

# **Schools for the future and the future of schools: Some comments on the unfulfilled potential of technology in education<sup>1</sup>.**

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Educators ought to be vigilant of trends shaping social and economic life. ORT owes its worldwide reputation to its prescient vision about teaching technology and using technology to teach, from mechanics and electricity, to electronics, IT, robotics and biotechnology. We must keep this forward-looking attitude in the 21st century and keep strengthening our capacity to learn as a prerequisite for having the capacity to teach.

What are the new technologies heading our way? Although, as school directors we should rightfully occupy ourselves with such question, it might be useful to look into the more general questions of why and how schools use, underuse, misuse or should use technology. I would like to argue that we might be approaching a historical point in time when a new synthesis between schools and technologies will need to be formulated.

Let me first share with you a rather startling observation. Schools (especially secondary schools that are the main focus of ORT activities) are possibly the only social institutions that have remained fundamentally unchanged for the last 100 years. Education has not been subject to globalisation forces to the same degree as other activities. It remains, essentially, in terms of organisation, regulation and outlook, a local, labour intensive, craft endeavour. Education has incorporated few of the most accepted organizational and managerial approaches such as systematic quality assessment, cost benefit analysis, or user-centered service.

I am not arguing here that schools have not changed at all. My point is that while hospitals, media, entertainment, banks, the military or transportation for example have been radically redesigned by new technologies, schools have remained quite recognisable in their organisation, technology or architecture. If you look closely at it, core school functions have been largely untouched by new technologies. Electricity was perhaps the last technology, decades ago, to permeate schools in a large scale. Not even radio or TV with their huge social impact have been incorporated into schools in any meaningful way. The only technologies that have become widely adopted and used for classroom teaching in the last decade are non-disruptive "spectator technologies" such as electronic projectors or interactive whiteboards. Many students use the Internet for school assignments, but for the most part is a shallow use of such powerful technology mostly involving searching for information and pasting (or plagiarising) it.

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<sup>1</sup> A related, shorter paper addressing this topic was presented at the World ORT Board of Directors in Mexico City in February 2009.

A 1900's teacher could find his way in an average secondary school today. He would recognise the spatial distribution of students and teachers in classrooms, rows of seats, and the key teaching resources, usually some type of black or whiteboard. But could you imagine a surgeon of 1900 operating today without extensive re-retraining? A plane pilot? A movie editor? Would a major newspaper, a bank or an airport be able to operate today with a major disruption of their computer systems? Not likely. But would not a school be able to operate fairly effectively without their computer systems?

Schools are historically static not only in the sense that they have failed to integrate in a productive and sustainable manner new technologies. This may actually be the result of a more fundamental issue. Schools have, by and large, system-wise, failed to integrate critical developments in the sciences and disciplines underlying their mission. Telecommunications, transport, food production, hospitals and most other social activities have been transformed beyond recognition by scientific and technological changes in their core missions. But where are the educational equivalents to breakthroughs such as vaccines, antibiotics, or transplants? Where are the educational equivalents of the satellite TV, the Internet or mobile telephony? Are cities still lighted with gas lamps? Do people still travel in carriages?

There have been major developments in the disciplines underlying education in the last decades. Educational and psychological research have shed light on how people learn. Sociological research has helped understand the intricacies of collaborative learning and school change. IT has brought enormous computing power to teacher and students and telecommunications has brought unprecedented access to information and to other people around the world. Management research has created new paradigms on quality and assessment and so on. However, schools have, system-wise, remained largely impervious to such momentous developments.

One of the main reasons in my view for the immutability of schools is that they were designed following an industrial paradigm. They were designed to teach a fairly uniform content, in the same time, to large numbers of people, irrespective of their particular interests, strengths or learning styles, grouped by biological age rather than personal interest, performance or psychological maturity. More often than not, focus is set on production (teaching) rather than achievement (learning), error is equated with failure, knowledge acquisition is "tested" rather than assessed, learning is largely perceived as an individual task as opposed to an essentially collaborative endeavour as it is perceived in the corporate and academic worlds. This design has proved itself over a long time as cost effective for achieving average educational targets for large numbers of students such as basic literacy and numeracy. Those aims were essential to strengthen new nations in the making, modernise work forces for industrial economies and consolidate democratic governance in the 19 and 20<sup>th</sup> centuries.

However, the current knowledge and innovation economy needs citizens with different skills. "Industrial teaching" emphasises rote learning and quantity of learning. A knowledge society requires schools that promote creativity and collaboration with a focus on the quality of learning. The real competitive advantage of individuals, organisations and countries in the future will be their capacity to learn and re-learn quickly and use effectively that knowledge rather than the stocks of information they may possess at fixed points in time.

As we are all becoming part of globalised, knowledge-intensive and constantly changing world we should ask ourselves whether the school should still be conceived as the undisputed social organising unit for delivering education. Mirroring the larger world, the school should perhaps become nodes in networks of learning where students would interact with different people (including teachers, experts, practitioners or other students in other parts of the world), technologies (books, cinemas, theaters, mobile computers such as notebooks, netbooks, smartphones or tablets, social networks, on-line information resources such as wikipedia) and cultural artifacts (museums, libraries, nature field trips, scientific labs). The primacy of the school in the social learning system should be reviewed in a world where the media, social networks and affordable long distance travel have redefined the quantity and diversity of stimuli, role models and sources of information that students are exposed to and benefit from. This is not to say that all this diversity of cultural stimuli might not be distorting or even dangerous since enormous amounts of inaccurate, misleading or hateful content are disseminated in the media or available in the Internet, this is an issue in itself that underlines the need for the students to acquire sound critical thinking skills and self confidence.

So, coming back to the starting point. Which technologies should we be monitoring and assessing in terms of social impact and educational potential?

E-learning has not met the test of sustainability as a substitute to classroom-based education although it is becoming widespread as a complement to regular courses specially in higher education. Digital environments inspired by the gaming world such as Second Life are losing traction in society in general and never really took off in education.

Search technologies, the semantic web and cloud computing are redefining the way knowledge is stored and accessed. But schools are still uneasy about students using these technologies (they reduce the rationale for memorising information and facilitate plagiarism) let alone using them productively.

An important trend is the fast emergence of Web 2.0 and social networking phenomena such as Facebook or My Space, Google Wave, blogs or microblogs and wikis, as well as new online video repository and delivery websites such as YouTube or iTunes. I believe there is transformative potential in such social networking technologies. Useful educational applications using such platforms and based on communities of practice and project-based learning are emerging that may add significant value to learning systems.

Many people are excited about the educational potential of mobile computing. Mobile, smart phones are becoming computers and laptops being reduced to phone sizes. This will facilitate much more field-based learning, and anytime, anywhere communication between students themselves and their teachers. The One-Laptop-Per-Child project promoted by MIT professor Nicholas Negroponte is infused with this philosophy.

In the not so distant future, the Internet will encompass all our senses. Today we can see and hear digital content. In the future we will have 3D vision as well as olfactory and tactile capabilities within virtual reality environments. These could be real “killer applications” for schools. Imagine being able to teach about animals or plants by

actually “touching” them or manipulating dangerous ingredients in laboratories that could be impossible for secondary school students even to visit.

Linguistic and artificial intelligence research has repeatedly disappointed us in the past but they remain the “last frontier” in educational technology. Once we can interact with students and assess their work using natural language we will be free of the reductionist shackles of “fill the blanks” or “multiple option” methods. Such new technologies could usher a new era of boundless possibilities for providing essentially unlimited individual tutoring.

Last but not least, neurobiology research is breaking new ground in understanding how people understand and learn. It is not clear yet where this might lead us but the potential is staggering bearing in mind the rather primitive models of learning that underlies much of current educational policy, planning and practice all over the world. Our very understanding of the meaning of teaching and learning could be altered in ways unprecedented for many centuries once we gain a new understanding of how the mind acquires and applies new knowledge.

In my view we are reaching a point in history in which schools will be forced to redesign and retool themselves to serve the needs of a society where knowledge and creativity are the key resources. ORT could be a leader in this epochal change as it has been in the past assuming a leadership role and becoming a test bed for new school redesigns using new technologies. The challenge is on us.