CISCO PUBLIC SERVICES SUMMIT @ NOBEL WEEK 2003

Stockholm, Sweden, December 8-10, 2003

Workshop

"The Impact of ICT in Education: Where are we Heading?"

Ferran Ruiz Tarragó
Director of ICT in Education
Government of Catalonia
Department of Eucation

The setting

(taken from S. Papert & G. Caperton, 1999)

[There has been] a chorus of pronouncements that **"the information society" both requires and makes possible new forms of education** …

… tardiness in translating these declarations into reality cannot be ascribed, as it often is, to such factors as lack of money, technology, standards or teacher training.

The primary lack is something different - **a shortage of bold, coherent, inspiring yet realistic visions of what education could be like 10 and 20 years from now.**

A blend of personal perspective & regional government experience

- It is almost impossible to study and look at the future of IT in education separately of education itself:
  - analysing the situation of IT in schools is getting to grips with many of today's education problems
  - implementing IT is nowadays the main innovation of the educational practice
  - affirmative IT policies, collaboration and networking do matter (schools evolve little without external support)

Themes

- Review of changes in technology and in schools' infrastructure (1993-2003-2013)
- Students: home environment, competencies and schooling
- Schools: architecture and industrial model
- Look outside education
- Lessons to learn

Infrastructure

Student-computer ratio

- 1993 - High, not allowing a systematic use by all students
- 2003 - Reasonable, allowing for systematic but nevertheless low-intensity use
- 2013 - Low, computers (or the like) are available to every student a substantial amount of school time. Possibly there are many other IT personal devices, or one device with many functions

Distribution of school computers

- 1993 - Computer labs, mainly; computers available in very few classrooms
- 2003 - Computer labs and a number of PCs available in classrooms and other areas
- 2013 - School “computers” (IT devices provided by the school) are available in all school spaces; many school rooms with PCs, videoprojector, broadband, peripherals

Infrastructure

Local area networks in schools

- 1993 - Stand-alone computers. Deployment of first LANs in computers labs
- 2003 - LANs in most of computer labs. Some/many schools thorougly cabled. Experimental/initial use of wireless
- 2013 - All schools are equipped with high performance local networks (wired and wireless)

Telecommunication protocols / Internet / IP protocols

- 1993 - Internet “does not exist”
  - Local/national & proprietary communications systems in place
  - No IP equipment in education
- 2003 - Many people use the Internet
  - Proprietary systems no longer relevant
  - Use of IPv4
  - Extensive use of NAT in local networks
  - Initial stages of IPv6

Telecommunication protocols / Internet / IP protocols

2013:

- Internet is pervasive and no longer mentioned
  - The world is unthinkable without Internet
  - No information system in education is isolated
- IPv6 widely implemented
  - Ability to address, manage and to deliver specific content and services to every IT device
  - IPv6 allows for innovative and efficient management of content access and delivery, videoconferencing and multicast

Infrastructure

Communications equipment

- 1993 - Modem: “one phone line - one modem - a single computer - a single user”
- 2003 - Router-hub/switch, allowing the connection of a mid-size LAN to the Internet. A sizeable group of students can use the Internet simultaneously
- 2013 - Powerful communications devices and content managers allow for ample simultaneous use

Communications bandwidth in schools

- 1993 - Very narrow (1200-2400 Kbps)
- 2003 - Low-end broadband (2 Mbps).
  - Few schools enjoy higher bandwidth (up to 10 Mbps)
  - Some schools still with ISDN (64-128 Kbps).
- 2013 - Real interactive broadband in very many schools

Infrastructure

Telephones in the classrooms

- 1993 - Have you ever heard about a phone in the classroom? Portable personal communications devices "do not exist"
- 2003 - No educational use of the phone
  - Most of students have their own cell phones, but make no educational use of them
  - Beginning of IP telephony
- 2013 - IP-based integrated communications facilities: data, voice, video. Every computer is a phone, a "videophone" and much more

Infrastructure

Summarizing ...

- It seems likely that in the next ten years:
  - many more computers and other IT devices will be available in the schools
  - broadband communications will be very powerful
  - most homes will have computers
  - Internet will be pervasive
  - people will be able to communicate at any time, anywhere
- We are on the brink of a very sophisticated IT infrastructure, with huge technical, operational and management implications

Infrastructure 2003 - 2013
Growing sophistication

- Systems:
  - networks, servers and user stations, supporting data & video communications; variety of peripherals
  - middelware (directory services, accounts manag.)
  - computational facilities and operations, security
- Applications and services ("a software age"):
  - productivity tools, administrative systems, e-learning applications, web publishing, content management and delivery, user portals, user support services

As a result of the infrastructure deployment, in 2013 ...

- a high level of educational use of IT will be possible (but certainly there is no guarantee to attain it)
- **it is going to be very difficult for schools to manage and to take advantage of such sophisticated IT infrastructure if today's management and organizational approaches are not greatly improved/redefinided**

Students

Home environment

- 1993 - Few homes with computers (just one computer at home); no Internet; scarce use
- 2003 - Most households with children have at least one PC (some own a few); narrow band Internet; many students are good regular users
- 2013 - Almost every home will probably have a PC (IP device); many homes networked (WiFi); broadband Internet; vast majority of students are confident (even expert) users

Students
Core competencies & skills

- The classical 3R's:
  Reading, wRiting, aRithmetic

- The modern 3X's (*)
  eXploration, eXpression, eXchange

(*) Idit Harel - A new necessity for the young clickerati

Students

The 3 X's

- eXploring: discover information and ideas, open-ended discovery; children on the driver's seat of their own learning experience
- eXpressing: using digital media for expressing ideas and representing knowledge
- eXchanging: asking questions, sharing ideas and working with others

Students
Core competencies & skills

IT 's essential for the 3X's

- the new technologies are essential to the creative, expressive and imaginative learning of children

- **The 3X’s are the skills that children need to become knowledge workers**
- **The 3X’s are the skills for the knowledge society**

Students
Formal curriculum

- 1993

  Almost trivium (language) & quadrivium (science). Broadly speaking:

  - there is no technology on subject matters
  - there is no technology branch/option with high academic status
  - technology is often for “less academic able” students

Students
Formal curriculum

- 2003

  Trivium & quadrivium are still dominating, but:

  - some IT is integrated on academic subjects
  - new option of technical undergraduate studies (baccalaureats) with the same academic status
  - there are high-level vocational education studies with lots of IT, with growing momentum & prestige

Students

Formal curriculum

- 2013 It's hard to speculate about it, because the curriculum is a battlefield of many and entrenched conflicting visions and interests:
  - the conservatism of academia, and the general fear of losing power if changes happen
  - the vision and slow response of curriculum planners and education authorities
  - the ”what's in it for me?" attitude of interests groups when considering curriculum reform (professional bodies may place their interests before those of the clients)

Students

Research projects

- 1993 - Usually students are not expected to conduct research projects: research is not a significative element of (secondary) education
- 2003 - Secondary education students are often expected to conduct a research project which is evaluated. Quite often students make extensive use of IT
- 2013 - IT opens up new possibilities and plays a very substantial role. Research projects may have a much bigger role.

Students
Personal production /1

- 1993 - Students' work is paper-based, implying that their own projects:
  - are hard to store, and get discarded every year
  - are difficult to retrieve and to reuse, so they are not used as a base for expanding the student's knowledge in successive school years
- 2003 - Students still work (produce) on paper. Teachers mark their essays and projects on paper, but ...

Students
Personal production /2

- 2003 - There are in place infrastructures for every student to have his/her own personal digital portfolio on the Internet (edu365.com):
  - stores all their digital files (projects, essays, programs, websites, e-mails, multimedia materials)
  - is always accessible and grows together with the expanding knowledge of the student
- 2013 - Students mostly own a personal digital portfolio of his/her school work/production, always available on a secure infrastructure

Students

IT on students' evaluation

- 1993 - IT is not taken into account in student's evaluation
- 2003 - Much of the same situation
- 2013 - Critical issues:
  - are IT skills and competencies evaluated?
  - is the integration of IT in specific subjects evaluated?
- In education, **lack of evaluation (a key function of the school) is equivalent to lack of importance**

Schools architecture
Implications for learning /1

- 1993 - The classroom is the defining physical feature of the school. Classrooms:
  - are isolated & isolating “boxes”
  - limit relationships and exchanges
  - do not have means of external communication
  - above of all, epitomize lecture teaching
- 2003 - Classrooms are still the same but Internet has opened up, at some extent, external communication

Schools architecture
Implications for learning /2

- 2013 - Is IT-based student work compatible with classrooms? If the current classroom model remains predominant (some guesses):
  - secondary school students may feel too constrained and reject the classroom model (learning mainly by being taught)
  - at that time, the limits & inadequacies of the classroom are notorious and under debate
  - some variants of the one-room IT-based schoolhouse emerge significantly

Schools
Teaching

- 1993 - A single teacher is responsible for lecturing a group of students in a classroom
- 2003 - Mostly the same situation
- 2013 - Maybe some changes are taking place at a significant scale:
  - teams of educators are in charge of students' learning, lecturing and coaching, and heavily rely on the IT environment
  - teams of educators may consist of a team leader, tutors of the students and teaching assistants

Schools
Chain/industrial model

- Schooling and teaching in classrooms epitomizes the industrial (chain production) model of today's (secondary) education:
  - teacher dominated, poor student projects/research
  - distribution of power among many specialists
  - every agent (teacher) intervenes in "slots"
- This model lacks of overall responsibility for the learning of the student along a significant period of his/her student life. **Nobody is really accountable for student's learning**

Schools
IT and the industrial model

"The instructional strategies enabled by the new technologies will more closely resemble some of the earliest instruction based on tutors and apprenticeships that today's factory-like classrooms"

The Learning Federation

Looking outside education
School leavers in 2013

- Most people in 2013 need to work with the support of a global technology infrastructure
- School leavers need to enter the workforce or proceed to further studies equipped with:
  - a broad and sound understanding of the ways they can use information technology creatively
  - the skills to employ it effectively

Looking outside education
School leavers in 2013

- School leavers in 2013 may wonder ...
  - about the relevancy for them of what teachers are told to teach (curriculum)
  - about the relevancy for them of what teachers (as a whole class/profession) know and teach (value of their intellectual capital)
  - about the suitability of a school industrial model of organization, “production” and management, in which they have been immersed for many years

Looking outside education
Business' executive structure

- 1980s boards
  - chair (CEO)
  - finance
  - human resources
  - marketing & PR
  - operations
  - planning
- IT is mainly tactical, so it is a sub-unit/s of one or more departments

- 2000s boards
  - chair (CEO)
  - finance
  - human resources
  - marketing & PR
  - operations
  - planning
  - **information systems** (CIO)
- IT is strategic, "sits on the executive board"

Looking outside education
Business today's hot topics

- Develop IT infrastr. to maximise productivity
- Work towards customer-driven organisations
- Improve service/production through change management
- Manage back office integration and business process re-engineering (security, privacy)
- Reshape the culture of the organisation (vision, knowledge, skills, attitudes)
- Establish collaborations and partnerships

Lessons to learn /1

- Productivity goals:
  - every student attains the core competencies, mastering the 3 R's and the 3 X's
  - school's IT infrastructure is of utmost importance
- Customer-driven service:
  - the school caters for individual student needs
  - there is someone accountable for the learning of every student (on the long range!)
- Back-office infrastructure:
  - full and secure integration of data and applications
  - always ready for users, featuring security & privacy

Lessons to learn /2

- Business process re-engineering (changes in the internal operation and the way school's services are delivered):
  - students' grouping, calendar, timetabling
  - methods of instruction, coaching and evaluation
  - learning by collaboration, research & project work
  - communication with parents, society and PR
  - interactive flows of value-added internal and external information
  - new indicators of performance and activity control

Summary: School should transform itself into a learning organization

- Grounding on a 20 years vision (1993-2013) the school should reflect upon:
  - students IT environment, competencies and needs
  - society's demands & parents needs
  - IT properties & opportunities, infrastructure
  - teachers' culture, working procedures, knowledge, skills and willingness for change;
  - accountability for the outcomes (students learning)
  - industrial model of schooling; organizational changes to exploit fully the learning potential of IT
  - need of new forms of leadership to conduct change

CISCO PUBLIC SERVICES SUMMIT @ NOBEL WEEK 2003

Thank you very much

Ferran Ruiz Tarragó

fruiz@xtec.net