Technologies for Education For All
A Luxury or a Necessity?

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Unfinished Business

Fifteen years ago, I had the privilege to lead the interagency team (UNESCO, UNICEF, UNDP and World Bank) that organized the World Conference on *Education for All (EFA): Meeting Basic Learning Needs*, in Jomtien, Thailand.

The years following Jomtien witnessed in the Arab States significant progress in the expansion and improvement of basic education worldwide and dramatic changes in the policies of development organizations. Yet, despite the progress, we are far from the attainment of the EFA goal and much remains to be done in the Arab States:

- Over seven million primary school age children remain out of school, of whom 60% are girls;
- About 65 million youths and adults are illiterate, 64% of whom are women;
- The emphasis on early childhood development is not commensurate with the crucial nature of this life stage;
- The quality of learning is still low in many countries, and the capacity to define and monitor this quality is lacking in most developing countries;
- Inequities continue to persist by gender, region and socio-economic backgrounds;
- The means and scope of education continue to be narrow and confined to historical models of delivery, and the use of other channels continues to be ad hoc and marginal;
- The increase in quantitative and qualitative demand for basic learning needs is not matched by commensurate increase in resources.

The backlog in meeting the target of Basic Education for All, coupled with the new demands for education, places a formidable burden on countries. A linear projection of past progress indicates that business as usual will not achieve desired targets within reasonable time. This may place some countries at risk of not developing their human capital to a threshold necessary for poverty alleviation, and economic and social development.

What EFA

This dramatic challenge poses serious questions for education and training planning and forces a rethinking in the way education is perceived, managed and delivered. The haunting issue is how to provide high quality basic education to all children, youth and adults within prevalent constraints -- physical, human and financial.

We cannot look at basic education only in terms of basic literacy, numeracy and rudimentary life skills, Basic Education for All in a modern world entails more than the conventional recipe. The new economic and societal challenges force us to think of basic education as a *learning activity, for everyone, anytime, and anywhere*.

1. Basic Education as a Learning Activity
High enrollments and efficient student flow, while necessary, do not indicate by themselves whether a country is achieving an acceptable level of education. Actual learning achievement is the real measure. In addition, drastic changes in national and world economic processes and skill requirements coupled with dramatic growth in knowledge necessary for citizenship and workplace, require a shift towards an education that enhances the ability of learners to learn, problem-solve and synthesize the old with the new. To meet these objectives, education must be engaging and authentic: Engaging in the sense that students are involved in the learning process, and not viewed simply "receptacles" for knowledge; authentic in the sense that what they are learning has meaning to them as individuals, members of society, and workers in the market place.

2. Basic Education for Everyone
Modern economic, social, political, and technological requirements demand that all members of society have a minimum level of basic education. The biggest challenge is to reach individuals and groups that are historically under-served: girls and women that face cultural and physical obstacles to come to educational institutions, rural populations that are too thinly dispersed to populate "regular" schools with reasonable class sizes, adult workers that have no time to attend regular courses, and persons who cannot come to learning centers because of security hazards. Here we need to be innovative and think

"outside the box." In some situations, we may need to go "over" the hurdles and provide education where these potential learners are.

3. Basic Education Anytime
The need for continuous access to information and knowledge makes learning lifelong and the traditionally neat distinction between learning and work unreal. Education thus becomes a continuum, with no marked beginning and end, which provides opportunities for lifelong learning to help individuals, families, workplaces, and communities to adapt to economic and societal changes, and to keep the door open to those who have dropped out along the way.

4. Basic Education Anywhere
To cope with the diversity, complexity, and changing demands for education services, learning cannot be confined to the traditional classroom. It is unrealistic and unaffordable to continue to ask learners to come to a designated place every time they have to engage in learning. Delivery must extend beyond the face-to-face institutional modality to include distance education, enrichment mass media, and nonformal settings.

Potential of ICTs: Myths and Realities

It is going to be very difficult—if not impossible—for countries to meet the objective of *effective learning, for all, anywhere, anytime*. Our inability to meet this challenge, however, is self-inflicted because we tend to think of linear scaling, that is, using the same model of education (a school constrained by space and time) but more of it and on a larger scale. What we really need is to think differently and radically. The world is experiencing a real revolution in the dissemination of knowledge and in the enhancement of instruction, through the advancement of Information and Communication Technologies (ICTs). This is the third revolution in learning, the first being the invention of the written language and the second being the development of moveable type and books. ICTs make both the content of learning *and* the interactions of high-quality (and other) instruction affordable and available anytime, anywhere. In this sense ICTs for the realization of EFA is not a LUXURY. It is a NECESSITY.

Thomas Edison, in 1922, predicted that "the motion picture is destined to revolutionize our educational system and ... in a few years it will supplant largely, if not entirely, the use of textbooks." Since then high levels of excitement and expectation have been generated by every new generation of Information and Communication Technologies (ICTs): compact discs and CD-ROMs, videodiscs, microcomputer-based laboratories, the Internet, virtual reality, local and wide area networks, instructional software, Macs, PCs, laptops, notebooks, educational television, voice mail, e-mail, satellite communication, VCRs, cable TV, interactive radio, etc. The list of "hot" technologies available for education goes on and on.

The potential of ICTs has put schools and school systems across the world under tremendous pressure to provide every classroom (if not every student) with technologies, including computers and their accessories and connectivity to the Internet. The pressures are coming from vendors who wish to sell the most advanced technologies, from parents who want to ensure that their children are not left behind in the technological revolution, businesses who want to replicate in schools the dramatic impact that ICTs have had in the worlds of commerce, business and entertainment, and from technology advocates who see ICTs as the latest hope to reform education.

Can ICTs really have such an impact in education? Before answering this question, there are four myths that decision makers have to deal with:

- *The first myth is that ICTs represent one monolithic entity.*

Decision makers frequently question the potential of technology in the singular.
Such inquiry is unanswerable because technologies are very different in their potential and use. The potential of different technologies depends on what we use them for. There are at least five hierarchical levels at which technologies may be used:
- Presentation of a piece of information
- Demonstration of a concept, idea, phenomenon, law or theory

- Drill and practice to gain competence in the application of knowledge
- Interaction – manipulation of variables to reach generalizations or to draw implications from a law or theory
- Collaboration on projects with other students in the school or in other schools in the country or elsewhere, or with scientists in the field.

Different technologies can be used for different purposes. The question here becomes: what is the value added for using one technology compared to a simpler and cheaper one? For instance, why use a video instead of a photo, a digital text instead of a textbook, and a simulation instead of an animation?

Table 1. Uses and Types of Technologies

	Technology				
Use	Text	Audio	Video	Computer	Internet
Presentation	x	x	x	x	x
Demonstration	x	x	x	x	x
Drill & Practice	x	(e.g., Language lab)		x	x
Interaction	hyperlink			x	x
Collaboration				networked	x

If technology is to be used for presentation and demonstration only, investment in computers and connectivity may not be justifiable. On the other hand, the potential for interactive and collaborative learning can best be achieved by networked computers and connectivity to the World Wide Web.

- ***The second myth is that merely providing ICTs to schools transforms the learning process, and merely connecting to the Internet changes the learner's world.***

Technology is only a tool. Providing schools with hardware and software does not automatically reform teaching and improve learning. Much depends on educational practices and how ICTs are used to enhance them. For example, if teaching is demonstrating and telling, and if learning is memorizing and reciting, using learning technologies and multimedia programs for this purpose will not have the desired impact. Also, if students are not asked to search and work collaboratively, and if teachers function independently, investment in connectivity will not be cost-effective.

 Experience is proving, to our surprise, that acquiring the technologies themselves, no matter how hard and expensive, may be the easiest and cheapest element in a series of elements that ultimately could make these technologies sustainable or beneficial. Effectively integrating technology into learning systems is much more complicated. It involves a rigorous analysis of educational objectives and changes, a realistic understanding of the potential of technologies, a purposeful consideration of the pre- and co-requisites of effectiveness of ICTs for education, and the prospects of this process within the dynamics of educational change and reform.

- ***The third myth is that providing technologies means acquiring computers and securing a connection to the Internet.***

Under pressures to be fashionable and adopt the latest educational innovations, the temptation is to limit ICTs to the Internet and exclude other technologies such as radio, television and print. These technologies use reception equipment that is readily available in homes, have proven to be effective and inexpensive in packaging high quality educational materials, reach "unreachable clientele," and overcome geographical and cultural hurdles.

- ***The fourth myth is that ICTs are a substitute for schools and teachers***

ICT-enhanced education activities should not be perceived as a substitute for conventional schools. Despite its shortcomings, the school system has been remarkable in its contribution to the fulfillment of basic learning needs, to skill formation, and to the preservation and evolution of cultures. We have, however, reached the limits of this model in providing high quality education for all, anytime,

anywhere, in an affordable and sustainable manner. ICTs can expand the potential of conventional delivery systems, complement its existing elements, and empower instructors to become better teachers.

Potential of ICTs: Solutions for Educational Problems

Different ICTs have the potential to contribute to different facets of EFA: expanding educational opportunities, increasing efficiency, enhancing quality of learning, and enriching quality of teaching. ICTs also offer possibilities in lifelong learning, adult training, and e-training for the workplace – which we will not elaborate on here. Planning for effective use of ICTs in education necessitates an understanding of the potential of technologies to meet different educational objectives and, consequently, to decide which of these objectives will be pursued. This decision affects the choice of technologies and the modalities of use.

1. Expanding Educational Opportunities
It is unrealistic to assume that conventional delivery mechanisms will provide educational opportunities for all in affordable and sustainable ways. ICTs have the potential to contribute to the solution of this problem. They can overcome geographic, social and infrastructure barriers to reach populations that cannot be normally served by conventional delivery systems. Additionally they provide feasible, efficient and quick educational opportunities.

The potential of ICTs to reach large audiences was tapped initially in the late 1800s, when correspondence courses became an alternative means to provide education for individuals who could not attend regular schools due to geographical, social, or cultural barriers. Experiments with radio broadcast started in the early 1900s, and, in 1924, the British Broadcast Corporation (BBC) began to air educational programs. Since then, radio has been instrumental in reaching scattered and rural populations.

Although experiments with televised broadcast began in the 1930s, it took another 20 years for television to become popular. Two of the most prominent examples are *Telecurso* in Brazil and *Telesecundaria* in Mexico.

Computer-related technologies began to make inroads 30 years ago and are changing the concept of time and space rapidly. There are now online courses and schools as well as self-standing multimedia curricular-related modules.

2. Increasing Efficiency
The capacity of ICTs to reach students in any place and at any time has the potential to promote revolutionary changes in the traditional educational paradigm. To start with, it eliminates the premise that learning time equals classroom time. To avoid overcrowded classrooms, a school may adopt a **dual-shift system** without reducing its students' actual study time. Students may attend school for half a day and spend the other half involved in educational activities at home, in a library, at work, or in another unconventional setting. They may be required to watch an educational radio/television program and complete related activities, or work on an online lesson at the school technology lab or in a community learning center.

For areas with low population density, **multigrade schools** become viable alternatives. While more advanced students listen to an educational program on the radio, watch a television broadcast, or interact with a multimedia computer software, the teacher can attend to other students who need individual attention.

ICTs can also provide courses that small rural or urban schools cannot offer to their students because it is difficult for them to recruit and retain teachers, particularly to teach mathematics, science, and foreign languages. Schools that don't need a full-time physics or English teacher can use radio, TV, or online instruction, utilizing already developed multimedia materials and sharing one "teacher" among several schools. Alternatively, retired or part-time teachers who live hundreds of miles away can be used to teach the online courses.

3.   Enhancing Quality Of Learning
Research and experience have shown that ICTs, used well in classrooms, enhance the *learning process*, in many ways. For example, they have the potential to:
- allow materials to be presented in multiple media for multichannel learning;
- motivate and engage students in the learning process;
- bring abstract concepts to life;
- enhance critical thinking and other higher levels of cognitive skills and processes;
- provide opportunities for students to practice basic skills on their own time and at their own pace;
- allow students to use the information acquired to solve problems, formulate new problems, and explain the world around them;
- provide for access to worldwide information resources;
- are the most cost-effective (and in some cases the only) means for bringing the world into the classroom; and
- offer (via the Internet) teachers and students a platform through which they can communicate with colleagues from distant places, exchange work, develop research, and function as if there were no geographical boundaries.

4.   Enriching Quality Of Teaching
Teaching is one of the most challenging and crucial professions in the world. Teachers are critical in facilitating learning and in making it more efficient and effective; they hold the key to the success of any educational reform; and they are accountable for successful human development of the nation and for preparing the foundation for social and economic development. Yet they are usually ill-prepared and left on their own to understand and address the needs of students, parents, administrators, society, the economy, the past, the present, and the future.

Obviously, teachers cannot be prepared for these unfolding challenges once and for all. One-shot training, no matter how effective and successful, will not suffice. . ICTs can contribute significantly to the lifelong professional preparedness and development of teachers in the following manner:
- First, ICTs and properly developed multi-media materials can enhance the initial preparation by providing good training materials, facilitating simulations, capturing and analyzing practice-teaching, bringing into the training institution world experience, familiarizing trainees with sources of materials and support, and training potential teachers in the use of technologies for teaching/learning.
- Second, ICTs open a whole world of lifelong upgrading and professional development by providing courses at a distance, asynchronous learning, and training on demand. ICTs have the advantage of ease of revisions and introduction of new courses in response to emerging demands.
- Finally, ICTs break the professional isolation from which many teachers suffer. With ICT, they can easily connect with headquarters, with colleagues and mentors, with universities and centers of expertise and with sources of teaching materials.

From Potential to Effectiveness

If ICTs possess all this remarkable, why have we not experienced such drastic effects? *If technologies are the solution they claim to be, then what or where is the problem?*

In attempting to answer this question, it is essential to make a distinction between potential and effectiveness. No ICT potential is realized automatically—not in education, not in business, and not in entertainment; many computerized businesses are managed badly and go bankrupt, and many movies are a complete failure. Placing a radio and TV in every school, putting a computer in every classroom, and wiring every building to the Internet will not solve the problem automatically. The problem is not strictly technological; it is educational and contextual; constraints must be alleviated and conditions met. Experience points to eight parameters necessary for the potential of ICTs to be realized in enhancing quality education for all, anywhere, anytime.

Parameter 1: Educational Policy

Technology is only a tool: no technology can fix a bad educational philosophy or compensate for bad practice. In fact, if we are going in the wrong direction, technology will get us there faster. Likewise, distance learning is not about distance, it is about learning. Just as we can have bad education face to face, we can have bad education at a distance. Therefore, educational choices have

to be made first in terms of objectives, methodologies, and roles of teachers and students before decisions can be made about the appropriate technologies

Parameter 2: Approach

Classrooms are constrained environments, and conventional instructional materials are static. If technology-enhanced education programs are taped classrooms, digital texts, and PowerPoint transparencies, then we are missing out on the tremendous potential of technologies that can animate, simulate, capture reality, add movement to static concepts, and extend our touch to the whole universe. Movies and TV programs are not replicas of theater—packaged theaters; they tell the same story in a more dramatic and multifaceted manner. So should ICT-enhanced education.

Parameter 3: Infrastructure

It is important to identify and provide in sufficient numbers the most appropriate, cost-effective, and sustainable technology and level of application for the different educational objectives. Then the whole prerequisite hardware infrastructure needs to be in place with the supporting elements, such as electricity, maintenance, and technical services. It is not realistic to expect teachers, who will be struggling with a new role and pedagogy, to assume technical responsibility for the hardware.

Parameter 4: Contentware

Contentware is one of the most forgotten areas, but evidently the most crucial component. Introducing TVs, radios, computers, and connectivity into schools without sufficient curriculum-related contentware is like building roads but without making cars available.

Parameter 5: Committed and Trained Personnel

People involved in integrating technologies into the teaching /learning process have to be convinced of the value of the technologies, comfortable with them, and skilled in using them. Therefore, orientation and training for *all concerned staff* in the strategic, technical, and pedagogical dimensions of the process is a necessary condition for success.

Parameter 6: Integration

The success of ICTs in education depends on how they are introduced into the system. Here are some strategic options:

- ICTs may be used as an additional layer of educational input, which leaves the current system intact but adds hardware and software for enrichment.
- ICTs may be treated as an integral part of the existing instructional system. Under this option, the process involves articulating learning objectives, translating objectives/standards into teaching/learning activities, producing multimedia curricular materials, training staff, establishing a distribution communication network, assessing learning achievement, and evaluating the program.
- ICTs may be introduced through a parallel system such as distance education or e-learning. This option may be used in situations where schools are not available or cannot be provided, or where individuals cannot enroll in regular schools because of lack of availability or for personal reasons, as in the case of working youth and adults.

Parameter 7: Testing

Integrating technologies into education is a very sophisticated multifaceted process, and just like any innovation it should not be introduced without piloting its different components on a small scale. Even the technologies that we are sure about need to be piloted in new contexts. Moreover, pilot schemes should be well designed to provide prognostic feedback, allowance for adjustment and scaling up.

Parameter 8: Financial Resources

As mentioned earlier, acquiring the technologies themselves, no matter how hard and expensive, may be the easiest and cheapest element in a series of elements that ultimately could make these technologies sustainable or beneficial. Educational authorities need to budget sufficiently in the all the parameters outlined earlier, including maintenance, training, contentware.

Into the Future…

Education for All is critically important. Attaining it is a human need, a societal must and an economic necessity. With the proper harnessing of information and communication technologies, the goal of basic education for all, anywhere and anytime, is within our reach. But the reality is that no technology can fix bad implementation strategy, nor can it compensate for a lack of political commitment. The decisions about what to use, how and when, are political and educational decisions that must be made consciously and daringly. As we look into the future, we should keep in mind that educational technologies will be further developing in a phenomenal manner and their costs will be dropping drastically. They are not the panacea for education, but can we attain education for all without them? The question is not whether we can afford them. The question is whether we can afford not to fully use them?