

Article No 4

# Digital Media and Learning Evolution: A Research on Sustainable Local Empowerment

**Magda Pischetola**  
**Università Cattolica del Sacro Cuore, Milano**

## Keywords

digital literacy, education, digital divide, ICT for development, discovery learning, didactics, One Laptop Per Child.

## Abstract

It is generally agreed upon that Information and Communication Technologies (ICT) are of vital importance for the social and economical development of a country. Following this idea, various initiatives have been made to address technical, cultural, rural and community development issues through projects of digital inclusion, with the direct or indirect supervision of international institutions or local agencies. Many initiatives, though, suffer from the inability to acknowledge essential cultural outlines, leading to a one-size-fits-all view of development interventions.

This paper aims to expose some issues associated with the impact of ICT projects for education, going beyond a linear (and simplistic) relationship between technology and knowledge. It highlights some important perspectives on research into cognitive access and digital literacy, while understanding the process of learning as a social output. The framework proposed is a digital inclusion model based on cultural needs analysis and subsequent promotion of didactics innovation, alongside the enhancement of social and intellectual capital. The results of the empirical research conducted on deployments of the One Laptop Per Child project in Italy and in Ethiopia are used to illustrate parts of the model and possible theoretical outcomes for future research.

## Introduction

It is generally agreed upon that Information and Communication Technologies (ICT) are of vital importance for the social and economical development of a country. Following this idea, various initiatives have been made to address technical, cultural, rural and community development issues through projects of digital inclusion, with the direct or indirect supervision of international institutions or local agencies. Many initiatives, though, suffer from the inability to acknowledge essential cultural outlines, leading to a one-size-fits-all view of development interventions.

This paper aims to expose some issues associated with the impact of ICT projects for education, going beyond a linear (and simplistic) relationship between technology and knowledge. It highlights some important perspectives on research into cognitive access and digital literacy, while understanding the process of learning as a social output. The framework proposed is a digital inclusion model based on cultural needs analysis and subsequent promotion of didactics innovation, alongside the enhancement of social and intellectual capital. The results of the empirical research conducted on deployments of the One Laptop Per Child project in Italy and in Ethiopia are used to illustrate parts of the model and possible theoretical outcomes for future research.

The article is organized as follows: firstly, it defines the cultural change in learning strategies coming from the wide diffusion of the digital media; secondly, it clarifies the meaning of digital literacy, and states its potential role for social development; following which, it reports two case studies of the worldwide project One Laptop Per Child, which aims at providing digital literacy in developing countries; and concludes with some ideas to implement sustainable projects for local empowerment and digital inclusion.

## ICT impact on learning strategies

The 21<sup>st</sup> century technologies provide users with an excellent opportunity to reshape the learning spaces, means and modalities. The advent of Web 2.0 tools, such as TV webcasting, blogging, social networks or wikis have facilitated content sharing and collaboration, as well as communication across geographies, time zones and cultures. Every user can publish personal thoughts, suggestions or initiatives online, thus making them available to others and contributing to create what De Kerckhove (1997) calls the *connective intelligence*. In this kind of communication system, the importance of networking as a shared attitude cannot be over estimated. The value of information does not depend as much on its original source; instead, it relies more on the relevance of its impact on a group or a community. Therefore, every issue can acquire personal, cultural or political importance, as long as it is published on the web and is *visible* to others. Moreover, content creation is a powerful means to get people involved and to voice their concerns: engagement with ICT brings out individual creativity and new opportunities of self-expression through different channels.

These observations have led us to understand how access to ICT provides a different model of education, which strongly contrasts with formal schooling: it is focused on personal discovery rather than unilateral transmission of information, on practical and substantial skills rather than on formal processes, and on unexpected outcomes rather than standardized educational paths. In other words, digital technologies change the way people build and use their learning strategies, and effectively help to put into practice some important learning theories developed over the past century.

## Discovery learning

John Dewey (1916), Lev Vygotsky (1926), and Jean Piaget (1952) developed learning theories that serve as the foundation of the so-called *discovery learning* approach. Their contributions describe learning as a collaborative process, where students take on an active role to construct and share knowledge. Instead of passively receiving information through lectures and related exercises, students are encouraged to make attempts, take risks, and find out possible solutions to a problem. The major attribute of this approach is to suggest using existing knowledge as a basis to acquire new knowledge (Bicknell-Holmes & Hoffman, 2000). As Bruner affirms, pupils who actively engage with the material are more likely to recall information later and to be able to use that information in different contexts (Bruner, 1961). Another attribute of this approach is that it promotes flexibility and openness of the learning activities, allowing students to follow their own creativity, thus greatly influencing their motivation. On the other hand, discovery learning radically changes the roles of students and teachers, calling for a new balance that can be quite difficult for some teachers to accept (Waks, 2007).

An analysis of the main characteristics of digital technologies leads us to support the idea that the way one accesses learning is very different from traditional forms, and much more similar to the discovery learning approach.

Firstly, as mentioned above, through the Internet the information is much more accessible and can be completed by different sources and other people's contributions. On one hand, this implies that the information retrieval is an active rather than passive procedure: certainly, a significant part of our learning comes from exploration. On the other hand, it is a complex procedure; as to be really effective, it requires deep understanding, concentration and selection.

Secondly, through technology, learning is process-oriented rather than content-oriented. That is to say that the students are not supposed to learn a scientific method as a fixed procedure, but rather gain problem-solving skills and informal reasoning associated with scientific work. The computer technology makes *learning by doing* become the rule rather than the exception. However, this does not mean that there is no role for the teacher beyond exposing problems. On the contrary, as it will be evident throughout this paper, within the use of technology, the teacher plays a central role, even more central than in most instructional design frameworks.

## Community of learners

John Dewey also stressed that learning is not an isolated enterprise, but a relational activity that takes place within the context of a social environment. Inspired by Dewey's position, the

*community of learners* theory (Brown & Campione, 1994) describes the ideal of education as a social process, achieved through interaction and relation with others. In this view, the learning context is a situation where knowledge is distributed and learning experiences are available to all students. The main didactical goal is to make individuals gradually acquire a mind of their own, through social intercourse, sharing activities and embodying beliefs (Waks, 2007). Fostering this ideal, teachers should encourage active learning, self-control and self-evaluation, and always focus on the student as the creative agent of learning. This requires first of all the establishment of a flexible environment, where students can exchange information mutually, move in space freely, ask for help or support each other. Secondly, within this approach the students are observed to have greater reflectivity, which influences their attitude to learning and gives them a deeper understanding of their progress. Challenges and failures are seen as necessary feedbacks, on which the learner gradually learns to build upon.

How do these attributes combine with ICT use? The youngsters are always networking through digital media: mobile phones, Facebook, MSN, Ning, MySpace, etc., are part of their everyday social fabric, and peer-to-peer exchange is their main source of information (Rivoltella, Ferrari & Carenzio, 2009). Then again, it is the teachers' responsibility to teach students how to use these networking opportunities to further their education, appreciate and value the viewpoints of others, and expand their knowledge in a meaningful and rich way. Cyber networking, school yard networking and classroom networking are all forms of valuable and mostly positive communication. This is to say that the potential role of ICT in learning urge educational professionals to think of ways to innovate their methodology. It is essential for the school to be able to support youth in the meaningful use of technology, which will include not only operational understandings of the ICT but the ability to communicate through different languages and codes, and to apply critical thinking to information. In literature, this concept has been called digital literacy.

### **Digital literacy and social development**

In 2008 the European Commission set a strategy to promote school systems' innovation through the growth of the competencies required in the knowledge-based society (European Commission, 2008). The most important suggestions of this communication are basically three:

- To increase levels of literacy and to reinforce learning-to-learn skills;
- To improve equity in school systems; to reduce early school leaving; and to improve support for students with special needs;
- To modernize curricula, learning materials, teacher training and assessment.

We can sum up these messages in three key words: *literacy*, *inclusion*, and *training*. Research has shown that in contemporary society, there is a significant relationship between these concepts and the potentials of digital resources (Warschauer, 2004, Van Dijk, 2005, Selwyn, 2004). The following paragraphs provide a critical evaluation of the existing evidence of this association.

### **Digital literacy**

Literacy has traditionally been described as the ability to read (decoding text), and write (encoding text), in the days when information came as books, newspapers and magazines, and was accessed through physical print-on-paper libraries. Nevertheless, the concept contains more meaningful and problematic aspects, which made it to be claimed by a range of different theoretical fields. In fact, it also relates to the ability to research information from a variety of sources, to find it, to understand it, to use it properly or functionally, and finally to elaborate it into knowledge. These are precisely the qualities which are needed so as to give a person the motivation and mindset to make best use of information. They provide the basis for understanding the importance of information, and of dealing with information resources and communication channels, as well as the incentive to continually improve one's capabilities (Bawden, 2008).

Now, if we are conscious of the transition we are in, from a society in which information was difficult to find and even more difficult to communicate, to one in which it is not, we have to reconsider the common definition of literacy and look for a broader definition. When information

comes in a digital form, it is not only presented through text, but as well through hypertext, pop-up, audiovisual tools and interactive pages (Lankshear & Knobel, 2006). ICT has changed the landscape of information access, and made a framework integrating various kinds of literacies necessary. What is required nowadays is *the ability to understand information and – more important – to evaluate and integrate information in multiple formats that the computer can deliver* (Gilster, 1997). This is what Gilster first called *digital literacy*.

The concept includes the so-called *digital skills*, which comprise complex factors required to access and work with digital technologies (Van Dijk, 2008). According to Van Dijk, the basic competences are *operational skills*, which correspond to the general ability to work with hardware and software. The most popular view is that access to technology is certain when these skills are mastered. However, research of the last decade has called attention to other forms of competence, such as the effective understanding of the retrieved information, and the strategic use of it for individual purposes. These ones are what the author points out as *informational* and *strategic* skills, which are needed in order to make a start on the real handling of information and knowledge. If the ability to construct information from multimedia tools is lacking, then however good the operational skills are, information will not be capitalized on effectively (Bawden, 2008).

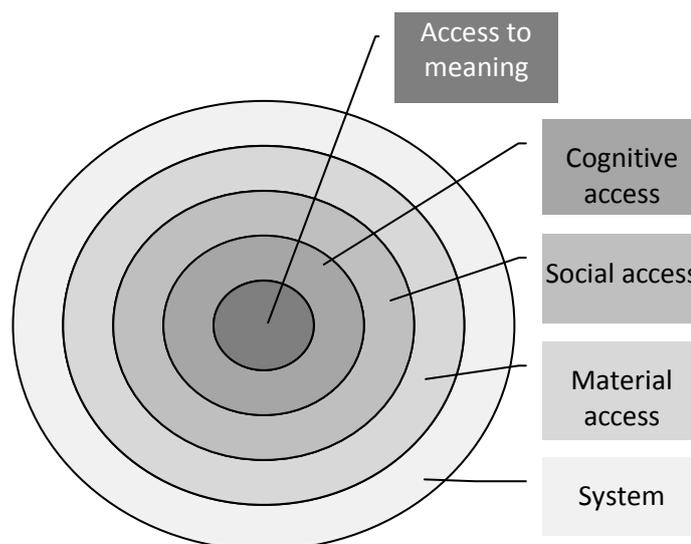
These assumptions affect the ways information is approached at school, the learning environment setting, and the whole concept of literacy. The challenge a school has to face is to develop every child's full potential, opening for them a channel towards literacy and opportunity. In this sense, technology can be used to better respond to the individual needs of students (Warschauer, 2002). Thanks to being cross-sectional, digital media can integrate different subjects and make pupils follow personal curiosity, not to mention time flexibility and procedure autonomy (Pischetola, 2010). As the European Commission well explains, "to acquire competences, learners need, from an early age, to 'learn to learn' by reflecting critically on their learning aims, managing their learning with self-discipline, working autonomously and collaboratively, seeking information and support when necessary, and using all the opportunities of new technologies" (European Commission, 2008, p. 6).

### Digital inclusion

Alongside the considerable opportunities ICT offers to those who are able to take advantage of them, we also have to consider a trend of increasing exclusion for those who cannot. Although there is still little theoretical development regarding the exact nature of the links between digital and social exclusion, nevertheless the sociological literature on inequalities has developed a set of views on what exclusion means (Helsper, 2008). It seems the inability to access and use digital resources (literacy) can be connected to the social disadvantages an individual faces. On the other hand, access to digital services, as to quality public services, for instance, is of particular importance for those people with greater social needs, who are often the less educated and literate.

We know that literacy depends on diverse factors: family reading culture, home language, choice of parental and school pedagogies, social environment and cultural input. But among other barriers there are some key factors identified as elements necessary for using technology effectively.

First of all, meaningful access is required. It implies considering whether an individual has some means to access the technology not only in terms of affordability or infrastructure, but also in terms of literacy levels, disabilities and usability of interfaces, and cognitive competences. Bucy and Newhagen present a model (Fig. 1) that defines meaningful technology access as something *more* than access to a computer with Internet service. They contend that the usual identified characteristics of a population who has or has not access to ICT (e.g. race, income, gender, social status, etc.) only explain some aspects of the matter. To picture a more complete landscape, these characteristics should be expanded to include psychological, cultural and sociological differences, which have an influence on the way people meet technology and use it. By consequence, if we are to promote social development through technology, we must reconsider the meaning of access to ICT from the point of view of the capacity to use digital technologies.



♦ Fig. 1 – Linear access to meaning – Bucy, E. P., Newhagen (2004).

A second critical element mentioned by the research is motivation. Whether the individual sees the benefit from, or has interest in accessing these technologies. In order to use the Internet or other ICTs, one must first be motivated to do so (Van Dijk, 2005). If the benefits of using a medium are seen, one is much more likely not only to use it, but to make an effort to incorporate it into everyday life. Although various international programs address digital inclusion through the distribution of technology, it seems more useful to focus on motivational aspects of the use of ICT. Recent studies have identified enhanced commitment to the learning task, enhanced enjoyment and interest, increased self-esteem and increases in independence and confidence as some aspects of motivation (Alvermann, 2002; Buckingham & Willett, 2006; Lankshear & Knobel, 2006; Rivoltella, Ferrari, Carenzio, 2009).

A third important component of digital inclusion is social support (DiMaggio *et al.*, 2004), which makes the individual feel confident to make effective use of technologies and to become an active participant in the emerging knowledge economy. The literature on the diffusion of innovations has always emphasized the importance of social support networks in the spread of new technologies (Rogers, 2003). Those who are more exposed to innovations in their surroundings are more likely to adopt new technologies. The exchange of information existing in a social context provokes one's initial involvement. In addition, the availability of friends and family who are also users of a medium provides assistance to solve problems encountered while using it, and psychologically it is an important source of encouragement.

## Training

The analyses in the previous paragraphs affirm that the ideas provided by the discovery learning approach can be effectively applied to didactics through ICT. In fact, in the case of ICT-mediated education the emphasis is placed on self-directed learning rather than on teaching (Chinien & Boutin, 2003). Pupils are encouraged to ask their own questions, carry out their own experiments, make their own analogies, and come to their own conclusions. However, the fact that school activities with technology are student-centered does not mean that technology can or should take the teacher's role. On the contrary, what makes students' experience meaningful is, as usual, the didactical purpose of a task. It means that active learning requires carefully constructed activities that challenge the learners to perform the tasks the instructor has in mind. The teacher acts as an expert learner who can guide students into adopting cognitive strategies such as self-testing, articulated understanding, asking probing questions, and reflection. His/her attitude should be open enough to recognize students' talent in using ICT with creative and collaborative purposes.

In other words, what should be avoided is to consider technology as a solution in itself. Digital technology should be intended as an additional language to be used in didactics, with its specific rules and impacts on the learning environment. Otherwise teachers can perceive it as a barrier to their work and a source of frustration.

Hence, to foster children's participation and involvement, in the first place it is necessary to promote the innovation of didactics. The focus should be on how to make technology more effective in encouraging teachers to change their teaching methods, and students to use digital media as tools to explore their personal issues (Papert, 1980). The first step should then be to encourage teachers to become digitally literate, in order to motivate them to integrate technology in their daily work. Ideally, they should have sufficient incentives to review their learning needs and to acquire new knowledge.

### **Technology in Italian and Ethiopian classrooms: learning as a social output**

In the last decade many projects have addressed social development through technology. The thought behind these actions is that a country's development can benefit from an educated population, which is able to use computer networks and takes interest in new services and tools. Nevertheless, some of these initiatives risk forgetting the local cultural resources, and offering a one-size-fits-all approach that presents some difficult aspects.

In the following, we will present empirical evidence from two case studies conducted in Italian and Ethiopian primary schools, where an international project named One Laptop Per Child (OLPC) was implemented. The research was set up to investigate whether the project has provided the envisaged access to expanded learning opportunities and whether the initiative will be sustainable in the future in order to foster educational changes and social inclusion.

#### **The One Laptop Per Child project**

The One Laptop Per Child initiative is the largest attempt in the world to promote development through a notebook for students and teachers. The project was founded in 2005 by Nicholas Negroponte at the Massachusetts Institute of Technology, and mainly addressed to disadvantaged and poor areas of the world. The theoretical design of the project refers to the constructivist approach, which includes both the belief in the potential of discovery learning and the idea that students can generate knowledge from their experiences in a positive social environment (Varisco, 2002). The main goals are:

- Every child of a given local community owns a laptop;
- The laptop becomes a private and personalized property to be used at school and at home;
- The child discovers computer features and develops new skills, sharing them with a peer-to-peer learning community.

Students should learn by doing, while the teacher would adopt the role of facilitator. Innovation in learning practices is thus expected to come from exploring, inventing, expressing and sharing: these issues are replicated throughout the mission and the vision of the program (OLPC site, in Internet at <http://laptop.org>).

#### **The research framework**

Two case studies were carried out in the school year 2008-2009 in the Italian and Ethiopian primary schools where the OLPC project was realized. The fieldwork data collection involved 26 classrooms, 13 for each country.

The research followed a qualitative methodology based on three tools: participant observation in the classrooms, focus groups with children, intensive interviews with teachers and coordinators. The study was based on a set of questions: what is the impact of a one-to-one technology introduction in the local educational system? How does the OLPC laptop influence both the children's and teachers' skills development? Does the development of new skills result in a change of the learning environment? Is there any evidence of the envisaged relationship

between developed skills and social inclusion? The analysis of the data collected gives some interesting information.

### **OLPC in Italian classrooms: children achieving discovery learning**

The youngest Italian generation has long been exposed to a wide range of networks and technologies. The OLPC laptop is an additional tool, which does not seem to correspond to the usual standards the children are used to. However, majority of students regard it as a novelty in school life, appreciate the specific child-centered design of the laptop and the responsibility they hold for an object of their property. The laptop activities they like most are those related to the use of image, especially the feature of audiovisual recording.

Seventy percent of the interviewed teachers observed some changes in children's skills during the year. What has primarily been noticed is a significant development of autonomy in logical procedures. The laptop especially facilitated information retrieval and creative elaboration, as well as motivation to discover new features and solutions. Working through a discovery process allowed students to develop their problem solving skills and, in consequence, the greater self-esteem that the children gained seems to have had a positive effect on the general behavior towards class-mates.

Moreover, many teachers noticed how this change in the collaboration dynamics inside the classroom has a positive impact on social inclusion, concerning both the students with cognitive problems and the children of immigrants (who represent 17% of the population in the area where the research was conducted).

### **OLPC in Ethiopian classrooms: students realizing a community of learners**

Ethiopian teachers usually adopt an education instructional model, influenced by cultural and religious traditions. They teach by using textbooks for a set curriculum on which students are tested periodically. They maintain authority and control over the learning process, expecting obedience and respect from students. The assumptions concerning the nature of discovery learning intrinsic to the OLPC design generated some difficulties in the Ethiopian teachers' methodology (Everts & Hollow, 2007). Therefore, the introduction of the laptop in itself did not change the traditional way of teaching, even though some of the teachers (23%) showed more openness towards the new technology and tried a more interactive approach with students. While integrating technology in daily lessons means extra work, extra energy and motivation for teachers, children are by nature more curious and eager to discover. The study outlined the awareness pupils have of the potential uses of the computer. They became experts on the most difficult activities uploaded on the laptop, thanks to their own initiative, autonomous discovery and social support from peers.

The shortage of connectivity options to the Internet gave more value to the one provided by the laptop, which allows communication by chat and file sharing. Children used these devices to record images, music and video, to exchange them with mates, and to learn new procedures and features from each other. This mechanism enabled the peer community to share interests and content: in other words, to share knowledge.

### **Conclusions of the main findings**

According to the OLPC mission statement, *it is an educational project, not a laptop project* (OLPC site: <http://laptop.org>). Offering children direct access to a personal technology actively involves them in knowledge construction processes, improves their learning approach and broadens their social inclusion opportunities.

The presented findings suggest that technology certainly does have a role in encouraging discovery learning and sharing of knowledge, but at the same time transformation of learning environments is unlikely to happen by itself in a spontaneous process. Besides, the primary goal of school reform is not to adopt or even internalize a valuable external model; it is to alter the aptitude of the school to engage in improvement.

On one hand, fostering cooperation and exchange of knowledge between Ethiopian teachers and pupils would mean to completely change established didactic methods towards a child-

centered approach, which is not acknowledged as effective in the Ethiopian culture. On the other hand, using a laptop instead of the exercise book, as it was expected by the OLPC project in Italy, is not an innovation to be taken for granted. That is to say that actions taken as if there was a strong cause-effect relationship between technology and innovation should be avoided, as they risk falling into an approach of technological determinism (Smith & Marx, 1994).

The main lesson the OLPC project has taught us is that it is counterproductive to look exclusively for direct impact of specific technologies on specific poverty conditions. The OLPC laptop introduced in a new cultural context is not adapted to it. There are few studies about such former methodologies used by teachers in a given environment. There is a lack of agreement with the final users about the goal of using the technology. Not only are the tools needed in the knowledge culture, but also the motivation, the enthusiasm for taking initiative, and the satisfaction of achieving goals.

To accomplish the mission of OLPC project, it is necessary to invest in methodological training for teachers, where a different model of learning is proposed and discussed in a bottom-up procedure. Training must be effective and uninterrupted during the school year to reassure teachers that they can count on experts to help them with any kind of problems. Technological skills and self-organization should not be taken for granted, especially when the envisaged outcome is a methodological change of teaching. The goal of this guidance should not be only to increase teachers' understanding about ICT but also the pedagogical knowledge related to the integration of ICT into their classroom practice.

These questions shift our attention from the technical elements of the training to digital literacy as the main outcome to be achieved by both adults and children. In fact, it means that strategies of ICT integration in teaching methods must be rethought and readapted to the cultural context, avoiding holding only a laptop responsible for the success of the project for school innovation.

### **Lessons learned and future work**

This article offers an overview of the opportunities relating to digital literacy, and of the barriers marginalized communities have to face to access it. In summary, it touches upon three main problematic issues: the importance of meaningful access to technology; the crucial role of the context in adopting new technologies, and the sustainability of a project for social development.

**1.** As we argued throughout the paper, simply having access to the technology is not enough to ensure participation and inclusion. In the 21<sup>st</sup> century, informational and organizational skills play a decisive role, and communities that are lagging behind in these kinds of digital skills are in danger of being even further disadvantaged in the future.

**2.** In the last decade there has been implemented hundreds of challenging ICT projects in underprivileged areas of Europe and United States as well as in many developing countries. These interventions aim at providing positive development impact on people's lives at both an individual and community level. Interestingly, the main focus has largely been on the implementation of the projects themselves, rather than on their impact on local contexts; and, as a result, such a lack of understanding has frequently led to failure.

**3.** A major problem of projects for digital inclusion seems to concern sustainability. It requires a great effort to accomplish the task of having a breakthrough in the local mentality, and to have the project "take deep roots" and grow within time. Moreover, a clear follow-up strategy after the first assistance intervention is critical to ensure continuity of the initiative. So far, some excellent projects have proved unsuccessful because, even though some goals have been achieved in the first phase, they were not sustained later.

Bearing this in mind, we define three achievements to be realized through the future projects promoting digital inclusion.

#### **1. Focus on the cultural transformation, not the technology**

Any technological change is likely to produce some social change, but the consequences of it do not depend on technology in itself. As Mark Warschauer states (2002), *too often technology projects focus on providing hardware and software and pay insufficient attention to the human and social systems that must also change for technology to make a difference*. Most of the recent research literature points out that digital exclusion is not simply a matter of lack of technical capacity. The ultimate purpose of innovation is not to provide the school with the

newest devices in the market, but to ensure that everyone has access to the expanded opportunities of the Knowledge Society. This leads to reflections on how technology can meet people's needs, and be useful for their personal purposes and goals. We need to keep in mind that the level of technology needed is not a universal standard. Users can be satisfied by using technology at different levels to meet their needs. Linked to this is the notion that there is not a one-size-fits-all solution to an effective use of ICT for all developing countries. Varying political, cultural and economic landscapes require different approaches, as well as different tools and technologies.

By reflecting on these issues, international and local initiatives can find appropriate means to channel specific activities into poverty-targeted media use and to embed ICT content as part of local life and local culture.

## **2. Focus on social and intellectual capital**

A structured project for digital literacy should try to explore how greater collaboration can be encouraged among the leading players of the technology industry, community, organizations, and local politicians, in order to ensure digital resources to be used efficiently in the school context.

It basically means to consider the availability of human resources as an overriding issue. The main resources for innovation are, in fact, the intellectual capital and social networking resources.

## **3. Focus on long-term effective training**

It is evident that a sustainable approach to digital inclusion should concentrate on the principal training needs of a community. Concerning school capacity, the emphasis has to be put on changing teachers' approach, which means considering their beliefs, knowledge, skills, and dispositions as individual staff members. To reach significant results, teachers have to face the challenge of basing their method not only (or not anymore) on a functional organization of the content, but also on the construction of flexible literacy, which results in the ability to access, manage, evaluate, and create information.

In addition, schools can combine individual development with professional communities' development, and combat fragmentation of multiple innovations by working on program coherence (Newmann, King & Youngs, 2000). In order to ensure ICT assimilation, it is of great importance to invest in practices and competences through planning, monitoring and evaluation.

It can be concluded that investment in training and education guarantees a better return than investment in infrastructure. The aim should be well-developed plans to enhance new individual skills and institutional capacities of assessing educational needs, monitoring of progress, and providing of supervision. Such a systematic approach will also address the role of institutions in influencing the diffusion of innovation, like suppliers of ICT in terms of hardware or software and support centers as part of the environment.

Future work should be associated with two main integrated directions: the establishment of a political framework addressing innovation in school systems, and a further refinement of frameworks and criteria when implementing digital literacy programs.

## **References**

- Alvermann, D. E. (2002), *Adolescents and literacies in a digital world*, Peter Lang, New York
- Ardizzone, P., Rivoltella, P.C. (2008). *Media e tecnologie per la didattica*. Milano: V&P.
- Bawden, D. (2008). Origins and concepts of digital literacy. In Lankshear, C., Knobel, M. (eds.). *Digital literacies: concepts, policies and paradoxes*. New York: Peter Lang.
- Bicknell-Holmes, T., Hoffman, P. S. (2000). Elicit, engage, experience, explore: discovery learning in library instruction. *Reference Services Review*, Vol. 28 Iss: 4. DOI: 10.1108/00907320010359632.

- Brown, A. L., Campione, J. (1994). Guided discovery in a Community of Learners. In McGilly, K. (Eds.). *Classroom Lessons: Integrating Cognitive Theory and Classroom Practice*. Cambridge (MA), London: MIT Press.
- Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review* 31 (1).
- Buckingham, D., Willett, R. (2006). *Digital generations: children, young people and new media*. Mahwah (NJ): LEA.
- Bucy, E. P., Newhagen, J. E. (2004), *Media access: Social and psychological dimensions of new technology use*. Mahwah (NJ): LEA.
- Chinien, C., Boutin, F. (2003). Bridging the Cognitive Divide in ICT-Mediated Learning. *IEEE International Conference on Advanced Learning Technologies (ICALT 2003)*, Athens, 9-11 July 2003.
- De Kerckhove, D. (1997). *Connected intelligence: the arrival of the web society*. Toronto: Sommerville House.
- Dewey, J. (1916). *Democracy and Education: an introduction to the philosophy of education*. New York: Macmillan.
- DiMaggio, P., Hargittai, E., Celeste, C., Shafer, S. (2004). From unequal access to differentiated use: A literature review and agenda for research on digital inequality. In Neckerman K. (Ed.). *Social inequality*. New York: Russell Sage Foundation.
- European Commission (2008). *Improving Competences for the 21st Century: An Agenda for European Cooperation on Schools' Communication*. Brussels: Commission of the European Communities. Retrieved from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0425:FIN:EN:PDF>
- Everts, B., Herren, M., Hollow, D. (2007). *Ethiopia Implementation Report*. Addis Ababa: Eduvision.
- Gilster, P. (1997). *Digital literacy*. New York: Wiley.
- Helsper, E.J. (2008). *Digital Inclusion: An Analysis of Social Disadvantage and the Information Society*. London: OII.
- InfoDev (2001). *Information Infrastructure Indicators 1990-2010*. World Bank. Retrieved from <http://www.infodev.org/projects/375/fin375.htm>.
- Lankshear, C., Knobel, M. (2006). *New literacies: Everyday practices and classroom learning*. Philadelphia: Open University Press.
- Melucci, A. (2000). *Diventare persone: conflitti e nuova cittadinanza nella società planetaria*. Torino: Gruppo Abele.
- Newman, F., King, B., & Youngs, P. (2000). Professional development that addresses school capacity: Lessons from urban elementary schools. *American Journal of Education*, 108(4).
- OLPC site, in Internet at <http://laptop.org>.
- Papert, S. (1980). *Mindstorms: children, computers, and powerful ideas*. New York: Basic Books.
- Piaget, J. (1952). *The Origins of Intelligence in Children*. New York: International University Press.
- Pischetola, M. (2010). Insegnare gli alfabeti mediali. In Cattaneo, A., Rivoltella, P.C. (Eds). *Tecnologia, formazione, professioni. Idee e strumenti per l'innovazione*. Milano: Unicopli.

- Pont, B., Nusche, D., Moorman, H. (2008). *Improving School Leadership*. Paris: OECD. Retrieved from <http://www.oecd.org/dataoecd/32/12/44374889.pdf>
- Rivoltella, P.C., Ferrari, S., Carenzio, A. (2009), "Puoi parlare?" Gli adolescenti al tempo del cellulare. Milano: CREMIT. Retrieved from [http://www.cremit.it/public/documenti/Abstract\\_report.pdf](http://www.cremit.it/public/documenti/Abstract_report.pdf)
- Rogers, E. (2003). *Diffusion of innovations*. New York: The Free Press.
- Selwyn, N. (2004). Technology and social inclusion. *British Journal of Educational Technology*, 35(1), 127–127.
- Smith, M. R., Marx, L. (1994). *Does technology drive history? The dilemma of technological determinism*. Cambridge (MA): MIT Press.
- Van Dijk, J. (2005). *The Deepening Divide. Inequality in the Information Society*. London-New Delhi: Sage Publications.
- Van Dijk, J. (2008). The Digital Divide in Europe. In Chadwick, A., Howard, P. N. (Eds.). *The Handbook of Internet Politics*. London and New York: Routledge.
- Varisco, B. (2002). *Costruttivismo socio-culturale: genesi filosofiche, sviluppi psico-pedagogici, applicazioni didattiche*. Roma: Carocci.
- Vygotsky, L. (1992 [1926]). *Educational Psychology*. Florida: St. Lucie Press.
- Waks, Leonard J. (2007). Rereading Democracy and Education Today: John Dewey on Globalization, Multiculturalism, and Democratic Education. *Education and Culture*, Vol. 23, Number 1.
- Warschauer, M. (2002). Reconceptualizing the Digital Divide. *Firstmonday* 7(7). Retrieved from [http://www.firstmonday.org/issues/issue7\\_7/warschauer/index.html](http://www.firstmonday.org/issues/issue7_7/warschauer/index.html).
- Wilson, E. J. (2004). *The Information Revolution and Developing Countries*. Cambridge (MA)-London: MIT Press.
- 

### About the Author

**Magda Pischetola** has a Ph.D. in Education at the Università Cattolica of Milan (Italy), and is currently an Assistant professor in Adult Education, and a Teachers Trainer. Her research focuses on the integration of Information and Communication Technologies in schools and community centers; the impact of technology on literacy practices; the relationship of ICT to social development, with a particular interest in how digital media may alleviate social inequalities. Her Ph.D. project has looked at the digital divide from the point of view of Education. It was held partly in Italy and partly Ethiopia, in order to present a comparative analysis of two case studies of the One Laptop Per Child project. In the last years she has been working at the Cremit (Research Centre on Media Education at the Università Cattolica of Milan), investigating the influences of digital media on cultural consumptions and the evaluation of effective didactic methodologies with technology.

Magda Pischetola  
Email address: [magda.pischetola@unicatt.it](mailto:magda.pischetola@unicatt.it)

Mail address:  
Cremit – Centro di Ricerca sull’Educazione ai Media, all’Informazione e alla Tecnologia,  
Università Cattolica del Sacro Cuore,  
L.go Gemelli 1,  
20143, Milano.  
Italy