Technology-Integrated Education: The Indian Experience

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Abstract. The paper begins with an overview of the current state of education in India. This provides a context for the ensuing discussion of the extent to which modern computer-based information and communications technologies (ICT) in India are integrated into primary, secondary, and tertiary teaching and learning. Universal education in India for all children between the ages of 6 to 14 is defined as a constitutional right. If a child wants to go to school, the state must provide the opportunity. But it is not obligatory on the part of parents to send their children to school. Literacy rates are thus in some states sadly low. Technology presents a ray of hope, which as yet flickers fitfully like a short-wicked candle that is struggling to burn bright. But pilot technology-based projects here and there in India are showcasing the way to what could be a glowing future for a country that is already very much a power to be reckoned with amongst the community of nations. The paper concludes with a set of recommendations for successful technology-integrated education.

Introduction

Part I of this paper provides background information about the system of primary, elementary, and tertiary education in India. This will be prolog to Part II, where an attempt will be made to describe the extent to which technology-integrated teaching and learning is being implemented both at the university where the authors teach and at state and national levels. With a view to proposing a vision for the future, Part III will present *Ten Pillars of Successful Technology-Integrated Teaching and Learning* which are based on the primary author's experience in the United States, where this process of transforming education has been ongoing for over 25 years, since PCs first started appearing in schools, colleges, and universities in the late 1970s.

Part I: The Current State of Education in India

My name is Chilakamarri Vijayalakshmi. I am a professor at Sri Padmavati Mahila Visvavidyalayam (Women's University) (SPMVV) in Tirupati, Andhra Pradesh, India. At present I am Dean, School of Education and also Hon. Director, Department of Adult Continuing Education, Extension and Field Outreach in SPMVV, Tirupati, (A.P), India. I have been serving the field of Education for 30 years.

This section of the paper is an overview of the current state of education in India.

Constitutional Aspects of Indian Education

The framers of the Indian Constitution enunciated, in the Directive Principles of State Policy under Article 45, 'Free and Compulsory Education' for all children in the age group of 6-14 years. The 73rd and 74th Constitutional amendments empowered local self governments to manage and monitor primary education. The Supreme Court Judgment of 1993 declared education as a fundamental right, a new status in India.

Education and Five Year Plans

Since Independence, India has launched various five-year programs for educational development. Here is a summary of the essence of each plan.

The first Five Year Plan (1951-56): During this Plan, it was proposed to open new schools, reform old schools and convert the existing ordinary schools into basic schools, where the focus is on work experience.

Second Five Year Plan (1956-61): During this Plan, a two-fold task was taken up. The first was the expansion of existing facilities and the second was the conversion of primary education into basic education. It was also decided to establish a Board of Primary and Basic Education.

Third Five Year Plan (1961-66): During this Plan, the number of basic schools was increased and some ideal basic institutions were established in urban areas. Greater attention was paid to training the teachers for basic education.

Fourth Five Year Plan (1969-74): During this Plan, emphasis was given to the education of drop-outs and several measures were envisaged to gain the objective.

Fifth Five Year Plan (1974-79): During this Plan, very high priority was given to the Directive Principles of State Policy by providing Free and Compulsory Education to all children up to the age of 14 years.

Sixth Five Year Plan (1980-85): During this Plan, new educational institutions were planned to open with a primary base. A multi-admission system was adopted, as a result of which any student is allowed to join the system at any academic level. A condensed course of informal education also was introduced for those children, in the age group of 9-14 years, who had never been admitted to school or who left school before becoming literate.

Seventh Five Year Plan (1985-90): During this Plan, emphasis was placed on the Universalisation of Elementary Education, on high quality and excellence of education, on increased enrollment and a reduction in drop-out rates.

Eighth Five Year Plan (1992-97): During this Plan, the target "Free and Compulsory Education up to 14 years" was revised. The new policy proposed to launch a mission to achieve this goal by the turn of the 20th century.

Ninth Five Year Plan (1997-2002): The targets for this Plan were fixed under three broad parameters like Universal Access, Universal Retention and Universal Achievement.

Tenth Five Year Plan (2002-07): The targets of this Plan are Universal Access, Universal Enrolment, Universal Retention, Universal Achievement and Equity.

Commissions and Committees on Education

After Independence, the Government of India appointed various committees and commissions with the sole purpose of bringing about radical changes in the educational system of the country for the development of education. Here is a summary of the recommendations made.

1. Secondary Education Commission 1952-53. Recommendations included:

a. Structural reorganization of educational patterns. Secondary education should include 4 or 5 years of primary education, 3 years of middle or senior basic or junior secondary education, and 4 years of higher secondary education.

b. The mother tongue as the medium of instruction.

c. Adopting scientific methods of teaching.

d. Establishment of more residential schools in rural areas and the continuation of public schools.

These recommendations were implemented at the primary and secondary school level and thus some of the secondary schools were upgraded as multipurpose schools in the country.

2. Indian Education Commission (1965)

This was the first Education Commission that spoke about Qualitative Improvement and Quantitative Expansion of Primary Education. Recommendations included:

a. Abolish a tuition fee at the primary stage.

b. Supply free text books and writing material to all the students.

c. Provide scholarships of an adequate amount according to each child's need.

d. Pay special attention to the education of girl children, children with a disability, backward classes and tribes.

e. Clear the backlog of un-constructed school buildings for new enrolment.

3. National Policy of Education (1968)

Recommendations included:

a. Provide "Free and Compulsory Education" to the 6-14 year age group in keeping with Article 45 of the Indian Constitution.

b. Tone up the existing educational system of Administration and Inspection.

c. Offer regular in-service programs to the teachers for the improvement of vocational efficiency.

d. Provide proper educational facilities to the backward and rural areas.

e. Provide assistance to poor, but meritorious, students in the form of free tuition, including food and clothing, books, scholarships and hostel facilities.

f. Lay special emphasis on the large-scale production of books in regional languages.

g. Provide special programs for the improvement in quantity and quality of education among Scheduled Castes and Tribes.

4. New National Policy of Education (1986)

This policy specifies that Universal Elementary education has three aspects;

a. Universal access and enrolment.

b. Universal retention of children up to 14 years of age.

c. Substantial quality improvement in primary schools and development of a child-centered approach in education.

The following schemes were implemented for the quality improvement of education.

a. Operation Black Board (OBI).

b. Establishment of District Institutes for Education and Training of Teachers (DIETT).

c. Environmental Orientation for Teachers (EOT).

d. Introduction of Educational Technology (IET).

e. Program of Mass Orientation of School Teachers (MOST).

f. Program of Special Orientation of Primary Teachers (SOPT).

g. Program of Minimum Levels of Learning (MLL).

In order to improve the quality of education, the central government has established a Central Institute of Education Technology (CIET) in Delhi. Some state governments, too, have established State Institutes of Educational Technology (SIETs). They produce tele-school lessons for primary school children. They also produce video lessons for difficult subject areas, such as mathematics, the biological sciences, and so forth.

Audio-visual instruction has been given priority from the late 80s on, at different levels in the ladder of education—from kindergarten to post-graduation, including professional, vocational, and technical education.

The University Grants Commission has introduced satellite TV programs which are telecast free. Necessary technological assistance is provided to all universities, along with brochures describing the various programs, schedule, duration, and so on. Teleconferences also are enabled nationwide across all curriculum areas.

At the grass roots level, this technology is being used to bring all the children back to school and to move towards 100% enrolment by 2020 (Vision 2020), under Sarva Sikha Abhyan ("Education for All").

The Ministry of Human Resource Development (MHRD), the University Grants Commission (UGC), the National Council of Education, Research and Training (NCERT), and different State Councils of Education, Research and Training (SCERT) have provided grants to further the introduction and implementation of computer-based educational technology at all levels of education. The immediate goal is to increase access to this technology in order to improve the quality of education and to empower the people. The ultimate goal is to bring India to a place of prominence in the "global village."

But, as might be expected, there are many disparities in the implementation of this directive around the country. Amongst these, the cultural, social, economic, regional disparities predominate. With regard to cultural and social disparities, for example, in some states early marriage of girls and the expectation that they will take care of the family, along with the priority given to boys' education, result in obvious discrimination. On the economic front, there is huge disparity between the quality of education (including access to technology) from one school to another, both within states and nationwide.

Part II. The state of technology-integrated education in India

My name is Bernard Poole. I am an Associate Professor of Education at the University of Pittsburgh at Johnstown (UPJ) in the United States, where my area of specialization is Instructional Technology. In October of 2006, I learned that I had been awarded a Fulbright Scholarship to lecture in Tirupati, India, at Sri Padmavathi Mahila Visvavidyalayam (Women's University) (SPMVV). I began teaching here on December 11. This section of the paper will focus on my experience working with the students at SPMVV. Extrapolating from that, and based on all that I have learned in reading and research, in conversations with professional colleagues, both at my own university and others in Tirupati and elsewhere in India, and on feedback (via questionnaires and

discussions) from my Masters level students, I will try to paint the broader picture of technology-integrated education in the state of Andhra Pradesh and, as best I can, in India as a whole.

I came to SPMVV with high expectations. At my university in America, I was accustomed to sophisticated access to modern information and communications technologies (ICT). In anticipation of my Fulbright work in India, I read everything I could get my hands on about the country in general, with particular reference to technology. I was led to believe that India was being transformed from within, education included.

Over and over again, I read that India is becoming a technology mega center. Companies such as Hewlett Packard, Microsoft, Cisco Systems, Dell, and so forth, were beating a path to India's door. This is because there is, In India, a seemingly unlimited supply of very well-trained computer software and hardware engineers, all of whom speak English and all of whom are willing to work for an annual salary (about $10,000) that is a fraction of what they would be paid in the United States.

There also is a similar, seemingly unlimited, supply of very well-trained business management personnel. As Dornan (2006) states: "India is one of the only nations in the world with an abundance of highly educated graduates ready to take their place in the global market." Added to this, the Government of India and several State governments have created highly attractive business environments for companies from the U.S. and other nations.

But creating a healthy climate for business to flourish is very different from turning around a monolithic structure such as education. A business has to struggle to survive from the word "Go." The principals of a business are highly motivated by profit to get the enterprise off its feet as fast as possible without jeopardizing survival. Establishing and managing a business has become a very scientific, structured, data-driven, coordinated affair. Time is of the essence in order to take advantage of every opportunity to make hay while the sun shines.

Education just sails along at its own speed, often ignoring all the pressures around it to change direction. This is as true of India as elsewhere in the world. Even in America, education at all levels has lagged well behind the business world in terms of accepting and integrating modern technologies to improve how it functions.

The problem is that education can often afford to take its own sweet time about things, without fear of failure, without fear of losing students. Sometimes, even, schools gain *cachet* by being snootily anachronistic. "We don't use computers here. We believe education should be done the old-fashioned way."

In India, the sense I have is that the state of technology-integrated teaching and learning is much like it was in the United States in the mid-80s. There is a lot of hype. A token number of computers are being purchased and installed in many schools at all levels. Training programs have been initiated for teachers, again at all levels. But certain key requirements for successful implementation are lacking.

1. Teacher-training in the practical use of computer-based technologies is sporadic and far from on-going. Indeed, there are but two government-sponsored e-Learning centers for training teachers to integrate technology into the primary and secondary school curriculum nationwide.

2. Technical support is practically non-existent, even at the university level. This results in systems and software deteriorating rapidly in performance and reliability, even when it is relatively new.

3. There are only a few computers (5-20) in those schools that have them. Hardly any students have computers for individual use, whether at school or at home.

4. Where there are computers, they are often not connected to the internet. Where they are connected to the internet, the connection speed is slow.

5. Almost invariably, the computers are clustered in a computer lab, to which students go for instruction in how to use them. They learn the basics. They do not have the opportunity to use the computers on a regular basis to advance their skills. Nor are the computers integrated into learning across the curriculum.

The state of technology-integrated teaching and learning in India is nascent at best, notwithstanding a token introduction of computers in some of the schools. There are exceptions, so-called "Center Universities," such as the Indian Institutes of Technology (IITs) and other well-endowed schools, which are showcase universities funded by the federal government of India, one per state, and designed specifically to attract and train a technology-skilled workforce for the burgeoning high tech industry that is making India such an attractive place to do business.

Part III: Recommendations for Successful Technology Integration: Ten Pillars of Success

It is time for some positive thinking in anticipation of a future in India where online technology will be ubiquitous in the schools at every level and in the homes of the majority of the population (Singh, 2005). Wi-fi is already being upgraded to Wi-MAX in cities such as Bangalore, and there are plans in place to making this available nationwide. Computers continue to advance in power and functionality even as they decrease in cost. Whether it takes 10 years or 20, the day will come when all students in all schools at all levels will have access to computer-based technologies.

In the meantime, independent initiatives abound, especially with an eye to serving the poor. An example is the "Baramati Initiative," which organizes an annual conference on ICT for developing nations. The initiative is the brain child of Vidya Prathisthan's Institute for Information and Technology (VIIT). The 2005 conference (Baramati, 2005) focused on e-Education, with the theme: 'Delivering Opportunity: Education, technology, and development.' The Jamsetji Tata National Virtual Academy for Rural Prosperity (NVA, 2005) is a similar initiative which, in collaboration with the Azim Premji Foundation, promotes e-learning as a solution to the lack of technology access amongst India's rural poor by promoting "every village as a knowledge center."

Then there is a project initiated by the physicist, Sugata Mitra, who set up a monitored kiosk in a rundown area near his office in Madangir (Veldhoen, 2006). There are now kiosks in 100 or so towns throughout India, sponsored by other organizations such as the World Bank. The kiosks are called "holes in the wall" because they are so installed as to allow youngsters to access the keyboard without being able to interfere with the rest of the equipment on the other side of a plexiglass window. Users are monitored by hidden surveillance cameras so that they can be observed as they "play" with the computers. Not surprisingly, observers discovered that children love computers and quickly learned how to use them without much help from anyone.

In America and elsewhere, much solid research has been done over the past 25 years into the value of using computer-based technologies for learning. The outcomes of this research are increasingly clear: these technologies do help students learn more effectively *provided the technology is appropriately and thoughtfully integrated into the curriculum* (Poole, Sky-McIlvain, 2006, Ch. 1). The technology does not work any magic *per se*. You still need good teachers who understand how any technology (including chalk and talk) can augment the students' acquisition of knowledge, and know when and how best to work it into curriculum and lesson planning.

What, then, are some of the prerequisites to successful implementation of a technology program? Below is a preliminary list of ideas as a basis for further discussion (Table. 1).

Table 1. The Ten Pillars of Successful Technology Integration

The Ten Pillars of Successful Technology Integration	
1.	Active support must come from the top
2.	A non-dictatorial approach is always best
3.	Every school should have a core of teacher-computerists
4.	User-friendly technical support must be available, ideally onsite and on demand
5.	Teacher needs must come first
6.	Teachers must be given time and freedom to restructure the curriculum around the technology
7.	An ongoing technology training program must be in place
8.	Parents and students must be involved in the evolutionary process
9.	Do not underestimate the ongoing cost of technology-integrated teaching and learning
10.	Everyone involved—administration, teachers, parents and students—must be committed to the on-going change in teaching and learning methodologies that will accompany technology integration

Conclusion

Technology-integrated education is still a dream at all levels of education in India. While there are computers in the schools, they are mostly used to learn about computers. Rarely are they used as tools for the teaching and learning of other curriculum areas—yet.

But there is an advantage to India's being behind the times, as long as the leaders in education keep their wits about them. They can skip wire-based technologies altogether. Wi-MAX, the latest generation broadband wireless medium, will be made available everywhere; it's just a matter of time. Computers, too, continue to come down in price. This will enable schools to connect to the internet at speeds that will make internet use, inside and outside the classroom, a viable *adjunct* to chalk and talk and traditional textbook learning—an adjunct, note, not an alternative. Traditional learning methodologies will continue to have an important place in education.

Students who routinely use the computer for learning do so because they have come to value it as a tool for accessing and processing information, for communicating and collaborating, for building a community of learners in which ideas are shared, and for increasing their awareness of the world of knowledge to which they can gain access at the touch of their fingertips. Those who are lucky enough to have the computer as part and parcel of their academic experience would never be without it.

The opportunity to use computers for teaching and learning should not be a privilege. It should be a right, just as it is only right that children should have access to books, pens and paper. There is a digital divide that separates the haves and have-nots with regard to access to technology. It is only right that the privilege of technology-integrated teaching and learning should be enjoyed by all.

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