



An environment, not a tool: a constructivist point of view on e-learning

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Donald Norman once said that technology can make things worse or better, a statement which can generally apply to the educational and learning technologies as well.

The Internet and new technologies have changed the time and methods of the educational action, forming new identities for learning and teaching subjects. Simply because of this change, many critics have been moved to commenting on technologies in the educational ambit. In the first place, the computer is often considered a creativity 'killer', in the second place, because of the new technologies there are some kinds of knowledge that we are progressively losing [Simone, 2003]. Besides, as far as the relation between school and new media is concerned, some sustain that, at the moment, information and communication technologies are probably fostering a reduction of the learning quality, encouraging a school that is more pleasant and attractive but also more futile and devoid of theory, flattened on doing and on an immediate interaction, refusing effort and engagement, thus reducing the meditation, the interiorization, and the capacity to prospect a wider vision [Calvani, 2000].

On the other side, many are convinced that discussing the usefulness of learning technology is just a waste of time, and that the opportunity to make the most of is unique. People thought that ICT would be the solution to teaching problems, but everybody presently understands that filling school laboratories and universities with computers is not enough for educational change or innovation to be made.

Despite that, besides the numerous critical observations, many people think that computer and computer science technology have become real *mind tools*, 'intellectual partners', knowledge amplifiers, the real *cognition technologies*. For this reason, different educational institutions are involved in a renovation process and are questioning the possibilities offered by using of such appliances, currently considered as an *extension of human intelligence*.

So, which way is to be followed in order to obtain what we really need from technology? That is a hard question to answer.

'Well-balanced ones' try to give us an answer. They raise a consideration about humanistic computer science, particularly to the computer: they are convinced that computer is just a tool, a 'stupid tool' at users' disposal. I don't really want to defend either technophobia or technoenthusiasm, but I would like to maintain that a well-balanced position-the one which sees e-learning and computers as tools-is a wrong, in a certain sense a misleading, position. Relegating the computer to a 'simple' tool, considering it like an electric household appliance, is a simplistic attitude itself that tries to solve the problem in a hasty improper way. Since apprehension and anxiety are still too conditioning and do not accord to the learner an adequate environment that takes him, without prejudice, to the knowledge adventure, this position doesn't allow to approach informatics technologies in a productive way or use them in a creative way yet.

Because of these opposite positions there have recently been alternate moments between enthusiasm and perplexity, changes of mind and scepticism towards the application of informatics to education. For that reason, as Seymour Papert once said, technology doesn't still seem to have had a significant influence on learning processes [Papert, 1993]: this is because, on one side, the school reality didn't get rid of some prejudice and, on the other side, it has always been trying to reproduce, through a new tool (the electronic one), many of the traditional educational dynamics. But the computer, as we know, doesn't lend itself to duplicate the usual relation teacher-student, where communicative strategies remain which are impossible to reproduce by means of a machine.

Besides, it is reductive to think that, as often claimed, the Internet and on-line education have only liberated us from bonds of space-temporal nature, more than promoted the exceeding of individual isolation; everybody noticed that, with e-learning, the relation among participants in the learning process, and the educational power of the Internet, doesn't even really consist in the capacity of being a telephone or a postal service substitute, or in providing an efficient mass distribution system, but rather in the capacity to realize new forms of learning and cooperative interaction.

The considerations about educational technologies bring to the attention the fact that the problem to be discussed is essentially educative [Winograd, Flores, 1986]. New technologies and new media had the merit of bringing the learning problem to the forefront, while the current use of technologies in education points out the mechanistic characteristics of the traditional teaching/learning system, made only, or nearly exclusively, of contents, notions, verifications and mechanisms of support, which establish structure, timing and order of information with absolute precision.

What are the computer's peculiarities? Why, by the increase of studies and research, has the attention of science and human culture been gradually turned to a machine that, at least initially, looked just like a complicated calculator? Why did we come to believe in the possibility of constructing an 'intelligent' machine, firmly convinced that computers would be the teachers of the future? Many sustain, perhaps rightly, that, while other machines are directed to carry out a specific function (cars transport people or things, razors shave, and so on), the computer's main characteristic is that of being a 'universal' machine capable of performing completely different operations, bereft of any relation with each other, without changing its physical structure (in fact, it is capable of preparing fiscal documents, putting up video-games, calculating journeys of satellites, simulating financial phenomena, printing pictures, and so on); I'm convinced that more than tools computers have to be considered as learning environments, real privileged environments where students accomplish remarkable intellectual experiences.

In the educational ambit, as Calvani maintains, we are struck by two changes at present: firstly, the attention of the didactics is moving from the teaching to the learning facet, secondly, the contexts in which the didactic works are becoming more and more articulated: the 'how do you teach', and education in general, don't have anymore the centrality they used to have in the 60s and 70s, when research was mainly concentrated on the methods of preparing and scientifically experimenting with 'instructional systems'. The didactics is increasingly a 'cognitive area' critically interested in the preparation, consolidation and valuation of 'learning environments', that is to say in specific contexts, as results of an opportune integration of cultural and technological elements.

That is how the current picture of the knowledge society appears: on one side the universal machine, on the other side a shared change of paradigm in the definition of the teaching/learning process.

With regard to knowledge, for example, everybody agrees at this point with the fact that simply passed-on knowledge very soon becomes obsolete, which has repercussions on the limits of the purely exercise aspects of some kind of didactic methods, that can only, and just in some cases, reinforce sectorial abilities, but certainly don't lead to an improvement of learning and don't move in the knowledge direction. So, most of the educational software brought onto the market, including the e-learning platforms, were projected just to be a tool at the teacher's disposal, whereas the use at school of the new media has to find a sense, a specific motivation for the use of electronic devices that doesn't cause precious time to be wasted and the traditional didactic system regretted. In fact, often we call e-learning what is actually e-teaching. Frequently, we reason in terms of didactic and communicative strategies able to optimize, to plan, to save, and to extend services offered by the net: the 'medium net' is considered a neutral platform through which we can manage modules, didactic units, maps and structured contents in the most effective and economic way. On the contrary, the computer should become more and more a learning environment, connoting in different way teachers' and students' role.

Simply having a computer available at school isn't an innovation; the innovation is in the particular use of the technological environment, a use that does not make students simple witnesses, but active protagonists of their own learning, not information consumers, but knowledge producers.

If the improvement of learning quality necessarily goes through school renovation, if learning also means listening, researching, comparing, interacting, sharing and cooperating, then new technologies can be helpful in the process of transformation and innovation we longed for. Considering the use of technology in a different way from the constructivist one doesn't allow us to get closer to the new technology in a productive way. It's clear, you don't learn 'from', but 'with' and 'in' technology. If we use a transmissive didactic, the traditional correlation of the teacher-student perhaps works, but otherwise the use of educational technologies and new media needs a radical revolution, a change of paradigm in weighing up the cognitive environment where knowledge can rise.

There are two different ways to understand the use of educational technologies:

- an instrumental pattern that considers the use of computer as a further didactic support in order to render the didactic more effective and to obtain better results from students;
- a philosophical pattern by which the 'multimedia' make it possible to build a world and operate on it.

In the first case, the personal computer is a neutral tool that, without disturbing extant balances, allows ways to conform to changes; in the second case, it turns into a 'key stone' able to sustain a new pedagogy more suitable for the complexity of epistemology, the heterogeneous ways of learning, the network logic and the unlimited methods of constructing knowledge; a key, therefore, able to innovate the didactic and the traditional way to construct knowledge.

Now that information, as we usually say of late, seems to be the gold, there is another consideration to put forth: information is one thing, and knowledge is another one. A wide-ranging information doesn't correspond with a wide-ranging knowledge. As Salomon claims, while information is discreet, knowledge is arranged in networks made up of

meaningful connections between the nodes; while information can be transmitted as it is, knowledge needs to be constructed as a web of meaningful connections; while information doesn't need to be contextualized, knowledge is always part of a context; while information requires clarity, the construction of knowledge is facilitated by ambiguity, conflict and uncertainty; while mastery of information can be demonstrated by its re-production, mastery of knowledge is demonstrated by its novel applications [Salomon, 2000]; information-to end up-is automatically transferable, knowledge can't be entirely communicated through formal channels. Knowledge is the result of an active construction of the subject; its character is situated, anchored to the practical context and evolves through particular ways of collaboration and social negotiation [Jonassen, 2003].

In all this, what are the student's prospects?

Considering the computer as an environment and not as a tool, the value of the simulation becomes important [Parisi, 2000]. Simulation allows us to directly realize experienced and strongly interactive environments ideal for an autonomic learning and supports the studying of complex systems. Moreover, simulation in interactive environments gives the opportunity to have experiences of phenomena that one couldn't directly observe, as it is the case with phenomena in far of time (history) or space, with too large (solar) or too small (the atom) systems, with dangerous (an explosion) or not expressly realizable ones (an economic crisis), or with simply possible worlds. It's not possible to realize a simulation through a book; simulation is one of the motivations that justify computer and technology appliance by their sustaining a learning process.

Besides, new technologies and the computer are the privileged environments to 'unclean' learning, because the multimedia environment forms a sort of mind virtual laboratory, where learning is constituted by trial and error, is do-it-yourself oriented, towards a sort of operative epistemology, characterized by flexibility of cognition.

In short, the ideas that need to inspire a learning environment supported by technologies are those of game, simulation, exercise, discovery, motivations, of learning how to learn, of cultural patterns, cooperative learning [Scardamalia, Bereiter, 1994], of managing the indeterminacy through continuous and progressive adjustments. The learner needs to do, to make, to directly experiment, to let his initiative attitude grow, to be, with the flowing of time, more and more responsible of his own learning process as time goes by, he needs to cooperate, to explore, to simulate, to 'try to see what would happen if?', not being afraid of learning: he needs to learn in an active and significant and not exclusively in a receptive way. Therefore, computers can maybe become the protagonists of a big change in school, to put an environment at our disposal that allows each single student to freely explore new learning patterns and actively build his own knowledge in a responsible and controlled way.

Which role, then, for the teacher?

She doesn't mechanically establish a real learning that should be seen as a continuous and pervasive process, where teaching is one of the many possible resources. In other words, the teacher is only able to carry out her function efficiently and consciously by acknowledging that the direct and causal connection between teaching and learning is an illusion; it is a possible, but not a predetermined and planned answer to the pedagogical purposes of the setting that he contributed to prepare. That means, for the teacher, to use her role prevalently as a 'learning environments builder', intentionally planned to allow active and conscious courses in which the student is oriented but not directed. An environment enriched by collective and individual moments of reflection, by pre-arranged heuristic questions and by purposely polysemous indications and opened instructions that the student can manage by self-determinate methods and courses according to her personal interests and strategies. A banal use of ICT is clearly not sufficient for it automatically to become a significant learning environment [Maragliano, 2004], in fact the different cognitive and meta-cognitive potentials of each technological environment can remain hidden until the teacher exploits them through his own didactic project. As a matter of fact, in some cases their utilization is completely superfluous and not pertinent as it only answers to a technological neo-conformist need or, as Calvani says, to 'technological hypertrophy'. It seems more appropriate to consider technologies as potential changing factors able to influence the educational setting in its complexity (the physical context, the behavior and relation between different actors, duties and activities,

the relational and operative climate, motivations, expectations) and, last but not least, the learning process. In this process, the leading actor can be no one but the teacher who, as inventor, constructor and director of the learning conditions, knows how to integrate constructivist didactic information with the potentialities offered by technology as well as possible, so giving back to the school its privileged and protected environment of action-research on didactic methodologies.

In conclusion, there are several wrong applications of technologies in learning, especially when the technological environment is conceived as an activity that is apart, like when it's brought back to a traditional explanation/verification fixed pattern, while it's well known that, especially in the ICT use, it's very important to turn the attention not as much to the product as to the process that leads the student at all.

Technology is more than hardware; it consists also of the designs and the environments that engage learners. Although technologies have been traditionally used to teach students, they are not conveyors or communicators of meaning, nor should they prescribe and control all learners' interactions. Learners and technologies should be intellectual partners [Jonassen, 2003]. There is no doubt: on one side, a not banal (right) use of new technologies in the school environment involves a studying methodologies revision, a new organization of the communicable knowledge and, on the other side, there are many risks of an indiscriminate use of technology and media, from the passivity and the isolation caused by certain applications with the ingenuous conviction of a benefic impact of new technologies on the democratic development, to the simplistic, and dangerous, statement of a myth, the 'omnipotent computer', in the view of completely delegate to technology all the problems of our society, so included, the problems of a scholastic system renovation.

Inside a university, just having a computer at one's disposal doesn't give us anything innovative; innovation comes through a different use of the computer that has come about in recent years, a use that puts students in the centre of the learning process where they become active protagonists of their knowledge development. Used in an appropriate way, computers can positively influence our way of thinking and learning, but it depends on how teachers consider the real utility of this machine.

e-Learning doesn't help to transmit information and documents, but to share, to cooperate, to construct, personally, our own knowledge. If we want computer science to offer a good ground to learning, the computer has to pass from the teacher's to the student's hands, so that the latter should be able to discover and experiment in a personal research environment, in order to actively build his own knowledge and to explore a microcosm rich in logical experiences, in simulations and deep learnings [Capponi, 2003]. So the 'calculating machine' turns into a privileged environment that allows a wide plurality of ways of urging the creativity of its users, finally defined not just as a 'simple tool' but as a real 'learning partner'.

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