EVOLVING LANDSCAPES FOR EDUCATION

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Abstract: Education is one of the most changing and sensitive landscapes of today's society. Anything that has an impact on any part of society (the economy, work, technology or culture, etc.) has an influence on education in the short, medium or long term. This paper first deals with how processes of change and no change in society are having fundamental consequences for education. In acknowledgement of the importance of ICT in teaching and learning processes it then argues that the real challenge of education today lies in our understanding of the nature of knowledge and its modes or production, the need to evolve from a disciplinary to a cross-disciplinary approach to the curriculum and students' experience, and the way we approach people's learning processes, including both emotional and biographical issues.

1. A CHANGING WORLD?

In the 15 years since the publication of *The Information Society: Evolving Landscapes*, edited by Jacques Berleur, many fundamental changes have taken place. Although the essence of life is change, human beings never seem to be prepared to cope with change. However, what seems to be even more distressing and creates greater turmoil are not the aspects that change, but those that remain unchanged. Thus, as suggested by Pareto (1966), a way of understanding social phenomena is the identification of elements of change and no change that compel people to deal with situations of conflict and to confront turmoil in their personal, professional and emotional lives. When related to education, these situations seem particularly conflictive and difficult.

In the following paragraphs several factors of change and no change in contemporary society along with their consequences for education will be identified.

Elements of change	Elements of no change
Developments in information and communication technologies have exacerbated processes of production, storage and transmission of information and, thus, of exogenous knowledge.	Individuals have not significantly increased their capacity to receive information and give it meaning (ontogenous knowledge).

Chen (1992) proposes a distinction between ontogenous knowledge (namely the knowledge that grows in the individual) and exogenous knowledge, which is interwoven intimately with technology. Ontogenous knowledge grows in the subject as a result of complex processes that relate innate knowledge that comes from the expression of the development of the genetic load to knowledge acquired through learning in the environment. All knowledge and processes involved in it are endogenous, regardless of whether they are located in the central nervous, the limbic or the genetic system. The development of the time scale of ontogenous knowledge is equal to the living space of an individual. This consideration raises some questions such as: Can individuals indefinitely increase their capacity to receive information and give it meaning? Are there technologies that allow for an increase in individuals' *storage* and *processing* capacity?

Exogenous knowledge defines the knowledge external to the body. It refers to public knowledge that has been accumulated by humanity in different ways and by complex social processes. Social institutions and information and communication technologies are the best bearers of this knowledge. The unit of analysis for examining exogenous knowledge is the social system as a whole and includes science, technology, the education system, cultural systems, the media, and different ideological institutions (religious and political), etc. The time scale for this knowledge type is around three million years for humanity, a hundred thousand years for *homo sapiens*, and ten thousand years for modern civilization. It is exogenous knowledge that has woven the closely-knit connection with technology and has done so in three stages.

The first stage involved the appearance of *writing* and *numeration systems* (around 3000 BC). These technologies allowed representations of knowledge to be conserved and transferred the ephemeral oral language of an acoustic body to a longer-lasting physical artefact. Writing systems gave

two new dimensions to exogenous knowledge: the transfer of knowledge would no longer be limited to factors of time or place. Knowledge could be communicated horizontally with all those places where someone may need it, or vertically to future generations.

In the Western world, the second stage began in the 16th Century with the *printing press*, which provided for mass reproduction of exogenous knowledge and allowed access to this form of knowledge by a greater number of society's members.

The third stage involves the emerging information and communication technologies. The most remarkable feature of these technologies is that, for the first time, they allow for the exogenous *processing* of knowledge outside the human brain. Meanwhile, digital information and communication technologies have meant improvements in the conservation and accumulation functions of the first stage and the reproduction functions of the second. In short, information and communication technology is focused on the social structure involved in the creation, accumulation, conservation and distribution of exogenous (public) knowledge.

There is no evidence of any significant increase in human beings' memory capacity, learning rate or higher cognitive skills. This led Chen (1992) to state that a young person in Athens in 200 BC would probably do as well at school as one in Boston in 1991 AD. The person from Boston would perhaps even do far worse and would certainly know much less about his or her world than the Athenian. This is because the huge production of public knowledge exercises enormous pressure on individuals who wish to have access to it.

This statement entails the paradox that men or women of today, despite greater access to information, may indeed know considerably less about their world than their ancestors knew about theirs. This is because, proportionally, what they do not know is a lot greater than what they know (Sotelo, 1987). This phenomenon has weighty implications for education that have not been sufficiently assessed to date.

Elements of change	**Elements of no change**
Exponential growth of technological knowledge.	For most human beings, life has not only not improved but in many cases has worsened. Inequality, hunger, new and *old* illnesses continue to strike.

Some years ago in an interview that appeared in the Spanish journal *El País*, a Nobel prize winner for Physics argued that since the Second World War science had been trying to answer questions that had already been raised and resolve problems that were already known, new questions needed to be asked. Two things were required in particular.

The first involves the orientation of decisions regarding research programmes that are considered to be priority and the allocation of resources for scientific and technological developments. If, instead of focusing all effort on achieving results that can be turned into patents, commercialised, and geared to the war industry and unsustainable mass consumption, science and technology focused on a search for knowledge and techniques for the real improvement of the lives of all human beings, the world could become an unimaginable place. Perhaps more effort would be put into solving real, everyday problems that make people suffer.

The second is connected with the political and economic will to redistribute the results of technological developments and make them truly and equally accessible to all. However, as environmental groups argue, the model of wellbeing upon which Western society is based can only be maintained at the cost of a large part of the population.

The created situation has very clearly implications for education as schools reflect the enormous gap between technologically rich and poor individuals and groups.

Elements of change	**Elements of no change**
Income and concentration of capital in the last 10 years of the twentieth century were spectacular.	Economic power is still concentrated in the hands of a few who hold increasing power.

For Ramonet (1995), Tapscott *et al* (2000) and Ontiveros (2001) today, more than ever, the highest form of power is economic, which is increasingly concentrated in the hands of fewer people and produces increasingly harsh and unaffordable rules for most countries and groups. Then comes the media. For Ramonet (1995), none of Ted Turner, President of CNN, Rupert Murdoch, of News Corporation Limited, Bill Gates of Microsoft, Jeffrey Vinik, of Fidelity Investment, Robert Allen, of ATT, or, of course, speculators such as George Soros or many other true owners of the world have subjected their economic and information and communication projects to universal suffrage. Democracy does not apply to them. They are above the interminable debates in which concepts such as the public good, social welfare, freedom and equality are still meaningful. These

types of individuals do not have time to lose. Unhindered, their money, their products and their ideas cross the borders of a globalized market. In their eyes, political power is simply the third highest power. However, electoral results like those in the last elections in Italy mean that barriers among financial, media and political power have diluted up to the point that they become confused. The current president, Silvio Berlusconi, is one of the richest men in Italy and the world and owns a powerful media corporation. The consequences of this phenomenon for aspects such as the knowledge, skills and values to be encouraged in education are considerable.

Elements of change	Elements of no change
Information and communication technologies allow access to a huge amount of information from anywhere on the planet.	The world is still structured and presented by the owners of the media (from local newspapers to Internet portals).

This change and continuity is closely related to the previous argument. The accumulation of power and capital cannot occur without the control of the media, which creates images of the world to suit those who have power. Individuals and groups with no power have little or no chance of expressing themselves, explaining their views of the world or staking their claims. This phenomenon leads to an increase in the gap between the info-rich and the info-poor, who are now not only those who do not have access to information sources, but also those who do not *control* these sources. This situation is also found in educational systems where the difference between information rich and information poor schools is constantly growing.

Elements of change	Elements of no change
The organizational, symbolic and artefactual systems of most jobs and professions have experienced profound change.	The systems of exploitation of workers still apply (temporary employment agencies, child labour, etc.) and are on the increase.

Since the 1980s, growing organizational, financial and technological changes in the workplace have led to even more complex demands on employees. The first skill considered to be necessary in societies in which profound technological changes are occurring is the capacity to deal with change itself. There is a need to be prepared to change work when a job becomes obsolete, to adapt to new software and hardware and to a way of understanding labour relations and the business world. This capacity to adapt to change requires general skills that can be used in different situations, which means that schools and universities must teach relatively general skills and leave the acquisition of specific skills to on-the-job training.

Another demand in work is the capacity to think critically and communicate effectively through the mastery of language. Problem-solving abilities and critical thought seem to be essential in many jobs. However, *critical thinking* and *higher order thinking skills* do not include the capacity to be critical of social and economic institutions, of superiors, of social standards and of cultural rules. At work, even for top executives, higher thought is more of a conformist phenomenon than a feature of dissidence. It is the aptitude to solve the problems of an engineer who sees a technical problem as something specific and not that of a reformer's tendency to identify a social problem, analyse its causes and seek to eradicate it.

The above seems to be both coherent with and contradictory to employment policies based on employee instability and unfair working conditions while it is an element of demotivation and discouragement for young people in education and training.

Elements of change	**Elements of no change**
Politicians, business owners and scientists now more than ever consider education to play an essential role throughout life.	In state schools, and in some private ones, there are still administrative shortfalls and limitations.

Politicians, business owners and intellectuals have never before shown so much concern for education. However, their explicit interest yields neither clear, determined policies nor significant investment for the introduction of substantial reforms in education systems and the provision of diversified learning environments adapted to the educational needs of the whole population. Hence, schools, and particularly state schools, continue to face chronically scarce resources and bureaucratic limitations that makes it difficult for them to meet the needs of an increasingly diverse and impoverished school population.

2. CHANGE AND *NO CHANGE* IN THE EDUCATION SYSTEM

In direct relation to the above argument, in education the orientation of the elements of change/no change is to be found at different levels of the education system.

Insofar as students are concerned, the factors of change are directly related to the fact that they are individuals being educated, even though there is a current trend to assume that everyone is being educated throughout life. In addition to natural elements of change in childhood and adolescence, today's children and young people encounter quite a different situation to that of a few years ago.

- Because of the process of individuation that has occurred since the eighteenth century, children and adolescents are expected to develop their own interests, which are considered in relation to those of their family, the community, school, media, political, economic and religious systems, laws of the market, etc.
- Because of the explosion of knowledge and information, children and adolescents are expected to assume not only the traditional curriculum's content, but also, and particularly, new languages (audio-visual, IT, virtual, etc.), which do not replace any curriculum requirement, but complement it, thus multiplying learning demands and at the same time expression and communication options.
- The education system that traditionally valued students' capacity to assimilate standards and reproduce the information provided by teachers or text books, is beginning to require students to develop independent, creative thinking and problem-solving ability, to prioritise understanding over and above mechanical reproduction and, in short, to take responsibility for their learning as they will have to continue learning throughout life (OECD, 2004).

For teachers, the situation produced by elements of change is not significantly different from that of the students. However, the most significant specific transformations in their work revolve around:

- *Student characteristics*. The interests, lifestyle, expectations, values and attitudes of today's children and adolescents who attend schools have little to do with today's teachers and even with their childhood and adolescence. These differences are even evident in comparison with students of 10 or 15 years ago. The diversification of social environments provided by information and communication technologies has stripped traditional nuclei of socialization such as the family and school of their exceptional role as transmitters of values, social standards and information. Today, students need more frameworks of reference and interpretation, more intellectual tools and emotional resources than they need information. They need more items for judging and evaluation than pre-directed, factual knowledge.

- *Teacher identity*. Up to now, teachers, and particularly secondary school teachers, have been defined by the subject they teach. However, the extension of the compulsory school age (to 16 in Spain and 18 in some countries), an ever complex daily life and the delegation of many aspects of family education to schools, has made *what* is taught less and less important and *how* it is taught and *what for* much more so. This situation is seen by many teachers to mean a *decrease in standards* and a *degradation* of their function. This phenomenon, which Goodson (1998) called *repositioning* in the workplace, is also occurring place in many other jobs of a social kind, such as the health-related professions.

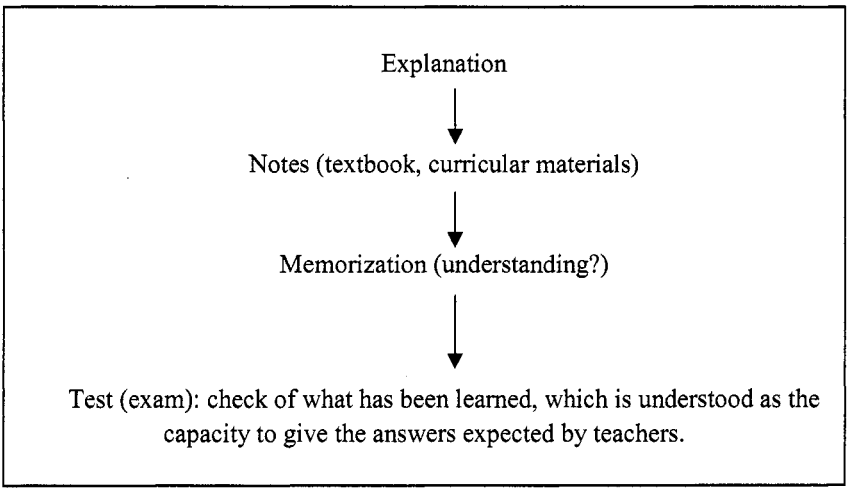
In an institution such as the school, which is not transformed merely by passing decree-laws, these elements of change coexist with deeply rooted elements of *no change* such as:

- *The compartmentalization of school knowledge.* As has been repeatedly shown, the choice and structure of school curricular content are still based on the nineteenth-century notions of scientific disciplines (Goodson, 2000), with repeated attempts to introduce emerging subjects, albeit on a *cross-disciplinary* basis (Yus, 1994 and Sancho, 1998). This way of understanding knowledge affects how the aim of school, particularly in the period of compulsory education, and its operation as a whole are not only perceived (Hargreaves et al, 1996) but *naturalised* (Tyack and Tobin, 1994)
- *The organization of the schools' physical and symbolic space.* In close relation to the above point, the physical, symbolic and artefactual organization of schools is designed to *transmit* to *homogeneous* groups a knowledge that is considered to be valuable, the main repository of which are teachers and text books. If this is not the case, why remove students from other learning experiences and other stimuli and interactions to have them around six or seven hours per day sitting, listening and copying, with a greater or lesser degree of understanding, what the teacher is saying, demonstrating or writing on the board?
- *Teaching practice.* In continuation of the above points, if teachers find they must *cover*, *give*, *teach* and *deliver* a syllabus full of subjects within a specific period of time, then methodological options are substantially reduced. Encouraging understanding by the students and getting their active participation in the learning process requires time, implies mutual trust, and a capacity to negotiate meanings and ways of ensuring a certain coherence between ends, means and quality in the process and the result of learning. Neither the current design of schools, nor teacher training provides the conditions for encouraging these processes and situations. In

this background, the use of resources other than the board, chalk, textbooks, the odd informative video and computer program that substitutes class or laboratory exercises is not envisaged at all.

- *Assessment.* Despite virtually constant questioning of assessment practices and their very often negative role in the process of student learning, assessment is still mainly focused on learning results shown by students in pencil and paper tests. Indeed, in spite of all reform efforts, this assessment system seems to fit most current education systems perfectly (see Fig. 1).

Figure 1. Representation of the standard sequence of the teaching and learning process.



- *Teacher professional development.* A recurring theme in the history of educational renewal, innovation and reform is the need to train teachers, change their attitudes and expectations, encourage their capacity to learn, argue, make founded professional judgements and increase and extend their pedagogical baggage in order to put into practice alternative and improved forms of educational intervention. The persistent failure to provide initial and in-service training to teachers that promotes and enhances these attitudes and capacities does not facilitate elements for change in teaching practices. It also leaves intact the basic problems in today's education, which are partly reflected in the above paragraphs.
- *Professional development of teacher trainers.* The, attendance of future primary and secondary teachers at a university lacking depth in its teaching innovations can be a significant restraint on their professional

development. The retraining of trainers is a longstanding issue that urgently needs to be tackled.

- *Professional development of civil servants and politicians.* In some countries, the constant increase in regulations and bureaucratisation of education systems means that policy makers and administrative bodies are one of the greatest obstacles for schools in rising to educational challenges in today's society (Sancho, 2003 and Hargreaves, 2003).
- *Training of families.* Not all families have the training, the predisposition and the material conditions to enable them to understand the best way to use their time. To continue learning means relearning with one's child and having the self-esteem and responsibility to be able to do so. One of the factors of no change in schools is the lack of training opportunities for families to acquire and develop the emotional capacities, the knowledge and the skills that enable them to assume their paternal and maternal responsibilities.

This network of change and no change is the main stage for the education system-perplexity, disorientation and lack of references are some of the basic problems in education.

3. FROM COMPUTERS IN EDUCATION TO EDUCATING FOR THE KNOWLEDGE SOCIETY

Technological advancement has traditionally come together with demands for the reform of school systems. Knowledge and skills, and even predisposition and motivation, required by individuals and societies are very different in different historical, social, economic and technologic contexts.

At the start of the 1960s, the general concern for the effects of technological developments on skills required and on employment levels led to an examination of many areas that are once again topical (National Commission on Technology, Automation, and Economy Progress, 1966; Jaffe and Froomkin, 1968).

In the 1980s some guidelines that were the basis for a large number of educational reforms at the end of the decade, were set out in the report *A Nation at Risk*[1], which considered that society in the United States was being eroded by a growing tide of mediocrity that was threatening the people's future and even its own future as a nation. Hence, the need to improve the

[1] *National Commission on Excellence in Education* (1983)

curriculum and to give a more important role to mathematics, science and technology. This was based on the argument that *basic learning* in the twenty-first century must include communication and higher problem-solving skills and scientific and technological literacy: *tools of thinking* that help us understand the technological world that surrounds us. The role of science and mathematics would not only have professional purposes, but also the development of students' problem-solving capacities and critical thinking in all areas of learning. Meanwhile other reports pointed to the need to recover humanities and placed special emphasis on critical thought as crucial in all the areas of a person's development (Broudy, 1984; Botstein, 1984). The elements involved in higher-order thinking skills generally include the capacity to use abstract systems (different types of language and representations), the capacity to build logical arguments, deductive skills, problem-solving skills and the capacity for independent learning. For Grubb (1987) this learning type is not only necessary to do well-paid jobs, but also to favour independent political thinking and a real understanding of cultural differences, something that seems basic in democratic and globalized societies, where the growing blending of cultures is a fact.

The real problem at the beginning of the 21st Century, as shown by the result of PISA (OECD, 2004) is young peoples' capacity (or incapacity) to use school knowledge and skills to solve everyday problems.

> "This approach represents a change in the goals and objectives of curricula themselves, which are increasingly concerned with what students can do with what they learn and not only whether they can reproduce what they have learnt" (OECD, 2004: 20).

This is where the problem lies. In an increasingly competitive world, in which growing effectiveness in the use of public resources to meet the needs of the public and society is demanded and in which changes in work require flexible individuals, with the capacity to continue learning and a predisposition to deal with new situations, basic sound education for the great majority of people seems essential. This will enable them to understand the complexity of today's world, while following their learning path during their life. It is also necessary because there is a growing belief that countries without workers who are skilled to perform jobs in knowledge intensive companies, which require considerable intellectual work by staff, will be reduced to the category of service countries without the capacity to produce added value. Leadership on the other hand is where added value is created, nourished and developed[2].

[2] In Reich (1991), quoted by Tedesco (1995).

Meeting all these educational and societal challenges seems to need much more than sophisticated digital technologies.

4. INFORMATION AND COMMUNICATION TECHNOLOGY AS A SET OF TOOLS TO TRANSFORM EDUCATION

As the present author has have discussed elsewhere (Sancho, 2004) the impressive development and application of ICT in practically all fields of human endeavour and the unbelievable power and the magnificent wealth and glamour generated by some ICT-related companies and people have aroused great interest and excitement in the realm of education. However, lessons learnt in over 40 years of research on the application of different media to improve teaching and learning processes have made well-informed educators and scholars aware that the use of any new tool does not automatically mean:

- The development and implementation of new approaches to school or academic knowledge.
- The transformation or improvement of existing teaching and learning methods or the development and implementation of better ones[3].
- The solution to all educational problems.

For practitioners, educators and researchers, the real meaning of the social transformations arising from political, economic and technological changes and the appearance of new tools is the need to meet new educational challenges, and find new kinds of practical issues and new research topics. Because political, economic and technological transformations have an impact on the construction of society and shape the inclusion/exclusion processes with their related consequences for people's learning opportunities. New information and communication technologies alter the structure of our interests (the things we think about), change the nature of symbols (the things about which we think) and modify the nature of the community (the area in which we develop our thought)[4].

This new scenario is faced by primary, secondary and higher education and vocational training and gives rise to a need for a deep rethink of teaching

[3] See Zammit (1992), Fabry and Higgs (1997) Richardson (2000), Burbules and Callister (2001), Cuban (2001), Pelgrum (2001), Schofield and Davidson, 2001; Zhao et al (2002), Ringstaff and Kelley, 2002; Kozman, 2003.

[4] Inis (in Tudesco, 1995).

and learning processes as a whole. This means not only reconsidering the content to be taught, the way of teaching it and of assessing student learning, but also the characteristics of the learning environments provided and the quality of the feasible learning experience. In this context, digital technologies can be considered as new learning settings in which students find an extension of their learning experience. However, the real challenge for education in today's society lies in the way educational systems are planned and implemented so they may connect with people's real educational needs.

Currently, in any education system cycle, the need both to use the available information and communication technologies and to consider the knowledge generated from the extremely wide fields of general science, technology and culture is more than accepted.

When planning and implementing the curriculum in this context, education systems find it necessary to establish the most suitable means to encourage students' understanding, problem-solving capacities and willingness to learn. If widespread use of the printing press made textbooks essential, it seems logical that widespread use of ICT, with their enormous culture-enhancing power (Steinberg and Kincheloe, 1997) will make these tools also essential.

It is sometimes argued that ICT will take longer to become involved in education as it is much more versatile that previous technologies and requires much more training to use it. This posture is backed by a large number of studies that reveal the scant impact of this technology on education, despite the large resources that are invested (Cuban, 2001; Ringstaff and Kelley, 2002; Kozman, 2003).

Nevertheless, there are currently a wide range of media to choose from in teaching. In addition, in the case of digital information and communication technologies, user options are multiplied (see Table 1)

Table 1. Educational use of ICT (OECD, 2001).

Type of application	Examples	Educational use
General tools	Word processing, presentation, spreadsheet, multimedia authoring, including Internet publishing.	Becoming increasingly important; require innovative and creative thinking from the teacher; the quality lies in the application and not the tool itself as such tools are not dependent on particular content.
Teacher tools	On-line lesson outlines; computer-projector systems; whiteboards.	Lesson preparation; whole class teaching with shared view of screen; interaction managed by teacher.
Communications	e-mail, e-learning; video conferencing, Internet browsers.	Require a view of education as something reaching beyond school, family in the out-of-school context.
Resources	Especially Web-based and either general or specifically educational.	Used according to availability, however required; for resource-based, skills-oriented learning.
Computer-assisted instruction (CAI)	Drill-and-practice, related to a certain kind of content and relatively unsophisticated.	Offers individual learning opportunities without expensive development: appears to go well with transmission models of teaching and learning.
Integrated learning systems (ILS|	Individualized task assignment, assessment and progression, including CAI, with recording and reporting of achievement.	These appear to lie outside teacher-led instruction and learning, but are only truly effective as an integrated part of the learning process, which may have to be re-thought.
Computer-based assessment tools	Examination boards are developing computer-based examinations, intended to mimic paper-based tests.	Components give advantage to the computer literate: teachers will need to incorporate some elements of similar tasks in their teaching, in order to prepare students adequately.
Management tools	Classroom procedures School administration Publication of results Communication	Students' progress, deficiency analysis, etc. Financial, personnel and educational resources. Parents, governors. Inspectorate, general public. *e.g.* between school and home

Furthermore, continuous development of communication tools is leading to an extension of the concept of space and time in education as they provide for permanent access to information and digital tutoring, which are theoretically increasingly suited to learners' needs. Upon fulfilment of the "forecasts" of the inevitable prophets that accompany all new technology, these virtual environments are already transforming ongoing professional training and will also change both primary and secondary schools. However, nearly 40 years after computers were introduced in education, the presence of these tools in classrooms is still the exception and educational planning and implementation continue to have the same organizational and symbolic structures.

For McClintock (2000:76) "digital technologies are very powerful forces that are deeply shaping our culture, education included. That is said from the perspective of a historical observer. From the perspective of people acting, trying to shape practice through the intentional use of digital technologies, we must recognize that educational change happens very slowly, that schools constitute a vast, far-flung system of practice. At best we will work reform slowly. But like iron, once wrought, it will hold its shape for ages".

The basic hypotheses upon which all McClintock's projects at the Institute of Learning Technologies at Teachers' College were based led to the following *axioms* that set out the basic conditions for ICT to act as a trigger for educational innovation.

- High-speed WAN to LAN connectivity is essential and should reach all classrooms.
- Schools should integrate new media into all aspects of the curriculum for students of all ages.
- Diffusion of the use of new media in a school should not be mandatory, but the result of the responsive support of voluntary efforts – constructivism in school management.
- Schools should design their technological implementation as investments in students' power to acquire their education.
- Educators should abandon the premise that they can predict what a good student should have learned as a result of an educational experience.
- Classrooms should become places from which students and teachers communicate interactively, among themselves, and with specialists and peers throughout the locality, culture, and globe.
- Under emerging conditions, precepts of pedagogical common sense may need substantial review, particularly with respect to what is and is not

age appropriate, who is entitle to make sound pedagogical choices, and how feedback controlling the educational process should work.

In McClintock's own account, the results so far have been disappointing. Progress has been good only with regard to the first axiom of practice: it has proven feasible to link schools via high-speed wide area networks to the Internet and to provide widespread access to that connectivity through local area networks reaching multiple workstations in each classroom. Such connectivity is expensive, but the resources available for it are increasing while its cost is diminishing. Insofar as the other axioms of practice are concerned, we have learned a well-established truth – significant historical change in complex institutions takes place on a time-scale of extended duration.

This situation is highly similar in most education systems that make considerable investment in ICT.

5. CHANGING THE FOCUS AND THE PRIORITIES

As argued above, some proposals for reform initiated in many countries in the 1990s, interpreted in a strict sense, would require a deep, sometimes radical (from the root) transformation of the way in which schools operate. The effects of such transformation could range from architecture and the use of human and material resources inside and outside the centre to the use and distribution of time and space (Sancho, 2000).

Elsewhere, reports drawn up by influential bodies with very diverse interests such as the Organisation for Economic Co-operation and Development (OECD, 1998), UNESCO (Delors et al, 2003), the European Commission (Study Group on Education and Training, 1996), the European Roundtable of Industrialists (ERT, 1995) have defined what have come to be called the educational needs of the Information Society. All support the need to educate a citizen who:

- Is integrally developed.
- Is able to make reflective judgements.
- Has developed research-like skills.
- Is able to attain self-fulfilment and the option of finding out what he or she really is.
- Is able to overcome the tension between which is world-wide and local, universal and particular, between tradition and modernity, the long-term

and short-term, indispensable competence and the concern for equal opportunity, the exceptional development of knowledge and their assimilation skills, and that which is spiritual and material,

- Has a broad range of skills that include the capacity to work with numbers, to read and write, critical judgement and basic knowledge of mathematics, science and technology, humanities, economic and social sciences,
- Knows how to think and not only to accumulate facts,
- Has the self-discipline to adapt to constant change and deal with continuous challenges.
- Has developed his or her communication capacity, linguistic skills, creativity, capacity for teamwork, and problem-solving capacity.
- Is qualified to work and use new technologies, exercises responsibility as a citizen, enjoys individual self-satisfaction, maintains an independent investigative spirit, is aware of his or her social rights and duties, and has a sustained disposal to work.

One item common to most of these views is the need to foster the development of higher order thinking skills. This is not only because it may be considered a professional skill for a small group of elite workers in jobs that involve freedom and creativity. It is rather because for most workers or the unemployed the capacity of independent political thinking and real understanding of cultural differences is still necessary. There is also broad consensus that a technological society requires greater powers of abstraction and independence in daily life so that complexity may be mastered and not be a source of confusion and exclusion.

6. WHERE SHOULD THESE CITIZENS BE EDUCATED?

It seems evident that this entails much more than the use of the most outstanding digital technology. The series of actions required to educate this type of pupil, student or citizen is far removed from the physical, intellectual and emotional potential of current schools. The education system must change a great deal to favour a learning environment that encourages this type of education. Moreover, the most important changes will not only be related to the incorporation of information and communication technologies in schools but are of a social and pedagogical nature and are related to:

- The need to transform the way in which the nature, the methods of production and types of knowledge are understood.

- A change from the disciplinary vision of the curriculum towards a more cross-disciplinary and experiential approach, which takes into consideration the evolution of knowledge and the need to interpret the world.
- The way of representing the forms of learning of different individuals and the factors involved therein. More comprehensive views of cognition that are aware of all the items involved in learning (emotions, likes, feelings, motivation, expectations, context, and biographies, etc.) are required.
- The way of conceiving education and learning scenarios. The basic organizational metaphor of the school must undergo a profound transformation. The class, as an exceptional place for education must become a multiple series of learning environments in which students can develop and acquire the skills, knowledge and attitudes necessary to live in society. In such environments information and communication technologies will probably have an important place. This will bring with it a need to generate new pedagogical know-how with regard to the planning and monitoring of student learning in diverse situations.

Many things must change in today's education system if a better future for the individuals and society is to be attained. Most are not within the reach of teaching professionals or the most appealing digital technologies. They are associated with legislative decisions, investment in material and human resources, training plans, working conditions, general social conditions, etc. Others are connected more with those people most directly involved in practice, and with their knowledge, predisposition and attitude. Hence, teachers' professional development is repeatedly mentioned as crucial in education.

In short, the education system as a whole needs to be rethought. There is a need to try out other ways of understanding contexts for teaching and learning, the content of learning itself, and the role of those involved in the process and of the means used.

7. CONCLUSION

Education is one of the most changing and sensitive landscapes of today's society. Anything that has an impact on any part of society (the economy, work, technology or culture, etc.) has an influence on education in the short, medium or long term. From this perspective, a more complex and holistic view of education is required in order truly to meet the challenges of

current education systems. Only an approach capable of taking into account the consequences of change and no change at different levels of society will prove to be the theoretical and practical basis upon which to develop teaching and learning scenarios for all kinds of learners. Taking into account this should be done in an ever-evolving political, economic, social, cultural, technological and educational landscape.

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