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Teaching practice and ICT in Catalonia: Consequences of educational policies

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Abstract

This paper reviews policies and practices related to the educational use of information and communication technology (ICT) and its role in improving education in Catalonia. Specifically, it analyzes the ICT educational practices developed at four schools in Catalonia, as well as the educational policies on the integration of these technologies promoted by the Administration over the last 25 years. These analyses indicated that the resulting practices, mostly centred on teachers' explanation or on teaching software, were in line with policies that have systematically focused on the provision of equipment and the uncritical use of ICT, regardless of actions for improving such practices.

Keywords: innovation, improvement, computer, educational policy, educational practices

Introduction

In recent decades, the majority of countries have launched distinct programs to integrate information and communication technologies (ICT) into education. The designation has changed from *educational computer sciences* to *ICT applied to education*, *e-learning*, *cyber-school*, *School 2.0* or *1x1 programs* (Area, 2011; Holcomb, 2009; Ruiz, 2007). From the beginning of these programs a revolution in the classroom was announced, given that it was assumed that the use of digital technologies would improve teaching methods and make the school respond better to the educational needs and challenges of today's society (Chen, 2010; Papert, 1979; Perelman, 1992).

Nevertheless, a series of studies in different countries (Balanskat, Blamire, & Kefala, 2006; Condie & Munro, 2007; Sancho & Alonso, 2012; Sigalés, Mominó, & Meneses, 2007; Vega & Merchán, 2011) explain that educational change is neither as simple as that nor is it only directly related to the use of ICT. These studies showed that despite the increase in technological resources in schools, the pedagogic practice of the teachers has continued to be anchored in what is known as traditional teaching (Area, 2008, 2011; Area & Pessoa, 2012; Bosco, Larraín, Sancho, & Hernández, 2008; Cuban, 1993; Sancho, 2006; Sancho & Alonso, 2012; Song, Kim, Seo, & Kim, 2013). Even schools such as those belonging to the European Network of Innovative Schools (ENIS) have encountered difficulties in integrating ICT in a way that promotes innovative pedagogic practices (Gillera, 2006).

As studies have shown (Area, 2011; Becker, 2001; Conlon & Simpson, 2003; Holcomb, 2009; Pelgrum, 2001; Sancho & Alonso, 2012; Wilson, Notar, & Yunker, 2003), the main obstacles to developing the educational potential of ICT have been schools' organization and the teaching cultures. The difficulty of transforming the rules of school grammar (Tyack & Tobin, 1994) are found, above all, in the specifications and levels of achievement of the current curriculum; the space and time organization; the disciplinary and fragmented conception of knowledge; and the lack of autonomy of the teaching staff and pupils (Area, 2011; Sancho, 2006; Sancho & Alonso, 2012).

In order for ICT to achieve a systematic change in education, educational policies would have to consider pedagogic principles that, generally speaking, remain unalterable (Area, 2008, 2011; Cuban, Kirkpatrick, & Peck, 2001; Levande et al., 1998; Pelgrum, 2001; Sancho, 2006; Sancho & Alonso, 2012; Sarason, 1996).

Thus, the following research questions guided this study:

1. Why, despite the existence of specific introductory programs of ICT in teaching, is its presence usually insufficient in schools, and does not involve substantial innovation for improving learning?
2. What would have to change in educational policy, in schools, and in teacher-training for teachers and pupils to be able to relate, in a reflective and educationally productive manner, with ICT?

Theoretical framework

This paper presents part of the results of the project “Policies and practices regarding ICT in mandatory education: Implications for innovation and improvement” (funded by the Ministry of Science and Innovation. SEJ2007-67562). The study was approached from a constructionist perspective (Holstein & Gubrium, 2008). In this view, all social phenomena is interpretive and all social practices are, by definition, significant and, therefore, socially organized, shaped historically and through politically informed actions. This means assuming, in our case, that the very socio-historical positions and visions regarding ICT and their role in education are built and represented through practices, experiences, interactions, and narratives socially produced in different places and by different means (Granberg, 2011; Player-Koro, 2012). From the viewpoint that the social players and the structures are the two sides of the same coin, social life and social structures are constituted *in* and *through* the interaction between those involved in them and the policies that govern them (Foucault, 1969). This leads to the importance of the relationship between the educational practices and the prescriptive discourses about these practices, embodied in educational legislation and programs because of different developments and political initiatives (Rochefort & Cobb, 1994).

Method

In the first stage of the project, the researchers analyzed the documents that reflect the policies of the autonomous region of Catalonia, in relation to the introduction and use of ICT in schools. These documents have been considered as discursive elements, the principles of which are linked to conceptions of education, learning, teaching, the technologies themselves, the information society, the productive system, and other related factors of importance. They are related to the practices inasmuch as they aim to set out how we must think, speak, and act regarding ICT. The study aimed to elucidate the impact that this has on education with the analysis of the practices in schools.

The essence of the research was:

- a) The analysis of the institutional policies put into practice in Catalonia in order to incorporate and use ICT in the school system over the last 25 years, reflected in distinct documents (from legal provisions to web pages) and evaluated, by those responsible for carrying them out, in 12 interviews with key people from the Catalan Ministry of Education.
- b) The undertaking of four case studies (two in primary schools, for ages 6 to 12 years old, and two in secondary schools, for ages 12 to 16 years old) to detect the forms of appropriation of official discourses in schools, or the elaboration of responses and alternative discourses. The sample of schools

was chosen applying the criteria of atypical case (Patton, 2002), which in this context translates into three schools recognized as particularly innovative in the use of ICT and a fourth considered as the *typical case*.

The case studies enabled the authors to obtain holistic information about the forces that intervene in the educational use of ICT. In particular, about: (a) the impact of the policies of integration of these tools in the teaching and learning process, paying special attention to the development of the syllabus (visions about knowledge, learning, teaching, the role of the pupils and the teachers); (b) the working conditions of the teachers (access to training, spaces and practices of collaboration and professional development); (c) the results of the learning (intellectual, social, and personal value of what is learned and capacity of transfer in order to continue learning).

The undertaking of the case studies involved the analysis of relevant documents, interviews with key informants, which were recorded and transcribed, to explore the phenomena analyzed in depth, and the observation of the practice and dynamics of the school. This ethnographic methodological approach is coherent with the previously outlined constructionist approach, since it allowed the researchers to generate detailed knowledge about the dialectic between the actions of the educational players and the social structures of which they form a part.

In this paper, we focus first on the analysis of the practices with ICT in the schools studied. Second, we present the analysis of the policies in Catalonia in relation to the integration and educational use of these tools during the last 25 years. To do this, we have highlighted the main actions undertaken, including the type of formation received by the teachers. Finally, we discuss the connections and disconnects between policies and practices and how these can be explained, in part, by the strategy of the adopted policies.

Results

In the schools studied, only one third of the teachers used ICT in their classroom teaching. The types of educational use of these tools are synthesized in Table 1. The majority of these practices were within the setting of traditional pedagogy. It was rare to see practices resulting from innovative perspectives focused on the pupil and those that promoted a learning process oriented at comprehension and creation.

ICT use for curriculum content

Some ICT uses are predominantly for explanatory purposes, for the presentation of curriculum content. They focus on the teacher in that they present the relevant information presented via different digital technologies. In some cases, this presentation diversifies from the use of other teaching materials that represent the data in different

languages and ways of expression, making it easier to understand and promoting multiple literacies. In other words, this use can increase the capacity to handle different means and languages that improve the learning processes (Area, 2008, 2011; Area & Pessoa, 2012), although this is a characteristic that does not occur in all cases.

Last year, for example, in the 6th year of primary school, we had a screen and projector in the class, so I used Google and Wikipedia a lot when we gave history lessons, or when we were studying the expansion of the Christian kingdoms over the Muslim ones in the Iberian Peninsula in the 12th century. It was very good to be able to see progressive maps, that is, maps of centuries and how this territorial expansion gradually developed. (Interview with a teacher; Bosco, Domingo, Casablanca, Alonso, & Fraga, 2012, p. 101).

Table 1. Main teaching practices with ICT

Types of practice	Main characteristics
Focused on the exhibition of content	<ul style="list-style-type: none"> • The teacher as provider of information. • The pupil as receptor of information. • ICT help represents the factual and declarative contents, sometimes making use of their multimedia possibilities. • The resources are based on the curriculum content linked to <i>knowing what</i>.
Focused on exercising	<ul style="list-style-type: none"> • The teacher as provider of resources (exercises in digital format). • The pupils as executors of the pre-established exercises of low cognitive and emotional demand. • ICT consists of exercising software, in general, based on multiple choice questions or single answer (behavioral vision of teaching and learning). • The resources are confined to curriculum content linked to <i>knowing what</i>.
Focused on teaching software	<ul style="list-style-type: none"> • The teacher presents information about a given software. • The pupils are receptors of information, although sometimes they use the software to work on curriculum content. • ICT consists of software to represent information. • Sometimes the computer programs that are the object of the teaching are used to deal with curriculum content linked to <i>knowing what</i>.
Focused on the pupils	<ul style="list-style-type: none"> • The teacher guides the activity, offers some general parameters for its development and suggests resources. • The pupils have an active and autonomous role to define how they will solve the problem or project, which content they will cover and how they will present the results. • In general, the use of a specific tool is not established but the pupils choose which they consider most appropriate for the work to be done. • The disciplinary content is covered from problems, cases or projects and is linked to <i>knowing what, how, where, why, and for what</i>.

In secondary school, for example, in English classes, projecting students' homework onto a screen allowed them to analyze and correct it. Moreover, going to a web page that showed the correct pronunciation of the words made it easier to explain why some words were pronounced in a particular way although their spelling appeared to be the same. In this sense, educational interaction provided activities of recognition but also of comprehension of some aspects of the English language.

This use of ICT strengthens the traditional explanatory practices focused on the teacher. The diversification of sources of information may favor the establishment of relationships between the ideas and the notions dealt with. However, in general, they prioritize learning by reception rather than by re-elaboration or re-creation.

ICT use for learning exercises

This type of practice prioritizes knowledge as factual content to be memorized. In other words, knowledge as a series of facts and concepts that need to be stored, and which must be repeated, in this case with the help of a computer program. The idea is that the pupils reproduce items of information with which they have been presented previously (in class or through an ICT resource), and the *correction* of their response to the exercise is judged in terms of the direct correspondence between them and the predetermined answer in the material used (computer program), which is considered the only valid one.

Although we found these activities on a regular basis in primary schools, they were also undertaken in secondary schools. In the former, they were generally linked to the *JClic* program: <http://clic.xtec.cat/es/jclic>. In fact, in some cases, the time spent on computer work in a classroom equipped with computers, outside the space of the usual class, became a time for reinforcement in the subjects of language and mathematics:

The 4th year primary class enter [the computer room]. This half hour of class time passes very quickly since the pupils arrive late and must finish early to go to their classroom to collect their rucksacks, since school ends at 5 p.m. The teacher gives instructions, the pupils are silent, listening: they must enter the page edu365 and navigate to Piolet. Like the last time. They then have to read the story and do the activities proposed afterwards. The assignment is to read, do the two parts of activities and notify the teacher before closing the program. (Class observation; Bosco et al., 2012, p.101)

In one of the secondary schools, the learning exercises also focused on mathematics and catalan. In the first case, they were done in the *Toomates* setting (<http://www.toomates.net>), comprising a collection of lists of mathematics exercises that the pupils can do independently, even from home, to go through, improve or go deeper into this subject. In the second case, the teacher, using a collaborative online text editor (Google Apps, today Google Drive) had the students do a summary of a story and answer a series of lexical and comprehension questions

related to the text, and mark the mistakes and correct answers on a sheet of paper. An exercise complemented by the creation of a story by the pupils.

In this category of activities, focused on doing exercises, the *GeoGebra* program (<http://www.geogebra.org>) was also used, which combines geometry, algebra, and calculus and does not represent the typical program of student exercises. This application integrates visual intuitive access to geometric figures and their corresponding algebraic formulae, which pupils can create, edit, and manipulate interactively to visualize their properties and how they change, by manipulating them. It is also a repository of objects of knowledge and enables the individual functions and/or geometric objects to be recorded and exchanged with other interested parties (students or teachers). However, in the sessions observed, teachers asked the pupils to solve specific problems in practically the same way as in the *Toomates* setting.

As a whole, this type of practice was similar to the proposals in the computer assisted learning programs. It is a vision of the use of the means based on the behaviorist perspective of learning and teaching of the 1960s, which was revived by the notion of Computer Assisted Learning (CAL). It is an approach that results in activities of low cognitive and emotional demand for the pupils, focused on the idea of *reinforcement* in order to *establish the schema* for the contents of subjects such as mathematics or language (Bosco, 2002, 2004).

ICT use of software

We placed in this category the classes that dealt with teaching pupils to use different software programs with the aim of helping develop digital competence or multi-literacy (Area, 2008, 2011; Area & Pessoa, 2012). In some cases, these uses were linked to the development of a curricular subject, through which the expression of ideas or the very meaning given to different data could be worked on. In the situations observed in one of the schools, students were using a slide presentation program, a web page editor, and a video editor.

In the technology class in the first year of secondary education, the pupils had to turn the content of a unit into a presentation using *OpenOffice.org Impress*. The contents of all the presentations were the same. However, the color of the background of the screens, the font type, and the animations used changed. The important thing seemed to be *to dominate* the tool, not that this would provide a better understanding of the subject content. Other computer applications, such as wikis, and web pages, were used for each of the following subjects with the same philosophy.

The optional 4th-year computer sciences class focused on the explanation by the teacher of the functions of the web editor program as he demonstrated them on a computer and projected them onto a screen. Another optional computer science class focused on the functions of digital video editors, but there was no provision for students to actually edit a video in order to apply what they learned about a subject or procedure. It was the explanation, this time given by the pupils, of the resources of the video editor that each group had found on the Internet, through a presentation

prepared by them. The teacher listened and asked for more details of the tool that, although it was the focus of interest, did not stop the teacher preferring a critical attitude seeking to deepen and generate technical knowledge (Sancho, Padilla Petry, Domingo, Müller, & Giró, 2012).

This type of use of ICT also confronts the pupils with tasks of recognition or memory, although focused on the use of computer applications. Only in the class about the video editor were the pupils asked both to explain its functioning and to demonstrate that they understood what they were saying, because they were urged to express their own ideas and look for different solutions (Sancho et al., 2012).

Student-focused ICT use

We found more reconstructive, creative activities in two secondary schools, in contexts such as a synthesis project in the third year, a research project in the fourth year and the optional subject of Digital Journalism.

The aim of the synthesis project was:

To develop complex competencies, to check if they have been achieved, and to what extent the pupils have integrated the basic competencies, acquired from the content worked on in the different subjects, for the application and solving of questions and problems related to practical life (Department of Education, 2010, p. 251).

In the case of one of the secondary schools, in the synthesis project in the third year, the teacher suggested to the pupils to undertake a route around Barcelona to discover the cultural, social, and artistic aspects of the city, as well as to learn to move around the city efficiently. To do this they were given a basic guide from which they had to work together to develop a blog (available at <http://3esomallola.blogspot.com>). The realization of this group work brought with it a search for diversified information by the pupils to illustrate the routes around the city, the use of different strategies, modes, and languages of information collection and the diversified representation of their work. The publication of the results on a blog accessible on the Internet made them face up to a series of unknown situations that they had to resolve as the work progressed.

The research project in the fourth year of secondary school had to be done in a team and consisted of a “series of activities of discovery by the pupils regarding a chosen subject and marked out, in part, by the pupils themselves, under the guidance of the teaching staff” (Department of Education, 2010, p. 251). The projects carried out (most of them can be seen in <http://spreadsheets.google.com/pub?key=prkrB9XkkI3qy4MZ9ed4aWg&output=html>) involved the pupils in an important task of searching for information on the Internet and the use of other resources to obtain it. For example, the preparation and analysis of surveys. It also involved showing a command of specific computer tools to be able to present the results of the work through a blog that included different types of information (text, image, and audio).

All the projects to which we had access had an organizing index and the content was produced from the selection of diversified sources of information. The major problem is how to help pupils advance from cut and paste to search, record, analyze, compare, and interpret the information (Sancho et al., 2012).

In the optional subject of Digital Journalism at one of the secondary schools involved in this study, ICT was used as a means of communication that meant boosting the use of a foreign language through different resources and tools of the Web 2.0 (blogs, wikis, and videos). In principle, preparing a news item has a more creative aspect and its success depends more on what the pupil is capable of analyzing, understanding, and expressing than on repeating and copying. Specifically, to create news, the pupils learned differently; although the organization of the class followed guidelines prepared by the teaching staff, it developed in a more autonomous way of learning. Each group of students had tasks and knew the deadlines for handing in the work, and proceeded to organize it in their own way, choosing the most convenient digital resources. The teachers explained at the beginning the activity and its meaning, as well as the logistical details and timeframe. From here on, the teachers' roles changed; they served as guides, solving doubts and giving advice to the pupils, taking on the role of mentors. The pupils decided on the type of news they edited, sometimes fictional, other times real, and they posted them on the course weblog, thus creating situations for group debate:

In the classroom there were 18 pupils distributed around nine computers in a classroom-library ... We see different types of work and different groups ...

We began to draw a plan of what the pupils were doing: the blog, writing the news item, voice recording the news item, preparation of the presentation, a boy interviewing his classmates ... some writing the news, others recording it, others posting it on the blog ... Each one ... makes their own decisions ...

Two boys and a girl go around the class with a camera and a microphone ... The rest are divided into pairs and continue working with the computers. When they want, they check with their neighbors ... Beyond the content of the blogs and the news, the work we see has different rhythms..." (Class observations; Ornellas, Moltó, Guitert, & Romeu, 2012, pp. 51–52).

This is the only approach to the use of ICT that does not reproduce information, but involves selecting, analyzing, understanding, recreating, and creating, rather than repeating and applying in a routine way. For the teachers, this meant offering the pupils resources that might help them to go beyond the information (Bruner, 1973) or to think about solving specific situations, such as producing a news item or exploring a problem, as in the case of the fourth year secondary school project. In all these proposals, the different curricular elements were dealt with in an unusual way. They were activities that took place in longer school sessions, suitable for a multi-disciplinary research project, or for a special activity that involved specific groups, independent of the subjects. These are proposals that can be conceived in the pedagogical setting through inquiry-based projects with a transdisciplinary vision

of knowledge (Hernández, 2006). The use of space is also different given that the work is usually in a group, with more than one teacher in charge, and with a distribution of people and resources in line with the needs of the task.

Nevertheless, of the four ways of using ICT that emerged from this study, the first three formed the majority, i.e., those that understand the use of digital technology as *knowing how to use programs*, or those that strengthen the conception of knowledge as factual and declarative information linked to a prescriptive curriculum. Considering the revised Bloom's taxonomy (Anderson & Krathwohl, 2001) it could be said that only the fourth practice can be place on the higher levels of the cognitive process dimension (analyze, evaluate, create) and knowledge dimension (procedural, metacognitive). Therefore, there did not appear to be a wide, deep, and sustainable innovation in terms of reflection about teaching practices to promote learning thought ICT.

All these practices can be explained by the policies of ICT integration created in recent decades (analyzed below), because it seems that the notion of educational innovation that underlies all of them is more that of introducing new tools rather than new teaching practices.

The policies that explain the practices: Three successive stages

From the analysis of the decrees and documents that regulate the policies of ICT integration in the educational centers of Catalonia and the analysis of the 12 interviews with key people from the Catalan Ministry of Education, there were three successive stages in the last 25 years (see Table 2). The main characteristics of these three are explained in the following sections.

Table 2. Main policies implemented in three successive periods

Stage	Characteristics
1) The beginning (1986-1993)	Provision of equipment and teacher training courses focused on teaching office computerization. It is thought that the use of informatics is innovative in itself, without a pedagogic reflection about the improvements its use could foster.
2) Integration of ICT into the curriculum (1993-2004)	The provision of equipment continues, particularly the connection to the Internet. ICT is seen for the first time as an ally for teaching curriculum content, and there is talk of digital competence. Teacher training continues to be linked to knowledge of different programs, which, in themselves, it is thought will bring about an improvement in education.
3) From ICT to LKT (2004 to present)	Critical reflection about the previous stages, understanding that innovation involves much more than the incorporation or use of digital tools. This vision is evident in the notion of LKT (learning and knowledge technologies) to refer to the use of ICT for educational purposes. Nevertheless, a new focus that involves a reflection about teaching practices for their improvement does not have a repercussion in the way of organizing either the provision of equipment or teacher training. The latter begins rather timidly to incorporate strategies such as professional development and counselling in the workplace as opposed to training courses focused on specific tools.

The beginning

In 1986, the Informatics Educational Program (PIE) began, which was founded with the aim of introducing informatics into primary and secondary schools, representing the first integral political action of the Catalan Ministry of Education. Its priority was, on the one hand, to equip the schools with a basic computing infrastructure. On the other hand, the aim was to train teachers in the command of computer programs. However, here was no link to either the curriculum or innovative pedagogic aspects. Rather, it was a process of professional qualification for the teachers, considered necessary to ease in computer use in schools. It assumed that the instrumental knowledge of the tools would automatically produce effective pedagogic use and an accompanying improvement in teaching. It was an approach linked to the technical dimension of teaching and the teachers' role, focused on training models that aim to convert teachers into efficient users of computers, teaching them *about* technology. Therefore, courses that focused on knowledge of the technical aspects (hardware and software) were the most widespread method of training in this period (Ornellas, 2007; Sancho, Ornellas, Sánchez, Alonso, & Bosco, 2008).

At that time, one may have thought that the mere introduction of hardware and software was all that had to be done. Currently, international (both European and American) studies show that the successful implementation of ICT to improve teaching practices requires more than good technological equipment and more than training on the technical use of computers (Area, 2011; OECD, 2009; Zucker & Light, 2009). In fact, this conception of computers and education was already being questioned by several researchers in the very same period (Alonso, 1992; Bosco, 1995, 1997; Sancho, 1994; Sancho, Alonso, & Guitert, 1991); who provided evidence-based research that the mere introduction of computers and learning of computer programs, by the teachers, did not improve educational practices.

The integration of ICT into the regulatory curriculum

Around 1992, as a consequence of the passing of the LOGSE: Organic Law on the General Ordination of the Education System of Spain (Boletín Oficial del Estado [BOE], 1990), which included some references to Information Technology, the new idea was *curricular integration*. The aim was to *sow* the curriculum with elements of ICT, since the aim was no longer to *teach about technology* but to *teach with technology*. We also have to consider the landmark represented by the spread of the Internet in this decade which garnered enthusiasm regarding the potential of innovation with ICT.

The Head of the Service for Learning and Knowledge Technology (STAC) of the Catalan Ministry of Education confirmed:

...Then, we focused everything on constructivist learning, explaining, *selling* the reform, etc. Moreover, a small window opened in 1992, when the decrees of the curriculum were passed, to start then a series of contributions, so that

technologies were gradually introduced in the distinct areas of the curriculum. [...] The key ideas of this second wave are the work integration, curricular integration, or that the curriculum had to be sown with the seeds of technology. In the previous decade, above all, we concentrated on learning or teaching about technology [...], and here in the second decade it was more about learning from technology. (Interview with the Head of the Service for Learning and Knowledge Technology [STAC] of the Catalan Ministry of Education)

It is important to point out that the different policies to provide computers and infrastructure throughout these years were framed within a uniform policy, without taking into account the projects and needs of each school. This is another example of the ICT integration was not being linked to proposals of educational innovation and improvement, since schools have different needs.

In terms of teacher training, the LOGSE also introduced changes, integrating into its basic principles in-service professional development to favor the quality of teaching. The analysis of the objectives and practical realizations of teacher training in ICT shows the latency in understanding the curricular integration of ICT as an element of innovation. However, it was linked to a technological perspective of educational innovation (Ornellas, 2007). In other words, the technological artefacts again were the central axis of transformation, as if ICT were understood as an instrument that could improve, by itself, any process in which it participated. On the other hand, despite the constructivist emphasis of the educational reform, the integration of ICT in the curriculums and teacher training for its use, continued to be based on reproductive visions of the means. That is, the teacher retransmitted and executed, like a technician, the instructions and guidelines that the material used presented.

From ICT to learning and knowledge technology

In the middle of the 2000s, a stage began in which the Catalan Ministry of Education was restructured. In this restructuring process, the conception of the educational role of ICT was redefined, and therefore, also its educational policies regarding ICT use. From 2005, the policy guidelines began to introduce the concept of *Digital Competence* as an objective for the pupils. Linked to this was the appearance of a new way of looking at ICT, and there was increasingly more talk of teaching and learning *with* technologies and not *about* them.

The decree of restructuring the Department passed in 2007 (Official Journal of the Generalitat of Catalonia [DOGC], 2007) represented a major change in the conception of ICT in education. A Service for Learning and Knowledge Technology (LKT) was created; among its functions were that of creating a Directive Plan of Learning and Knowledge Technology, understood as “an instrument of definition, planning and coordination of the educational use of ICT” (DOGC, 2007, p. 53457). The commitment to this LKT Service intended to place equal emphasis on the

technical and pedagogical aspects of ICT. Some international studies (Area, 2011; OECD, 2009; Zucker & Light, 2009) indicate that the success of ICT integration depends on the teachers' knowledge of ICT use from an educational point of view.

Our interviews conducted with key figures of the Catalan Ministry of Education, demonstrated expectations and hopes in promoting a fundamental change. Overall, the 2007 decree still maintains the inertias of the predominant discourse since the creation of the PIE, mainly because in the preamble it appears that the objective is to "boost and favor the use of ICT," not the improvement in learning with ICT.

Teacher professional development also acquired a different vision in this stage. Teachers had to be trained to use ICT for change and pedagogic innovation, learning to use ICT in a manner that focused on the pupils, allowed them to solve problems, learn collaboratively, and with attention to diversity. Changes are observed in both the strategic objectives of the training and in the training modalities that begin to promote training in the actual workplace itself. Nevertheless, despite getting a glimpse of an effort to renovate, our interviews revealed that this new vision was in its early days. The inertias of more than two decades of educational policies in ICT, based almost exclusively on technical-instrumental knowledge, was maintained in the approaches of many of the courses offered, some with changes merely in name but not in content or methodology (Fullan, 2013).

In summary, the policies have focused much more on supplying technological equipment and its instrumental use than on the educational (learning) dimension of ICT. It has moved on from the notion of teaching *about* technologies to teaching *with* technologies, but without a significant pedagogical reflection about how to do it. Without knowing "how to do it" the impact in teaching and learning improvement is not relevant (OECD, 2009). These results can be extended to other regions in Spain that implemented similar policies. All regional ministries of education in Spain opted to emphasize infrastructure over educational objectives and the needs of the context. All that resulted in a messy incorporation of ICTs, without attention to the characteristics and needs of each particular educational context (Meneses, Fàbregues, Jacovkis, & Rodríguez-Gómez, 2014). These results can be applied to Europe and also beyond, as show studies conducted in Ireland (Marshall & Andersen, 2008), the Netherlands (Drent & Meelissen, 2008; Tondeur, Van Keer, Van Braak, & Valcke, 2008), Korea (Aoki, Kim, & Lee, 2013) or Gulf Cooperation Council countries (Wiseman & Anderson, 2012). Only in the cases in which a deep reflection has been made have the practices been reformulated, restructuring all the curricular elements necessary to lead to improvement. Doing so is very uncommon, because of the effort it represents.

Conclusion

The integration policies of ICT in schools in Catalonia have focused, since their beginnings, on providing equipment. This experience can be extended to Spain. In relation to the notions of change and improvement in education, the measures adopted promote the underlying idea that access to the equipment is enough in itself to transform teaching. In the same way, teacher training for the effective use of ICT has been based on an instrumental conception, in which the teachers are taught to use hardware and software, but not to think about the why, what, and how to use them in the teaching and learning process. This conceptualization runs counter to findings from local and international research.

In this way, the practices that involve the use of ICT in schools — or rather, focus on the teaching of programs sometimes even decontextualized from the regulatory curriculum, or used to reproduce information — do indeed come within the curriculum. Additionally, when these teaching practices aim to transcend the reproductive uses of the means, they require school reorganization so that they might be reduced to the minimum expression, due to not having enough support from the school and/or administration.

Also as a result of this research it was clear that, in the third stage, these integration policies started to pay a greater attention to teaching and to the needs of the schools and the teachers, but did not have a significant effect on teaching practice. Moreover, in implementing the latest programs for the integration of ICT, specifically the eduCAT 1x1 and the eduCAT 2.0 (2009–2012) and Escuela 2.0 in Spain, have not transformed the teaching practice, as different studies demonstrate (Alonso, Area, Guitert, & Romeu, 2012; Alonso, Guitert, & Romeu, 2014; Area & Sanabria, 2014).

In fact, as this research and the aforementioned studies about the implementation of the latest actions indicate, the only schools that achieve a successful incorporation in terms of improving teaching and learning, are those that rethink their methodologies and are ready to incorporate ICT in a genuinely innovative manner, without diluting pedagogy in technology (Alonso, Bosco, Corti, & Rivera, 2014; Alonso, Bosco, Corti, Rivera, & Romero, 2013). This practice, however, does not originate from the action of the administration, which continues imposing policies of infrastructure on educational policies with ICT (Alonso et al., 2012; Alonso et al., 2014), even when these policies of infrastructure are today secondary, due to the economic crisis and cutbacks in expenditure.

Thus, there is much room for revision and improvement in the mechanisms and instruments of information and relationship between the schools and the policy sphere, given that they are weak, fragmented, and not very effective. Policy-makers do not know the real needs and characteristics of the schools. Their physical presence in them is rare, so much so that despite the traditional emphasis put on equipment, notable by their absence are the lack of service and maintenance of the digital infrastructures. Neither do the schools seem to have channels to make known

their problems, ideas, and needs.

Along the same lines, it seems essential to publicize among policy makers the results of research into educational change and improvement, which show that introducing ICT into the classroom does not automatically mean educational innovation. This leads to the necessity of bringing together the researchers and practitioners to work collaboratively, along with students, in reflection-action for change and improvement. All that would ensure preparing students to be lifelong learners, having benefited from the effective pedagogical applications of ICT as part of that process, which would become a central element of educational planning in the European Union and elsewhere.

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