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Do innovation projects with ICT enhance learning? Experiences from case studies in Galician schools

Abstract

We present a study which analyzes the factors that influence the processes of change in innovation projects with ICT in schools. In the current socio-political and economic context, the demand for innovation is felt across all fields. The educational system is no exception, and schools are expected to hop on board the innovation wagon. Our research involved four cases including a pre-school, two primary schools and a secondary school in Galicia (Spain). A collaborative action research methodology was used in the usual stages: action, observation, and reflection.

The factors affecting change in schools are complex and intertwined. The present study focuses on the following three research questions: How do education administration policies affect the development of school innovation processes with ICT? What training and professional development processes are mobilized for the management and evaluation of school innovation projects? And which aspects of school organizational culture change when there are innovation processes with ICT?

The findings reveal a strong interconnection among the dimensions analyzed (socio-political context, school organization, teachers, their professional culture and their training and professional development). The difficulties and possibilities associated with each dimension as well as the way they interconnect also come to light.

Keywords

ICT in schools; Educational innovation; Teacher education; Professional development

Fördern IKT-gestützte Innovationsprojekte das Lernen? Erfahrungen aus Fallstudien an galicischen Schulen

Zusammenfassung

Diese Studie dient der Untersuchung von Faktoren, die Veränderungsprozesse in informations- und kommunikationstechnologisch gestützten Schulinnovationspro-

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jekten beeinflussen. In gegenwärtigen gesellschaftspolitischen und ökonomischen Zusammenhängen ist die Forderung nach Innovationen auf allen Feldern spürbar. Das Bildungssystem ist dabei keine Ausnahme und von Schulen wird erwartet, dass sie auf den Innovationszug aufspringen. Die Untersuchung umfasst vier Fälle in Galicien (Spanien): eine Vorschule, zwei Primarschulen sowie eine Sekundarschule. Dem methodische Ansatz der kollaborativen Handlungsforschung gemäß erfolgte die Untersuchung in den Stufen Handlung, Beobachtung und Reflexion.

Faktoren, die Veränderungen in Schulen betreffen, sind komplex und miteinander verwoben. Der Studie liegen die drei folgenden Forschungsfragen zugrunde: Wie beeinflussen Strategien der Bildungsadministration die Entwicklung von Schulinnovationsprozessen mit IKT? Welche Aus- und Weiterbildung und welche professionellen Entwicklungsprozesse werden für die Durchführung und Evaluation von Schulinnovationsprojekten bereitgestellt? Und welche Aspekte der schulischen Organisationskultur verändern sich im Zuge informations- und kommunikationstechnologisch gestützter Innovationsprozesse?

Die Befunde zeigen starke Querverbindungen zwischen den untersuchten Dimensionen auf (gesellschaftspolitischer Kontext, Schulorganisation, Lehrkräfte sowie deren Berufskultur, Aus- und Weiterbildung). Außerdem erhellen die Ergebnisse die Schwierigkeiten und Möglichkeiten, die mit den einzelnen Dimensionen verbunden sind, sowie die Art und Weisen ihrer Verknüpfung.

1.   Introduction

In this article we present a three-year study, financed by the Spanish Ministry of Education (reference SEJ2005-08656), whose main purpose was to analyze the factors that influence the processes of change in innovation projects with Information and Communication Technologies (ICT) in schools.

In the context of an information society with omnipresent ICT, educational research should contribute to analyzing ICT integration in educational spheres, the development of innovation processes, and the continual improvement of teaching quality. The incorporation of ICT into schools can represent a qualitative jump that disrupts the meaning of the school institution. If this is to occur in the not too distant future, this is due to the fact that ICT are not merely tools but that these technologies entail a new way of accessing knowledge and disseminate referents and values that do not exhaust – or at least they should not – the referents and values that make up the nature and intentions of the school system (Escudero, 1995).

Education policies often associate innovation with school integration of ICT. In fact, ICT themselves are even attributed innovative potential. However, it is often overlooked that meaning is conferred by the specific contexts in which ICT are placed.

Our study is based on the idea that the potential for change of incorporating ICT is related to the way in which it is integrated into the school's educational project. The time dedicated to reflecting on the educational possibilities is a crucial factor. Reflection at this level implies modifying school structure in terms of organization, curriculum, and methodology. Most earlier studies address the issue by focusing on only one aspect of school structure (San Martín, 1995; Fullan, 2002; Martínez-Bonafé & Adell, 2004; Sancho, 2006; Nachmias, Mioduser, & Forkosh-Baruch, 2008). Our approach emphasizes the close relation among all dimensions, and adds the inestimable weight that teacher's professional development has in educational change processes (Montero, 2007).

2. Background

Previous studies have shown that innovation processes with ICT are potentially disruptive instruments[1] that can affect the practices in force at educational institutions. The literature clearly shows that changes in school teaching and organizational practices are multi-determined and complex. Integrating ICT into schools has been shown to depend on a variety of factors such as: teachers' beliefs and theories on education, their training, education policies, school practices and organizational culture of the school itself (Hargreaves, 2003; Law, Pelgrum, & Plomp, 2008; Montero, 2007; Mumtaz, 2000; Somekh, 2008; Webb & Cox, 2004). It is relatively safe to say that the available research has shown that sustainable and supportive conditions for innovation in schools require a mixture of personal, institutional, and leadership factors.

As far as the Spanish context is concerned, the literature describes a varied landscape. There is a decentralized education system under the authority of different autonomous communities. Policies and practices have developed according to the peculiarities of each region. There are clear historical, cultural, political and economic differences among the different autonomous communities regarding the implementation and use of technologies at every education level, which the proliferation of European Union-financed initiatives has not alleviated. Autonomous communities do not have the same level of wealth nor the same infrastructure to support technological development. Policies for providing schools with hardware are dated before the Lisbon Strategy was launched by the European Union. Although these policies still continue, the research almost unanimously suggests that they have had little impact on teaching innovation (Area, 2004; San Martín, 2009).

Every autonomous government has a framework for implementing ICT into its society and schools. In the specific case of Galicia, we can point out three such

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1   The concept of disruptive technology is taken from Christensen and cited by Law (2008) referring to the analysis of the potential of technology as a catalyst for change in educational institutions.

projects from the 1990s, (Estrela, Abrente y SIEGA²) (Gewerc, 2002; Gewerc & Pernas, 1998; Gewerc & Vidal-Puga, 2002; Montero, 2007).

The Galician context has its own peculiar conditions characterized by a digital gap, an aging and dispersed population, low income level, a scarcity of services and content, precarious infrastructure, and scant training and information. The eEspaña 2007 report listed Galicia, after Extremadura, as one of the communities with lowest household access to ICT, considerably below the national average (Fundación Orange, 2008). Outside of urban areas, it is difficult to get broadband access in Galicia, and there is still no policy in sight for reducing the digital gap that is so real for those who have to bear it on a daily basis. All of this is clearly recognized by the Galician Strategic Plan for the Information Society (PEGSI 2007–2010), which recognises the need for information-society infrastructure to bridge the digital gap resulting from the unavailability of access to communication services. As a long-term objective, the plan focuses on the extension of telecommunications services, especially broadband, throughout the Galician territory.

These background conditions have made schools the target. Education policies for the provision of hardware have received a great deal of media coverage and reflect a "hope" for bridging the gap.

From the perspective of much needed educational innovation, however, this effort by the different administrations of providing equipment has generally confirmed the analysis by Cuban (1986, 2001) insofar as expecting too much from new resources (whether they be computers, interactive whiteboards, etc.) as being generators, in and of themselves, of the desired changes in schools.

Nevertheless, because of this effort, the difficulties faced by our schools in incorporating ICT into their daily educational activity are currently not so much the result of scarcity in resources or Internet access (although both may sometimes still constitute a problem) as they are the result of scarce support, school organization, the lack of genuine projects for incorporating resources, attitudes, competencies, and teacher training (Mumtaz, 2000; Montero, 2007, 2009; Voogt, 2008; Somekh, 2008).

Our research in this field has attempted to determine the processes that schools go through. We have attempted to discover what is undocumented and shed light on issues such as: the role of teachers, their beliefs, feelings and experiences when using ICT, the changes that teaching and learning activities undergo as a result of this incorporation, the changes in school management and organization, the training needs that arise, the support that is required, the people who are pivotal in the process, and whether the ways of knowing, learning and communicating are truly transformed with the incorporation of ICT into schools.

2　The *Estrela* project was started in the late 1980s to introduce computer technology into secondary education. *Abrente* is for K12; and *SIEGA* (Galician Education Information System), which addresses the Lisbon demands, started operating in 2000–2001 and involved management, training and technical support. For example, through this project teachers were provided with e-mail accounts for use in all administrative procedures.

After analyzing the results from previous research (see Montero, 2007, 2009), we clearly saw the need for placing ICT integration within a greater context of innovation that promoted a break from the dominant models of use. It was our hypothesis that when this does not occur, ICT may actually favour the reproduction of the school *grammar* (Tyack & Tobin, 1994) currently in force. Thus, we reached the conclusion that school incorporation of ICT does not represent an improvement in teaching and learning processes if it is not accompanied by a comprehensive school project addressing the necessary organizational and methodological changes. Indeed, it must be accompanied by a change in the educational model (Martínez-Bonafé & Adell, 2004; Montero, 2007; Sancho, 2006).

All of this led us to propose, between 2006 and 2009, a study delving into the possibilities and limitations of innovation in schools by analysing the design, development and consolidation of changes brought on by ICT in educational practices. We followed in the line of research focusing on the disruptive quality of technologies described by Nancy Law (2008) using the concept coined by Christensen to analyze the relation between technology and teaching practices. According to this view, technologies can act as a vehicle for change in schools, help to develop the curriculum and provide new objectives, processes and relations. Our interest focussed precisely on the processes gone through when technologies are integrated for a disruptively innovative purpose, and to identify the most limiting and/or enabling factors.

Our study builds on the tradition of research with the following characteristics: teachers are considered to be builders of their own professional knowledge, drawing from different traditions that value reflection in and on action (Schön, 1992, 1998); research on practice is seen as an educational opportunity; professional development and conquest of "adulthood" by teachers is considered valuable (Zeichner & Nofte, 2001); having an inquiry-oriented education approach (Cochran-Smith, Feiman-Nemser, & McIntyre, 2008; Cochran-Smith & Lytle, 2003; Lieberman & Miller, 2003); and belief in the specific contributions that action-research (AR) and collaborative research can make to the professional development both of teachers and the research team itself (Korthagen & Vasalos, 2005; Savoie-Zajc & Descamps-Bednarz, 2007). In consequence, teachers are here considered to be users and generators of knowledge and not merely transmitters.

Innovation is one of our key concepts. We consider it to mean an intentional proposal, from within schools themselves, woven in the midst of their community, in the hope of providing answers to the needs of a changing environment (Gather Thurler, 2004; García Gómez, 2004). We have also been inspired by inquiry as an approach to teacher education (Lieberman & Miller, 2003), as a lifelong learning attitude of innovation and collaborative work, a structural reason for continuing teacher education in "knowledge-based" societies.

The accompanying research was based on this theoretical-methodological framework. The principles that buttressed our action were the following:
• Changes cannot be solely technical but must involve school organization, its fundamental culture and its key protagonists. This principle derives from the the-

ory of change by Watzlawick, Weakland, and Fisch (1995), where it is understood to be a restructuring of the conceptual or emotional framework in which a given situation is being experienced (López Yáñez, 2005). Thus, changes in education and learning require changes in teacher conceptions, attitudes and routines (Fullan, 2002; Hargreaves, 2003).

- ICT can be a disruptive vehicle that helps school organizations find renewed social meaning and their role in the current society, in this way critically addressing the challenges posed by the knowledge economy. These tools, like the forces behind the creation of the information society, play a significant role in the change that so deeply affects content and skills (Nachmias, Mioduser, & Forkosh-Baruch, 2008).

- Innovation is an internal process, which can be aided from outside by choosing and implementing a suitable strategy and deploying the skills of advisers and internal leaders (Fullan, 2002; Gather Thurler, 2004*;* Gewerc & Pernas, 2004; Hargreaves & Fink, 2006; Marcelo, 2008; Martínez Bonafé, 2008; Montero & Gewerc, 2010).

3.   Methodological approach

The research involved four case studies with elementary and secondary schools in Galicia (Spain) that had teaching innovation projects using ICT. We used a collaborative research-action approach with the usual stages of planning, action, observation, and reflection (Avgitidou, 2009; Kemmis, 2009; Kemmis & McTaggart, 1988, 2000).

Our methodology consisted of a study of cases (Stake, 2000), which was longitudinal (in its broad procedural sense, and continuous over time), collaborative, and in the direction of sustainable innovation (Hargreaves, 2002, 2003; Hargreaves & Fink, 2006, 2008). It was collaboration between the university and the schools defined as an accompaniment on a project chosen by each school. Thus, our starting point was the work with each school on its own project: pondering, debating, contributing, and helping to identify the different work areas for each group to focus on. Innovation was considered to be whatever they defined as such. Undoubtedly, analyzing the meanings attributed to this concept was also part of the work carried out and its conceptualization underwent changes during the three years of work.

The research went through a series of phases: selection and negotiation with the schools, mutual exploration and discovery, and project reformulation. In the latter stage, we had the opportunity to work together on characteristics, conditions, difficulties, attitudes and assessments of the ICT integration processes in each of the innovation projects presented.

The case selection process was carried out in two stages: a preliminary-selection and a final selection. We were interested in finding active examples im-

mersed in the process of innovation with ICT. Initially, we used a database from an earlier study in 2003–2006 (Montero, 2007). The preliminary selection identified 20 schools that were sent a letter inviting them to participate in the study. The selection process was later limited to the six schools that answered positively. Afterwards, interviews were conducted to determine the four centers which would finally make up the study group. These four were considered to exemplarily represent the organizational structure of Spanish schools. The selection criteria were: the existence of a genuine project and an innovative use of ICT (a breakthrough in methodology that went beyond the pursuit of good practices).

The final sample included a *Centro Rural Agrupado* (CRA – Grouped Rural School), a *Centro de Educación Infantil y Primaria* (CEIP – Pre-school and elementary school center), a *Centro Público Integrado* (CPI – Integrated public school) and an *Instituto de Enseñanza Secundaria* (IES – Secondary school). All of them are located in the Autonomous Community of Galicia.

The university-school collaboration focused on accompanying the process of moving an innovation project forward, walking side by side, observing the process in a participative manner and supporting reflection on practice (classroom and online) as well as advising and intervening when requested. In this sense, the action-research brought together the clinical, recursive, participative, qualitative, and reflective aspects mentioned by Pring (2000, as cited in Latorre, 2004, p. 28).

The following research tools were used: reports on periodical meetings, in-depth interviews with key informants (principal, advisers, experienced and beginner teacher participants and non-participants), and observation of lessons with and without participating. In each case, the protocols reflected the questions posed by the study.

After selecting the schools[3], four work teams were organized. These subgroups adapted to the problems posed by each school and its workflow in a customized way such that the rhythm reflected the needs of each specific context and not the application of a standardized solution. Meetings were held bi-weekly at each school for two hours and were audio recorded. Transcripts were then analyzed to prepare a progress report that was sent back to the school for joint reflection regarding the process carried out. At this point, problems, needs, difficulties and advances were addressed and experiences were shared among the schools. The fact that reports were prepared by consensus with the teaching staff based on these meetings made it possible to share developments among all research teams, and to reach a level of detail that allowed for a meaningful analysis and reflection processes. In addition to the four research teams at each school, a fifth team was set up which included researchers and technicians funded by the project to analyze the aforementioned reports and extract specific needs as well as provide possible solutions and technical support for the innovation proposals at each school.

Every work session represented an important learning space with reflection as its foundation. One of the first areas of resistance we encountered was precisely

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3   See http://stellae.usc.es/pietic.

this: the professional culture of the teaching staff was somewhat at odds with reflection, which was sometimes considered by teachers to be a waste of time or an issue that is only concerned with university. Moreover, the professional socialization of teachers does not provide time and space for analysis and their labour conditions. Together with the scarcity of pedagogical support for teachers, this can hinder the critical analysis of beliefs and practices (Hernández & Sancho, 2001; Montero, 2007; OECD, 2009).

After analyzing this resistance, including resistance from university researchers, a joint routine developed allowing the participating cultures (university and teaching staff from the participating schools) to find common ground and balance for the benefit of the work being carried out. Meetings were also used to provide counselling, technical support, and training in the use of technology (e.g. better use of CMS, simulation software like Squeak, webquest design, using a PLE (Personal Learning Enviroment)). Meetings were also an opportunity to reflect on the practice of teachers and researchers as well as to make adjustments in the study procedure.

After collecting all this data, an interpretative content analysis was carried out (Tesch, 1990; Glaser, 1978, 2002). We used an inductive analysis method applying the conceptual saturation principle to generate dimensions and categories. The following ones were identified:
- Socio-political context (national and regional education policies);
- School organization (school culture, atmosphere, communication, distribution of time and space, teaching and learning concepts, micro-politics, attitudes regarding conflict); as well as
- Teachers, their professional culture (educational and professional beliefs, attitude towards ICT, student perceptions), and their training and professional development.

This group of dimensions and categories represented the basis for each case study report. A cross-sectional analysis of the four cases was carried out to determine the common and unique aspects. Within this frame of reference, our research questions were posed in the following way:
- How do education administration policies affect the development of school innovation processes with ICT?
- What training and professional development processes are mobilized for the management and evaluation of school innovation projects?
- What aspects of school organizational culture change when there are innovation processes with ICT?

We will now go on to present evidence obtained from the support process at each school, as well as general research conclusions.

4. Results

Despite the fact that the aim of our study was not to compare the processes at each school, we detected some similarities and differences that should be pointed out. One of the similarities relates to the influence of education policies on practices, which refers back to the first research question we posed. Although each school interprets policy on the basis of their own organization, all schools are affected by it (Montero & Gewerc, 2010; Tondeur, Van Keer, van Braak, & Valcke, 2008).

The innovation projects we worked on at each school clearly affected the professional culture, beliefs and attitudes of the teaching staff as well as the "grammar" of the school (Tyack & Tobin, 1994). We will now describe one of the innovation projects carried out at a participating school which clearly shows the close ties between organizational conditions and teachers' professional culture.

5. Innovation: From policy to educational practices

From the outset of the study, we perceived that policies being applied in the Autonomous Community of Galicia were creating some confusion among participating teachers. Thus, we saw the need to analyze them in depth as something that, far from contextual or external,[4] seeps into the walls of schools and helps to consolidate a way of thinking, doing and feeling about change processes.

That is why we say that the economic, social and political context is not only a frame of reference but also a text that marks the limits of what is possible and desirable, and helps to determine the life of schools by channelling educational practices.

Nowadays, in education as in other fields, the need for innovation is often mentioned in initiatives spawning from public institutions. We might even say that the imperative to innovate, yet another indicator of the knowledge economy, is itself being attributed value, beyond the actual changes or improvement that may be spurred. There is a demand for constant change, as if movement itself promoted improvement, defined as a gradual adaptation to conditions imposed by the market economy. As Ball (2007) expresses magnificently, never before have the political discourse and education regulations been so full of words such as improvement, transformation, reform, excellence and innovation, based on modernization or the demand for innovation in schools.

How was this reflected in our experience during the research process?

For example, in recent years, education policy relating to the integration of ICT in schools has used contests and awards as a way to complement hardware

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4   Some authors also call them "non-manipulative" or exogenous factors, which are always interrelated with endogenous or specific factors of the school and teaching staff itself (Drent & Meelissen, 2008). In our view, the external-internal division is not so clear, therefore, we proposed to analyze how policies are experienced by teachers and schools as well as how policies regulate educational practices.

resources. Institutions that hope to be recognized must submit a project that "proves" a concrete innovation or an example of "good practices". If they are selected, the prize usually consists of cutting edge hardware resources. In general, this material does not represent an actual need for the school; instead it is desired for its "novelty" and responds to what schools today "must have", as is the case of interactive whiteboards. Only after these tools enter schools one starts thinking about their potential use and the technical training they require.

The calls for these contests and awards refer to the need for innovation as a response to social demands, suggesting an idea of "novelty" and improvement in teaching practice. This political discourse compels schools to rethink themselves by promoting concrete actions bearing the name "innovation" and school are "forced" to participate in order to be considered in such a way.

Therefore, schools have been witness to an epidemic of projects: for libraries, the integration of immigrants, gender equality, environment, drug prevention, cohabitation and, shall we also say, ICT (not usually listed alongside the others). At the beginning of the 2007–2008 academic year, to address a specific demand by the education administration, we witnessed how the teaching staff became anxious over the need to "submit" projects, many of which were mere formalities elaborated by a few people and sometimes without any prior reflection on what an innovation proposal should mean. And this was translated into a kind of frantic activity with a variety of actions, which were sometimes disconnected. Furthermore, the teaching staff often felt stretched by the demands of the projects in which they were participating, having no time to plan rationally or to reflect on their own practice.

Thus, the school is seen as "obligated" to participate and become part of the new narrative on the value of innovation and change. Innovation and its various packages (massive shipment of certain resources, technological tools as awards, etc.), constitute a methodology to rethink schools and also for schools to rethink themselves. In a certain sense, one learns a way of *being* that is recognized by evaluators, in the hopes that the school "fits in" with the values that are supported, as suggested by Ball (2007).

Nevertheless, we have seen that individual schools, more than the administration, have sufficient skills to resolve their problems through innovation and institutional change. Even so, failing to participate in the demands made by the administration comes at a high cost. Many teachers get involved in proposals, without expecting support (material and symbolic) from official sources. This represents a fight against the tide involving too much personal effort which is very short lived from the standpoint of innovation sustainability (Fullan & Stiegelbauer, 2000).

On the other hand, when one dances to the rhythm of the administration, support translates into more equipment – not including, however, the maintenance and technical support needed for keeping up the equipment. Thus we can see the attention deficiencies and contradictions of the education administration. Teachers perceive that the education administration is insensitive to their demands. They denounce a lack of support and that they are given what was not requested or con-

sidered to be a priority. This is one of the limitations that the majority of researchers point out as a conditioning factor for ICT integration into schools (Cox, 2008; Mumtaz, 2000; Somekh, 2006, 2008; Webb & Cox, 2004). It is not a simple issue, and it is limiting many innovative forces in addition to frustrating teachers.

It could be said that proposals stemming from the education policies of the autonomous administration are inconsistent and reveal a technical and superficial view of change. They indicate a bureaucratic view of the administration that provides the same treatment and solutions to users in diverse contexts. The education administration is also conveying a view that innovation is equivalent to the artefact being utilized, and is helping to shape a way of appropriating technology as though its mere presence was enough to transform the context of teaching and learning activities.

6. Teachers: From projects to practices

As we have already mentioned, policies present innovation as a set of materials and resources. This is, perhaps, the most visible aspect of change and the easiest to apply in a merely literal sense. Therefore, one of teachers' most deeply rooted beliefs regarding innovation with ICT may be reinforced by the administration. The aim of our research was to "accompany" the participating school along a journey involving reflection on what is done, the usual ways of proceeding in the classroom, and the changes involved in using a computer tool.

However, changes in the didactic approach or in the way of using new materials are more difficult when new skills and new ways of conducting teaching activities are required. Changes in beliefs are very complex: they put into question individuals' fundamental values regarding the objectives of education (Hermans, Tondeur, van Braak, & Valcke, 2008). Moreover, these beliefs are often not explicit nor the object of discussion, but they are rather buried deep at the level of presupposition. That is why we cannot disregard the subjective aspect of change; that is, the emotions that coexist with proposals, either supporting them or slowing them down.

It is also important to recognize that in order for changes to represent an improvement, they have to be grounded in practice, and this is defined within the cultural meshwork of the organization. A change based on this underlying philosophy in ICT could represent a catalyst but it cannot be merely the sum of individual changes, or a solitary event in the school. Change is a process involving the organization as a whole and each one of its members has to learn new ways of thinking and acting (Fullan, 2002). Nothing changes if the organization's processes of construction and interpretation are not altered. The organization is a cultural artefact, not simply a structure and, therefore, the most invisible and determinant dimensions in the life of a school are the result of how people build and configure organizations. With this in mind, it is not a question of doing new things just because they are new, but rather it is a commitment to change through an understanding

and consensus on philosophy and goals. There must be a clear commitment to new ways of understanding and working within the school. As Larry Cuban asserts, "in order for fundamental changes to occur in teaching and learning, we must have an overall reform in the organizational, political, social and technological contexts of schools" (Cuban, 2001, p. 195).

As we can see, the problems surrounding innovation processes with ICT in schools are highly complex, because a variety of elements are interconnected.

To address this issue, we have selected one example of innovation out of the cases studied in our research: the design and implementation of a school's institutional portal. This gives us an opportunity to demonstrate the interplay between the different dimensions involved.

7. From school website to institutional portal

The transformation of a school website into an institutional portal was one of the projects we worked with, specifically at the CRA (Grouped Rural School).

The elaboration of a portal as the virtual space where the school could be visualized was seen as a need after analyzing the possibilities and implications of transforming the school's static website into a dynamic space where the responsibility for updating content would be shared and distributed.

Given the peculiar organizational circumstances of a CRA – isolated unitary schools which are integrated and communicate amongst each other – the possibility of a space for exchanging information and observing the daily routine was appealing to the group of teachers involved in the task.

Previously, the school website was managed by a single teacher who took on all of the responsibility; in contrast, the use of a CMS would make it possible to share the responsibility. It was clear from the outset that having only one person assigned to the task would severely limit the amount of content incorporated, because of the amount of time required and high demands that this work represents in this type of school setting.

The starting point was similar for most of the institutions. As mentioned previously, the education administration plays a limited role in the development of projects. In this particular case, it provided a server for the websites of the schools under its authority, but offered no resources for design or maintenance. It is up to the teaching staff to do this job, and in most cases done by one colleague with the skills, knowledge, and initiative to do so.

From the organizational point of view, this situation has sometimes generated micro-policy issues, because decisions are not made by consensus. A clear division is produced between computer illiterates and the initiated ones, who can expect to keep control from a position of power. They offer everything to the school, but without implicating the rest of the teaching staff.

In contrast, our proposal of designing a portal was presented as a collective effort. At all times it was understood that the virtual space had to reflect the complexity of the CRA's organizational structure. The intention was for this space to be an open window to the teaching community that implicated the group of schools and the families belonging to the educational community. A space for sharing what is done in the intimacy of the classroom with colleagues and students; a place where processes can be transparent while at the same time serving as a channel for information and communication. This was the basic need felt at an institution made up of schools scattered in a rural area of Galicia.

The decisions taken throughout the project pointed in this direction. We would like to highlight the following issues:

- Every school has a space for its own news, and if the news is important it goes to the home page. This has made the portal more dynamic and has made the activities at each school more transparent. Some schools produce a lot of news and others do not.
- Students can write their views on activities carried out in the school, or make comments in the portal, as part of their class work. This is possible when there are few students in each classroom. In any case, decisions are taken in assembly to write or to reply to a comment (regarding news or comments from other schools). It is done jointly and is part of pre-school and elementary school reading/writing activities.
- Parent participation is also made possible and encouraged. Through the portal, they can see what activities their children are doing and make comments. Currently, work is in progress to provide parents with their own space within the portal for communication, presenting ideas, news, and so on.

In short, for the participating teachers the portal has been a way of opening the classroom to the community. In addition, this has meant a path of reflection on practice itself because it has had to be rethought in order to be narrated, registering the daily work through images or diaries and, by adding it to the website, also assuming the risk of comments. It was a truly enriching process of intense professional development, both for the participating teachers and the collaborating team of university researchers.

We are interested in highlighting this experience, because it is an example of a different way for schools to appropriate technology. Generally, it is assumed that integrating ICT into schools exclusively involves classroom work, and institutional spaces are left out. Our study identified specific aspects of organization and micropolicy that are in play when a collective activity projects the school outward. The fears of being revealed, or feeling exposed to outside comments are the product of opening the school up to the community. Previously, this had been neither so clear nor so visible. These issues denote the school culture and its modification by new environments that "force" established communication structures to change. If organizational culture is understood to be a set of code that a number of people can decipher because they share the same habitat (López Yáñez, 2005), this new space

forces modalities to be rethought and can stir up some of those old codes to build new meanings.

The portal belongs to the school as a whole and becomes a common space. It is another school space to be visited by different members of the educational community or from outside. Becoming aware of this also requires rethinking the place afforded to virtual spaces in institutions, as real places that make it possible to do things, instead of entities that are "uploaded" and where the initiated ones take possession of. It involves appropriating technology in a critically creative way and enabling communication with an awareness of the environment, establishing new relationships and expressions that show the school's identity as an educational organization.

8. Discussion

As has been reflected throughout this text, the issue of innovation in schools involves many dimensions: political, institutional and personal considerations. Innovation is the magic word, invoked constantly and in most cases referring to the demands of the knowledge economy. From the theoretical perspective of our research, it cannot be said that everything done with ICT is innovative. More than once, we have come upon proposals that tended to repeat routine activities with new devices, in the vein of what Perkins (1995) called the "finger tip" effect. However, we have learned that technologies are not innocent. Insofar as they are re-mediating educational practices (Crook, 1998), some aspects are being modified by their use. Perhaps these are small changes that go unnoticeable at first view, but they cannot be overlooked. If we reflect on them together with teachers, we may be able to move forward towards deeper changes, or even towards a paradigm shift as is suggested by Nachmias, Mioduser, and Forkosh-Baruch (2008). A fine line separates change from non-change. Often it is better crossed not by completely severing it, but rather with small scratches to weaken it.

Attempting to capture and analyze innovation processes with ICT that take place in schools has been a very ambitious research project and this manuscript can hardly hope to go into all the details of the findings, nor delve into each of its aspects. Our intention has simply been to show some brushstrokes of the picture.

By entering schools, sharing the teaching staff's daily routine, their worries and discoveries, living the quotidian urgency that is not always appreciated, we have been able to observe the limitations and possibilities of innovation processes with ICT from a very different perspective to that we have when reading other research with a lower level of involvement.

To mention and summarize some of the limitations and possibilities we found in the processes of disruptive use of ICT, firstly, we must refer to education policies themselves. We concur with Somekh (2008), who indicates that the greatest difficulty lies in that politicians have not yet understood the importance of innovation

processes. From the analyses conducted to date, we conclude that there must be a structural problem that disorients the teaching staff, "traps" them and alienates them from their work. This lack of understanding is apparent in policies that range from an implicit undervaluing of teachers to a technical vision of their occupation. Schools and teachers are faced with a dilemma between their traditional role as keepers of cultural traits and the demands for innovation made by the knowledge society. The lack of clear policies and an overly technical focus generate apprehension in the midst of an avalanche of demands and a great amount of "new" information to be processed (technical handling, new contents, a new student-centred educational concept, etc.) ICT are being used as a political instrument for the innovation discourse, but appropriate measures are not being implemented (systematic and continuing education; organizing school schedules in accordance with ICT use; relevant contents for education in the knowledge society, continuity of teachers at the same school, etc.).

Therefore, ICT use is adapted to the current school culture, contents and teaching methodology.

In this respect, we agree with many other researchers that list the following elements as inhibitors: lack of experience with ICT; little on-site technical support; lack of specialists teachers in schools, absence of administrative support; organizational change; lack of access time and need for financial support; preconceptions regarding ICT and their relation to knowledge; and prevailing views on education. (Cox, 2008; Law et al., 2008; Mumtaz, 2000; Somekh, 2006, 2008; Webb & Cox, 2004).

The innovation projects carried out in the research provide examples of a different possibility. During this time, the teaching staff has had the university research team as a travel companion and has enjoyed the benefit of such things as advice and technical support on problems that arise, updates and adaptation and specifically designed software. Undoubtedly, this has had an influence on basic conditions, and thus, our main concern has been the sustainability of the proposals especially to prepare for when the researchers are no longer at the participating schools. Therefore, we have focused on cultural rather that technical changes. In a sense, this provides only relative stability, because cultures are in flux and dependant on emerging needs and problems. The main concern has been to delve deeper into the mechanisms that introduce reflection into the teaching framework. This is because we understand reflection to mean a technology that becomes a strength amidst the avalanche of changes that are thrust upon us. We would like to emphasize that at each of the institutions where research was carried out we came upon charismatic individuals, positive leaders of change, professionals eager for career development and to learn. And this has been one of the most evident potentialities in the process.

Other aspects stand out as clear obstacles to using ICT as a disruptive instrument. The most significant are related to teachers' beliefs that transcend what goes on in the classroom; that is, teachers' beliefs regarding ICT and their value for the

educational process; their concept of knowledge and the curriculum; and their concept of teaching itself.

Elements such as the fear of losing control of students and activities involving too much memorization limit the potential of these new tools for changing daily classroom routine.

Have ICT improved learning during this process? Work with teachers fostered the professional development of all those involved. From that perspective, there has undoubtedly been a considerable enrichment. Moreover, the learning experience in the classroom has benefited, for example, by introducing the communication dimension in the example described earlier. It is not easy to give a conclusive answer to the question, because improvements are difficult to perceive in the short term. What we are sure of is that introducing ICT into the experience, through reflection, questioning and analysis has "upset" the ready-made proposals, forcing them to be re-thought and pointing the way towards a new way of teaching and learning.

The theoretical-methodological approach chosen has required all researchers (whether university researcher or school teacher) to continually analyze their role in the context of the schools.

The experience brought together two types of researchers to collaboratively study school reality and significant problem areas: one group was from the university and the other from the schools themselves. These two groups represent different cultures, working atmospheres and backgrounds. Working together has represented a continual theoretical-practical clash and a shock to deep-rooted identity issues leading to a rethinking of "traditional" roles for researchers and teachers. This cannot be solely theoretical because they involve beliefs, assumptions, emotions and images that imply an identity transformation process. The study was conceived with "us" as a goal, and that generated a clash of cultures with occasional tension. All those involved in this study, whether university researchers or school teachers, have had to rethink their practice. Thus, we agree with Kemmis (2009, p. 463) in that "action research changes people's practices, their understandings of their practices, and the conditions under which they practice. It changes people's patterns of meta-practice: a practice that changes other practices. It transforms the sayings, doings and relating that compose those other practices".

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