27 to 44 per cent. The World Bank has set up a programme to target

31 countries with populations over 4 million and with the highest gender gap to reduce the gender gap with an increase in lending for girls' education to an average of US\$860 million a year. The President has made the following pledge:⁹

“No country with a viable and sustainable plan for achieving Education for All will be unable to implement it for lack of external resources”

He has also taken initiatives to eliminate unsustainable debt in the world's poorest and most heavily indebted countries, and redirecting resources into the social sectors. He has said:

“The World Bank is firmly committed to achieving the goal of Education for All”.

He has suggested the following strategies to achieve the goal:

1. Strong political commitment to promote efficient resource utilization, sustained support for difficult and sometimes contentious policies and build the necessary institutional capacity.
2. Education policy developed in the context of a comprehensive sector policy framework.
3. Equal emphasis on quality as on quantity with dedicated and well trained teachers supported by a rational incentive structure and a conducive learning environment.
4. Use of information technology for teacher training and for increased access and equity.
5. Broadening the framework of responsibilities of education from the Ministries of Education to other relevant Ministries, donor agencies, NGOs, trade unions, the private sector and foundations. The EFA movement must move forward at the country, regional and global level. It must be broader, more inclusive, more innovative and more flexible than in the past.
6. Active involvement of the Ministers of Finance in the meetings concerning EFA.
7. Improving girls' educational opportunities.
8. Addressing the scourge of AIDS with partners in UNAIDS and building new partnerships like 'Focusing Resources on Effective School Health (FRESH)' which had been launched in Dakar during the Forum in co-operation with WHO and UNICEF.
9. Bridging the digital divide with programmes such as World Links for Development, the African Virtual University, the Global Distance Learning Network and the proposed Global Development Gateway. The World Links for Development programme involving the private sector and the NGOs is linking 400 schools and 40,000 teachers and students in developing countries to their peers in industrialized countries.
10. Putting into place a fast-track action plan of the Bank in partnership with other agencies, for countries that are committed to achieving EFA goals sooner than the 2015 deadline. These countries will be pace setters for others and demonstrate

⁹ James D. Wolfensohn, *Address by the President of the World Bank, World Education Forum, Dakar.*

how to remove the barriers, establish working partnerships and set milestones for progress.

The role of higher education in the implementation of some of the above strategies will be discussed in the following section.

II. New functions of higher education: the role of higher education in achieving Education for All

Higher education is at the top of the education pyramid and determines to a large extent the state of the education system of the country, especially its quality. As such it has a responsibility towards the whole education system as it has towards the whole of society.¹⁰

The World Conference on Higher Education proclaimed in its Article 1¹¹ as one of the missions and functions of higher education: “to contribute to the development and improvement of education at all levels, including through training of teachers.”

Achieving education for all should therefore be one of the responsibilities of the higher education system. However, in reality higher education has been concerned mainly with human resource development for the modern economic sector, has served the elites of the society and has produced elites. “Institutions of higher education (IHEs) in developing countries have mostly kept to their traditional functions and objectives, and the ‘ivory tower’ idea that they should only deal with theoretical knowledge, show interest to the formulation of theory and research, and value knowledge ownership and preservation idea.”¹² It has hardly concerned itself with other levels and types of education except through some ad hoc individual efforts without any institutional mechanism. Paradoxically, the foundation for education, which lays at the basic education level, has been ignored to make the whole education system weak and fragile.

Higher education has an important role to play through its graduates who should provide leadership roles in education as researchers, teachers, consultants and managers, who should create and apply new knowledge and innovations, and who should provide analytical perspectives on development problems and service to public and private sectors.

Higher education through its research function could identify the preconditions for a supportive policy context for the development of basic education and explore techniques of mobilizing resources. Through its research, training and service programmes (the three principal functions), it could contribute to build national technical capacity and contribute to strengthening international solidarity.

In particular, to promote basic education for all, higher education through its three principal functions, could improve access and equity in basic education, its quality and relevance and

¹⁰ Delors, J et al, *Learning: the treasure within*. Paris, UNESCO, 1996.

¹¹ World Conference on Higher Education, *Higher Education in the Twenty First Century, Final Report*. Paris, UNESCO, October 1998

improve its efficiency and management. The detailed tasks for each of the principal roles of higher education are given in *Table 1*.¹³

Table 1. Role of Higher Education Institution (HEI) to promote ‘Education for All’

Role of HEI	Task
I. Education and training	<p><i>To improve access and equity in basic education</i></p> <ol style="list-style-type: none"> 1. Introduce teaching of local languages and ICT literacy for potential teachers. 2. Reinforce teacher education and teacher management training, especially female teachers for basic education. 3. Introduce teaching of cultural factors promoting education. 4. Introduce teaching of educational planning, especially in formulating access policies and equity policies for basic education. 5. Introduce affirmative action for admitting female students and students of lower socio-economic status in the teacher education programmes. 6. Introduce distance learning and learning through suitable ICT to reach the unreached
II. Research	<ol style="list-style-type: none"> 1. Investigate the effect of medium of instruction on motivating children of lower socio-economic status to pursue basic education and literacy programmes. 2. Investigate the role of culture on demand for education for children of different socio-economic status, especially girls. 3. Investigate the reasons for children remaining out of school, dropping out of school and failing examinations at the basic education level and formulate policies for achieving greater access and equity.
III. Services	<ol style="list-style-type: none"> 1. Initiate adult literacy classes in campus. 2. Introduce national service for students to teach in basic education schools as a condition for graduation. 3. Launch campaign through media and other means in extra mural studies department for motivating and encouraging children of lower socio-economic status and women to pursue basic education.

¹³ DAE (now ADEA), *Working Group Meeting on Higher Education*. Paris, DAE, 1995. (Updated by the author)

Role of HEI		Task
I. Education and training	1. 2. 3. 4. 5. 6.	<p><i>To improve quality and relevance of basic education</i></p> <p>1. Train teachers for teaching/training materials suitable for local contexts and environment.</p> <p>2. Involve the community in designing content, method and structure of teacher training so that basic education can make school leavers employable either in the formal or in the informal sector.</p> <p>3. Modernize teacher training taking into account the development of ICT and new pedagogy.</p> <p>4. Introduce courses on methods of assessing quality and relevance of basic education and their improvement.</p> <p>5. Introduce in-service courses on teacher management for heads and managers of basic education programmes.</p> <p>6. Introduce training programmes on how to conceive, produce, distribute and evaluate textbooks cost effectively.</p>
II. Research	1. 2. 3. 4. 5.	<p>1. Investigate the status of quality and relevance of basic education programmes (content, method and structure) through the perception and experience of the parents, the community and the employers.</p> <p>2. Investigate the reasons for lack of quality and relevance and formulate policies for improvement.</p> <p>3. Investigate the needs for skills of basic education completers in the labour market, formal and informal, and formulate policies for education, training and service departments of the Institution.</p> <p>4. Investigate the difference in quality and relevance of education offered by different methods.</p> <p>5. Evaluate and monitor the progress made in 'basic education for all'.</p>
III. Services	1. 2.	<p>1. Organize evenings for the community within the 'extra mural studies department' to discuss the usefulness and the quality of the basic education programmes in so far as they concern the institution of higher education (e.g. adult literacy programme of the department, the training of teachers, the standard of the content of the training materials prepared within the institution of higher education, etc.).</p> <p>2. Prepare programmes of neo-literates for the media for sustainability of education received.</p>
I. Education and training	1.	<p><i>To improve efficiency/finance/management of basic education</i></p> <p>1. Introduce courses for heads of schools/programmes in educational planning and management, focusing on ways of better utilization of resources, financing of programmes through community participation and other means and on school management and management of programmes at the national, provincial and local levels.</p>

Role of HEI		Task
II. Research	<ol style="list-style-type: none"> 1. 2. 3. 4. 5. 	<p>To prepare state of the art papers on 'good practices' in efficiency, financing and management of basic education and literacy programmes from around the world.</p> <p>Investigate the roles of the State, the community and the school in improving management of basic education and literacy</p> <p>Identify reasons for inefficiency and wastage of resources (including student and staff time) and formulate corrective measures (e.g. demotivation of teachers and corrective measures; internal and external inefficiency and methods of reducing them using new technology where applicable) .</p> <p>Investigate cost-effectiveness of alternative delivery systems for different target groups</p> <p>Assist the government to prepare a 'viable and sustainable plan for achieving education for all' to mobilize funds from international agencies.</p>
III. Services	<ol style="list-style-type: none"> 1. 2. 3. 	<p>Organize 'open door' evenings for meetings with the community to identify any inefficiency perceived and experienced by them and discuss possible means of correcting them.</p> <p>Organize meetings with potential donors to finance programmes of improving basic education.</p> <p>Organize evening in-service classes for school and programme managers inviting extension lecturers on educational management.</p>

One must not forget, however, that even for higher education to be successful in undertaking the above tasks, a supportive policy context for itself is needed and that would call for extensive and intensive reform in higher education. The role of higher education has to be developmental and transformative and not just fitting individuals in the labour market. For that to happen, its management has to be improved so that it can function efficiently with, at least, minimum basic resources. The development of basic education and literacy should be an explicitly recognized function of higher education as instruction, research and public service. An institutional framework for the development of basic education is essential within the institutions of higher education.

III. The role of ICT in enhancing the development of basic education and literacy

We take the same broad definition of ICT to include radio, television, satellite, fixed and mobile telephone, fax, computers and CD-ROMs and the internet, as used by DFID.¹⁴ The ICTs can be divided into two groups: traditional or old ICTs (namely, radio and TV) and the new ICTs (namely, the Internet and telecommunications). Learning through new ICTs is also called e-learning. Recent studies show the enormous potential of e-learning, especially in industrialized countries. The Web-Based Education Commission in its report to the President and the Congress of the United States came to the following conclusion:

“The question is no longer if the Internet can be used to transform learning in new and powerful ways. The Commission has found that it can. Nor is the question should we invest the time, the energy and the money necessary to fulfil its promise in defining and shaping new learning opportunity. The Commission believes that we should. We all have a role to play. It is time we collectively move the power of the Internet for learning from promise to practice”.¹⁵

In April 2001, MIT announced that learning materials and syllabi for all courses were being put on the Internet for anyone to use – recognizing the power of the Internet and that knowledge is for sharing. E-learning has the following advantages:¹⁶

1. Access to the learning programme *any time* convenient to the learner.
2. Learners can be at *any place* to log on.
3. *Asynchronous interaction* providing participants and tutors with time to prepare their responses leading to succinct and to-the-point interaction and on-track, thoughtful and creative conversations.
4. Enhanced *group collaboration* creating shared electronic conversations which can be more thoughtful and permanent than voice conversation. Aided by group co-ordinators, these sessions can be powerful for learning and problem solving.
5. *New educational approaches* can be used. For example, faculty from anywhere in the world, faculty teams with different specialities can be put together and innovations of teachers can be shared along themselves for improvement and adaptation.
6. Recently developed *intelligent computer-assisted instruction (ICAI)* programmes are able to generate and solve problems, diagnose students’ misconceptions, select appropriate teaching strategies and carry on dialogues with students based on in-depth studies by researchers on how people think, learn and solve problems.

However, these advantages are out of reach of most developing countries, where power and telecommunication facilities are poor, where resources and well trained teachers are scarce and where television and other forms of distance education cost less.¹⁷ One has to look for

¹⁴ DFID, *The Use of ICTs to support basic education*. <http://www.imfundo.org/Advisory/basicedu.htm>

¹⁵ Bob Kerrey et al, *The Power of the Internet for learning: moving from promise to practice*. Washington DC, December 2000. (Report of the Web-Based Education Commission).

¹⁶ Joanne Capper, *E-learning growth and promise for the developing world*. In: “TechKnowLogia”, May/June, 2001.

¹⁷ Claudio de Moura Castro, *Education in the information age: promises and frustrations*. In:

alternatives while being watchful not to ‘miss the bus’ with the new ICTs. We shall examine below how and where ICTs, both new and old, can enhance education for all in developing countries.

As in the case of higher education mentioned in the previous section, there are four ways ICTs can support basic education – (i) supporting education in schools, (ii) providing non-formal education for out-of-school children and adults, (iii) supporting pre-service distance education of teachers and their in-service professional development, and (iv) enhancing the management of schools. These are detailed below.¹⁸

1. Supporting education in schools

ICT can provide access to information sources, enable communications, create interacting learning environment and promote change in methods of teaching. Quality and access to up-to-date and relevant materials can be improved while offsetting some costs of textbooks. However, the improvement in quality resulting from the new ICTs is yet to be justified with the cost in developing countries. Radio is still the most cost-effective ICT for enhancing quality in school education. However, with the falling cost of hardware, maintenance and Internet access and increasing extension of telecommunications and power infrastructure, it is expected that the benefits of using new technology in the schools of developing countries will exceed the costs.

2. Supporting non-formal education for out of school children and adults

Empirical evidence demonstrates that radio and television, the traditional ICTs are cost effective means to reach out-of-school children and adults where the costs are spread over a large number of learners, in the regions of conflict and for refugees. If the purpose of ICT is to reach children and adults who cannot go to school for remoteness and/or for opportunity costs, radio and television are more likely to widen access than the new ICTs which may not be available to them. However, basic education is more successful when delivered in the mother tongue and traditional ICTs may be less economic because of the small number of learners. The possibility of two-way communications with new ICTs makes them more attractive where the target group have easy access to them, for example, in peri-urban areas.

3. Supporting pre- and in- service teacher education

The high demand for teachers calls for the rapid supply of trained teachers. Distance education of teachers is an essential medium to achieve education for all. Radio and television (radio more than television) still remain popular means because of low costs. However, teacher education using new ICTs are increasingly becoming popular because of the possibilities of the ‘multiplier effect’, greater interactivity between students and tutor, opportunities for learners to proceed at their own pace, at any place and at any time, the possibilities of combining video, audio and texts to improve delivery and quality of instruction and finally the possibilities of establishing teacher resource centres with access to power and telecommunications equipped with computers and Internet facilities. Regional initiatives, such as the African Virtual University, are also enhancing teacher education using a combination of new and old ICT.

4. Enhancing educational management

In this area new ICTs are more relevant. Computer software programs are being used in time tabling and school management to improve the use of staff time, student time and space, thus reducing costs significantly. Only a few computers are necessary for this type of application.

It is noted that ICTs in schools can improve quality with less cost. Old ICTs are still cost-effective for provision of education to out-of-school children and youth .in developing countries. New ICTs have a very large potential for teacher education in larger quantity and better quality. A combination of old ICTs to widen coverage and access and new ICTs to provide interactivity is supposed to be cost-effective for teacher education. If a nation wide network of community learning centres equipped with computer laboratories with broadband access and trained staff to access online distance learning and to provide tutoring support could be set up in developing countries until a computer is available at home, there are possibilities for these countries to take advantage of the benefits of e-learning mentioned above. Some of the E-9 developing countries are already taking a step in this direction as will be noted in the following Section.

IV. Other experiences of using information technology for the promotion of Education for All.

To promote basic education and literacy some developing countries have already adopted varieties of ICT. I have chosen some examples from the continents of Asia, Latin America and Africa. We shall briefly describe their experiences below.

A. India

In India, the estimated clientele for basic education (6-14 years old) at the end of 2000 is close to 200 million children. Present facilities allow for a 160 million student population. For the remaining 40 million, several innovations have been proposed, including the already functioning 'open school' and the use of information technology in distance education. The National Open School has set up a faculty for developing digital multi-media software on education curriculum at the school level. India is also working on micro-satellites that can provide localized service on open school programmes through uplinked earth stations.

The universities, the government agency (the Department of Electronics) and the National Council for Education, Research and Training and the private sector (including the private National Institute for Information Technology) are working together to develop computer aided instructional material to be used for both distance and traditional learning programmes. NIIT works with various State governments in the area of IT education in schools. It provided computer training to 371 schools in the deep interiors of Tamil Nadu. It is also working with the Karnataka Government to offer computer training to students of 700 government schools throughout the state with an ambitious target of reaching over 175,000 students every year.¹⁹

¹⁹ C.N. (Madhu) Madhusudan, *How NIIT brings people and computers together successfully!* In:

A computerized management information system is linking the district planning units of the DPEP (District Primary Education Project) programme. In an attempt to bridge the 'digital divide', several conscientization programmes have been launched in non-educational fields which have a tremendous potential for education and literacy:

In 1998, as an outcome of an international seminar on Information Technology for Developing Countries held in Bangalore, a team of academic and technologist entrepreneurs of India launched a device called *Simple Inexpensive Multilingual People's Computer (Simputer)* to address the need for a low-cost portable alternative to PCs that will bring local language IT to the masses with a price of US\$200 to the home user. The *Simputer* uses a touch screen interface, but allows for an external keyboard through a USB interface, for those who require data entry capability. It is built around Intel's StrongArm CPU, and is based on the Linux operating system with memory capabilities of 32 MB RAM, a monochrome liquid crystal display (LCD), screen size of 320x240, and a touch panel for pen-based computing. The *Simputer* runs on three AAA batteries or off the mains, can also use rechargeable batteries. The provision of the smart card reader/writer and use of the versatile Information Markup Language (IML) following the Internet standards would increase the functionality of the *Simputer* to have increased value-added and have it shared by a community. A local community such as the village school, a kiosk or a shopkeeper should be able to loan the device to individuals for some length of time at a very low affordable fee and then pass it on to others. It is expected to be commercialized in March 2002. The device has great potential to eradicate illiteracy.²⁰

Another US\$45,000 community-financed project called *Gyandoot* (Bearer of Knowledge) launched in the Dhar district of Madhya Pradesh in 2000, is benefiting farmers with the correct prices of their products by providing information on just prices through a network of kiosks which charge a fee equivalent to 10 US cents for the information they provide.²¹

B. People's Republic of China

China had an objective of introducing 9 years compulsory education by the year 2000. It had a school-age children population of 207 million in 2000 requiring a large number of teachers. China has the largest educational TV transmission network and system in the world with the largest number of learners. The Chinese Central Radio and TV University (CCRTVU) provides a wide range of TV-based training programmes through its network of provincial universities. A division within CCRTVU provides distance training to teachers and has trained over 3 million teachers and headmasters among whom over 1.2 million have received graduation diploma since 1986. Model teacher demonstration and training of heads of schools are included in the programme.

CCRTVU has more than 80,000 hours of TV courses and education programmes on air. These programmes are developed in close co-operation with general universities. The best field teachers, experts of different disciplines and audio-visual professionals constitute the team to prepare educational materials. China's satellite TV education programme planned to cover 70 per cent of the country with educational TV stations or relay stations by the year 2000. By the use of distance learning mode, China plans to expand the idea of the 'virtual classroom', breaking away from the constraint of learning place and time. The objective of

²⁰ In "TechKnowLogia", May/June, 2001.

the plan was also to “combine TV technology, education programmes, revision of basic curriculum of schools and the whole process of teaching through distance education.” Although the country is finding it extremely difficult to achieve the objective of 9 year compulsory education for the entire country because of inaccessibility in certain regions and ethnic diversity, by 1998, 9 year compulsory education had been achieved for 73 per cent of the nation’s population, thanks to the significant contribution of ICT.²²

C. Mexico

In Mexico, *Telesecundaria* started as early as 1968 with its programme of transmitting live programmes through open public channels to television sets placed at distant classrooms where students of 7 to 9 grades (age 13-15) were learning in the presence of a teacher. Television was used to carry most of the teaching load and one teacher was used to cover all subjects rather than the subject matter specialists used in general secondary schools. The combination permitted education to spread over sparsely populated rural areas with low enrolment rates.

By 1993 the programme reached 512,700 students in more than 9,000 schools. In 1994, with the orbiting of the second generation, Mexican satellites (the *Solidaridad System*), the programme extended its coverage to reach all 20,000 communities of Mexico that have grade schools (primary level). The new system required smaller size antennae. With the availability of digital home receptors at a cheap price (the small antenna and the digital receptor cost only US\$ 1,000 at that time), most schools could afford the new technology. By the end of 1997 817,200 students were enrolled and an estimated 890,400 students in 14,101 schools with 42,615 teachers were expected by the end of 1998. The system accounted for 16.6 per cent of total enrolment in grades 7-9. “*Telesecundaria* is projected to enrol around 1,100,000 students by the year 2004. It is now an integrated and comprehensive programme providing a complete package of distance and in-person support to students and teachers”.²³

D. Brazil

In Brazil, a special Secretariat for Distance Education (SEED) was created in 1996 to promote education for all. It has the responsibility of three programmes among others: *TV Escola* (School TV), The National Information Technology Programme in Education (*ProInfo*) and the ‘On-the-Job Teachers’ Training Programme (*Proformação*). These are described below.

The *TV Escola* programme has the objective of improving the quality of teachers. By the end of 1999 it had provided 56,000 primary schools having over 100 students with a kit made up of a TV set, a video recorder and a satellite dish. With this kit the schools can watch directly or record educational programmes aimed basically at enriching the learning process, ensuring

²² Chen Xiangming, *China: teacher training with TV technology*. In: “Technowlogia”, November/December, 2000.; State Education Commission, The People’s Republic of China, *Distance education in China*. SEC, China (undated); and UNESCO, *The EFA assessment country reports. China Report. Part II, Analytical Section*. Paris, UNESCO, 2000.

²³ Diaz de Cossio, Roger, *Distance education in Mexico*. Mexico City, Secretaria de Educacion Publica, Mexico, 1994; and Claudio de Moura Castro, Laurence Wolff and Norma Garcia, *Mexico’s Telesecundaria*. In:

a continuous training of teachers and principals and improving recovery and catch-up activities and other actions required by the teaching project of each school.

The *ProInfo* programme is aimed at democratizing access to telematics, providing education for the exercise of basic rights and enabling educators to use new ICT. For this, master teachers are being trained at the universities for specialization courses and regular teachers are being trained in the *Educational Technology Centres (NTEs)*. By the end of 1999, 223 of these decentralized centres were spread around the country with the following functions: providing technical and pedagogical support, operating as the high level focal points for the training teachers and maintaining the hardware and software installed in the schools. The *Educational Technology Experimentation Centre (CETE)* set up in the Ministry of Education is the central node of the *ProInfo* programme to facilitate all its actions. The programme has distributed until the year 2000 105,000 computers, 100,000 for 6,000 schools and 5,000 for the 223 NTEs. 27 state-level programmes have trained 1,419 master (multiplying) teachers, 6,600 support technicians and 25,000 regular teachers covering 7.5 million students.

Proformaçao (On-the-Job Teachers' Training Programme) is a pilot project with a two year secondary level distance learning course meant for teachers of the four initial grades of primary education, pre-school programmes and literacy classes with primary school graduate teachers as the target audience in public schools in North, Northeast and Midwest regions. 1,500 teachers were covered in 1999. By 2002, 95,000 teachers will be trained in 18 states of the three regions.²⁴

Brazil's experience in reaching outlying areas and indigenous people may be useful for China in reaching the unreached in the country's 9 year compulsory education programme.

Like the *Simputer* in India described above, Brazil's Federal University of Minas Gerais has created last year a *Volkscomputer* as an outcome of a commission by the Federal Government of Brazil. *Volkscomputer* will have a 500 megahertz processor, 64 megabytes of main memory and 16 MB more on a flash chip substituting for a hard drive. There is a 56 kpbs modem and the software is Linux-based and free of charge. As the machine is modular, schools can link a series up to a regular PC that would act as a server. It is still in prototype stage. Estimated manufacturing cost would be US\$600 but it could be made available to the individuals on a US\$15 monthly instalment payment. It is expected that installing the *Volkscomputer* in schools will provide 7 million students access to the Internet.²⁵

E. Arab Republic of Egypt

Egypt has set up the *Technology and Science Discovery Centre* with the purpose of linking the educational process with the day-to-day life of the pupils with the help of ICT among other technologies. The Ministry of Education has developed a comprehensive plan for the improvement of the quality of education through use of ICT. At least seven programmes have been listed in the EFA Assessment Report presented in Dakar. These are described below.²⁶

²⁴ UNESCO, *The EFA 2000 Assessment: Country Reports, Brazil, Part I*. Paris, UNESCO, 2000.

²⁵ In: "TechKnowLogia", May/June, 2001.

1. *Technological development in schools*

8,500 schools have been provided with ICT facilities in the following directions:

a. Multimedia laboratories

Computer labs have been established for the projection of multi-media programmes using computers as a teaching aid. TV and video sets, enlargement projectors, interactive CD ROMs and drivers for the CD ROMs have been provided for the kindergarten and primary stages.

b. Knowledge sources network

127 schools and 27 'distance training halls' are using the Internet through direct contact. 4,482 schools use the services of electronic mail through the network of the Ministry of Education. 17 assembly centres have been set up in 17 educational *mudyrria* to utilize the distance learning facilities through Web sites. A central 'electronic library' has been set up with the facilities of CD ROMs, Video tapes, and books with teaching aids. A special network has been established to connect the central library with the *Centre of Technological Development and Support of Decision Making* (see later) and the school libraries. All schools participating in the project can benefit from the remote access to the central library. The Internet services are being expanded to reach 4 megabyte / second in order to enable a large number of sites and schools to exchange files and share screens by sound, text and pictures.

c. Educational satellite transmission

Advanced schools have been equipped for receiving thematic educational satellite channels with possibilities for extension to remote rural schools.

d. Technology mobile teams

Mobile laboratories have been provided to 25 *governorates* (administrative departments) out of 27 to transfer development to faraway villages and hamlets. The teams deal with teachers, students, parents, specialists and administrators. They also participate in literacy programmes.

2. *Centre for Technological Development and Support of Decision Making*

Set up by the Ministry, the Centre is provided with the necessary equipment in the fields of information systems, multi-media and video tape productions for transmission through the educational thematic channel. The Centre also produces computer programmes, graphics and animation, and runs a virtual library in addition to developing modern management techniques for itself and the Ministry.

3. *Developing educational administrative departments*

27 administrative departments have been provided with *Centres of Training on Technological Development*, equipped with multimedia laboratory equipment and receivers of educational satellite channels and training equipment on networks. 575 computers have been provided to

the educational administrative departments for administrative automation and 477 computers for the analysis of educational statistics.

4. Training

Training has two components related to ICT:

The first component is a video-conference distance learning centre which has been established to link 27 sites in all *governorates* and Luxor City in order to provide learning facilities in remote areas. This has reduced the cost to one seventh and increased the number of female teachers. 374,000 individuals have been trained through 274 training courses and 47 special programmes on practice and assessment.

The second component is a training centre on networks and multimedia which has been established in Al Haram to provide training for all the personnel in the field of education on using networks each in his own field of specialization.

5. Information system and decision-making support

Since the Ministry is giving a great deal of importance to improving performance, a database has been designed to cover all schools using the *Oracle* software. Educational projections are being made on alternative assumptions. Linkages among different departments have been established for better co-ordination. Personnel are also being trained in the areas of: creation of databases, documentation by scanning, geographical information systems, and the creation of 'expert banks'.

6. Production of educational aids

138 multimedia programmes have been produced for different stages of education. 75 films using computer graphics system have been made. 5 multi media programmes have been produced for students with special needs, including a visual dictionary for the deaf.

7. Educational satellite channels

The *Centre of Technological Development and Decision-Making Support* has produced 68 multi-media films. 9,478 schools, 27 educational directorates, 239 educational administrative units and 25 mobile technological teams have been equipped with receivers of the transmission of educational satellite channels for use in schools of remote areas.

In addition, in an attempt to make use of all potentials of the Egyptian Satellite (*Nile Sat*), the thematic educational programmes have occupied a whole satellite channel. Transmission for schools started in November 1998. This will cover primary education, preparatory education, secondary education, technical education, languages and general knowledge. A special channel will cover the upgrading of teachers and another for literacy programmes.

Egypt plans to expand the network of distance learning to cover its 260 educational directorates. 45 were covered in 1999. The country also plans to connect the local centres with European and American institutions to train its teachers.

The above description demonstrates the leap the Ministry of Education in Egypt is taking in ICT to move to the 21st century. It will be useful to monitor the progress and take note of the lessons learnt for adaptation elsewhere.

V. Concluding remarks

The tasks of higher education institutions for the development of basic education and literacy given in *Section II* give the broad basis of what higher education could do to promote education for all. The role of information technology and distance education becomes important, if not imperative, to perform some of the principal tasks.

In a period when, on the one hand, central authorities are delegating managerial tasks to institutions (retaining only the controlling and regulatory functions) and, on the other hand, when management of resources has become an important issue and when development in information and communication technology is accelerating, it is only natural that cost-effective means of imparting education have to be adopted. Distance education with the use of affordable ICT can provide that cost-effective means, as has been evident from the above discussion. Each institution of higher education could help such development in the following ways:

1. Each institution of higher education should set up a *Research and Development Centre* for the development of basic education and literacy which will work on educational content (videos, cassettes, texts), method of delivery, monitoring and evaluation of the programmes of basic education.
2. In respect of the methods of delivery, each institution should establish inter-linkages of the *R&D Centre* with units working on communication and information technology (including the *Computer Centre*). An interdisciplinary team should be set up to work on the effective methods of teaching/learning strategies. The *R&D Centre* should interact and co-ordinate with the traditional system of basic education and literacy to maintain quality and harmony.
3. The interdisciplinary team should also advise the *R&D Centre* on the contents and programmes of education in different disciplines so that the learners can find them interesting and attractive in the distance learning mode. (See for example, the Norwegian and Swedish experiences.²⁷)
4. The interdisciplinary team should also advise on the preparation of programmes for the parents and the community to be diffused through media so as to keep them involved in and committed to basic education development.
5. The *R&D Centre* should also develop the content, method of delivery, monitoring and evaluation mechanism of teacher-training programmes with the use of affordable information technology, in distance learning mode. The experiences mentioned above could provide useful hints for developing such programmes. The *R&D Centre* should also co-ordinate and interact with the traditional system of teacher training.

6. The institutions of higher education should encourage and initiate textbook management training programmes in distance learning mode with the use of ICT. The IIEP experience in this area may be useful.²⁸
7. There should be a national co-ordinating body and clearing house of all the programmes and experiences of each institution. Brazil has already set up such a co-ordinating body. The universities' role has to be delineated precisely in this body given their resource, expertise and infrastructure potential.
8. Until computers are available at home, a nationwide network of *Community Learning Centres* should be set up stocked with computer laboratories with broad band access and trained staff to access online distance learning courses. The experiences of the countries mentioned provide some optimism.
9. The trained staff of these *Community Learning Centres* should provide tutoring support to individuals and groups engaged in learning.
10. These *Community Learning Centres* can be connected to schools, hospitals, clinics or other community service centres to mobilize the different stake holders in the programme of education for all.

We shall end this article with two observations on use of new ICT in education: one optimistic and the other cautionary. Interestingly, the optimistic observation comes from an expert from a developing country and the cautionary one comes from an expert in a developed country.

The *cautionary* observation says: "Putting computers in class rooms and wiring up schools does not of itself create exciting new learning situations that are about changing the ethos of classrooms and the culture of institutions".²⁹

The *optimistic* observation says: "The power of online learning is awesome. We are learning to create content, design interfaces and provide services that encourage continuous learning. By combining online content with online services, by combining structure with the ease of discovery and by providing access everywhere and all the time, we hope we will be able to address the need for lifelong learning-everywhere all the time".³⁰

We have to take note of both.

²⁸ IIEP, *Planning the development of school textbooks*. Paris, IIEP, 1995.

²⁹ Tom Alexander, *ICT in Education. Why are we interested? What is at stake?* In: "TechKnowLogia", November/December 1999