RESEARCH PROJECT

"The Inclusion of ICT in Initial Teacher Training"

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⬊ Executive Summary

The ICT in initial teacher training research project was carried out through the collaboration between Fundación Evolución and the Organization of American States (OAS).

This investigation involved the study of the incorporation of Information and Communication Technologies (ICT) in the initial teacher training standards of two countries – one from Latin America and the other from the Caribbean region. To that effect, the two case studies selected were Argentina and Guyana. This selection was based on the following criteria: a) the existence of a defined and explicit ICT policy in initial teacher training, b) the presence of a wide array of institutions showing evidence of articulation in the initiatives and the defined ICT policies, c) the possibility of completing all stages of this research project in due time and manner, and d) the level of interest of those selected to participate in the investigation, e) the absence of prior research and publications on the subject in these countries, f) the need for qualitative research on ICT and initial teacher training in the region.

The objective of this research was to describe the priorities and definition of policies related to the inclusion of ICT in initial teacher training, based on following the identification of stages, aims and guidelines. Additionally, the progress of implementing ICT policies at the institutional level was examined. Given this purpose, we analyzed official documents, specialized literature and websites of government departments and carried out in-depth interviews with key officials holding political and technical responsibility in the educational system. As part of the field work in both countries, we visited various educational institutions and the Ministries of Education of Argentina and Guyana.

After the reviewing the historical background of the process of ICT incorporation in the educational systems of both countries, this publication will then cover the main results of the challenge of ICT inclusion in teacher education in Argentina and Guyana.

Key words:
State, ICT inclusion policies, teacher training institutions, ICT, teachers, teaching practices, initial training.

List of abbreviations

ANSES	Administración Nacional de Seguridad Social (Social Security National Administration)
CAIE	Centro de Actualización e Innovación Educativa (Professional Development and Innovation Center)
CPCE	Cyrill Potter College of Education
FE	Fundación Evolución
IIEP	International Institute of Educational Planning
INFD	Instituto Nacional de Formación Docente (National Institute for Teacher Education)
ISFD	Instituto Superior de Formación Docente (Teacher Training Institute)
ISFDyT	Instituto Superior de Formación Docente y Técnica (Teacher Training and Technical Institute)
NCERD	National Centre for Education Resource Development
OAS	Organization of American States
OEI	Organización de Estados Iberoamericanos (Organization of Ibero-American States)
NGO	Non-governmental organizations
CIP	Conectar Igualdad Program
REDAL	Redes Escolares de América Latina (Latin-American School Networks)
ICT	Information and Communication Technologies
UG	University of Guyana

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1. Introduction

We decided to center our research on policies concerning the incorporation of ICT into college teacher training based on case studies of countries written under the context of promoting ICT integration policies, programs and extension projects in educational systems. Argentina and Guyana were selected as study cases. This research was made possible thanks to the collaboration between the Organization of American States (OAS) and Fundación Evolución (FE), an Argentine non-profit organization that promotes ICT pedagogical integration in educational environments.

The purpose of this study was to illustrate the priorities and definitions of ICT integration in the education/curriculum of teacher-training colleges by identifying the goals, lines of work and characterization of teaching and learning practices promoted by ICT integration. To that effect, we analyzed the macro-level of politics and the institutional micro-level, where the elements of politics come into play.

The increasing level of inclusion of ICT in educational systems suggests a future set of challenges regarding teacher training due to its rhythm and intensity. This holds true both for future and practicing teachers as well. Equal or greater challenges will face teacher trainers, many of them already possessing a wealth of experience in teacher education. Their responsibility as teacher trainers makes them reflect on how the pedagogical and didactic use of ICT is adaptable to the context in which future teachers will have to work.

Despite the existence of literature published and experiences recounted from different parts of the world that could provide a starting point to reflect on teacher training with ICT, there still exists a set of problems remaining to be solved in the ICT implementation process. This requires us to revise the theoretical assumptions on which they are based, and articulate devices to facilitate and promote the inclusion of technologies into class activities. Both initial training and professional development in pedagogical ICT integration constitute opportunities to reflect on the educational process and commit to the improvement of school performance, equity and social inclusion.

In the current Argentine educational system, initiatives focused on incorporating ICT into teaching training and professional development. These efforts were accelerated by a presidential decree (Decree N° 459/2010) related to the social inclusion program Conec-

tar Igualdad,1 which supplied and delivered portable electronic devices (netbooks) to all students from state secondary schools, special education schools, and teacher training institutes. Three million netbooks had been delivered by October 2011.[2]

In the Guyanese educational system, the incorporation of ICT into teaching training faces challenges stemming from the quantity of unqualified teachers at schools and regional differences in internal system performance due to the diversity of educational opportunities. Infrastructure and connectivity problems seem to exacerbate such regional differences.

This report is organized into the following sections. Firstly, we present the theoretical aspects of the main cultural, social and economic features of the global society. The second section contains a brief description of the current trends of ICT incorporation into the educational systems in the region. We believe that these trends influence the forms in which national policies have devised the incorporation of ICT in teaching training. The third section makes reference to teachers and the potential pedagogical challenges resulting from the ICT school incorporation. These sections provide a framework under which the case studies may be analyzed. Subsequently, there is a section for each one of the analyzed cases. It should be pointed out that the Argentine case is more developed due to its accessibility and available knowledge. In the Guyanese case, efforts to expand the study have been limited since the topic of ICT in teacher training is new to the country and access to information is more difficult.

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1 The implementation of Model 1-1 is promoted by this program to ensure fairer, more equal and more democratic access to technologies to bridge the digital divide and promote social and digital inclusion of all citizens. Conectar Igualdad website available at www.conectarigualdad.gob.ar/ (Accessed: 30/01/12).

2 See Informe de Avance en Tiempo Real (Progress Report in Real Time). Available at: www.conectarigualdad.gob.ar (Accessed: 30/01/12).

2. Theoretical aspects

2.1. Information and Communication Technologies (ICT)

Beginning at the end of the twentieth century and early twenty-first century, the expansion of Information and Communication Technologies (ICT) has contributed to irreversible changes in lifestyle and personal experiences. Furthermore, this technological revolution encourages the globalization of the economy and communications as well as the digitalization of culture (Palamidessi, 2006).

Analysts in the field of culture and specialists in social sciences have created different denominations to refer to the most relevant cultural traits in the modern world: information society, knowledge society, global village, information age, network society, etc. These terms aim to explain, understand and convey the idea of change (rapid, extensive), transformation, exchanges, networks, and interdependence.

In many ways, we are experiencing a slow revolution fueled by the impact of new technologies on the economy, politics, society and culture. These technologies are profoundly transforming the way of wealth production, social interaction, identity, knowledge production and circulation.3 Living conditions, knowledge production and learning processes acquire a new meaning under this technological revolution (Castells, 2004). In this society, ICT has expanded at an unprecedented speed. The personal computer has become a natural devise in every household, bringing about changes in everyday culture and relationships. Young people use technology as digital natives, while adults, given their status as "digital immigrants", develop a different kind of relationship with technology. (Prensky, 2001; Piscitelli, 2009 cited in Dussel y Quevedo, 2010).

2.2. The incorporation of ICT in educational systems

3 As Lev Manovich says, referring to the changes brought about by digitalization, "(...) there is a widespread and global awareness today of the importance of this revolution, but there is still a need for an overall reading of their codes, procedures and audience reception modes that can see beyond the specifics of each new media and allow us to understand the logic of these new media in the present" (from Dussel, I. and Quevedo, LA, 2010).

The scenario described above impacts the ways that the educational process is organized, analyzed and articulated. Educational systems and schools are facing a huge challenge. With the availability and growth of knowledge production, the school is no longer the privileged institution that allows new generations to have contact with information from around the world (Palamidessi, 2006). Furthermore, there is a challenge with integrating school education for a big number of individuals with new digital natives, who are acquires such skills through their early technological socialization.

These challenges threaten educational systems, schools and the role of teachers. Nevertheless, school continues to be the place where young children are warmly received and taught values and useful life skills for their professional development. In light of these changes, it is necessary to revise the conceptual and methodological dimensions of the educational process, or in other words: what to teach and how to teach it (Carriego y Carriego, 2010).

It is important to identify the meaning given to public policies for the incorporation of ICT in educational systems. As pointed out by several studies (Galarza, 2006), a significant number of European countries, the United States, East Asian countries, Latin America and the Caribbean are making significant investments in the development of policies for the introduction of ICT in educational systems. If we focus on the countries of the Latin America and Caribbean region in particular, we will see that these policies have had different scopes and approaches to implementation and involved different actors, but in all cases the efforts of countries to invest in ICT is evident. In this region, international organizations[4] and international financial institutions[5] have played an important role in the development of agendas and the funding of specific projects related to ICT. Another point worth mentioning is the influential role of NGOs, foundations and companies in the sector as part of their business strategies.

Around 1990, computers broke into Latin American classrooms and immediately brought two primary questions to public attention: what to do with them in schools, what to focus initial and continuing teacher training on and how, and in what way to integrate them into educational systems.

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[4] UNESCO, UNESCO, the International Bureau of Education, IIEP - Paris, OECD have played a strategic role in promoting incorporation of ICT policies.

[5] Mainly the World Bank (WB) and the Inter-American Development Bank (IDB).

Recent ECLAC[6] research shows the existence of different levels of ICT integration in Latin American educational systems. This study presents a typology to analyze the situation in each of the studied countries, taking into account the presence or absence of formal specific and non-specific policies of ICT inclusion. It is worth mentioning that all the countries analyzed have some kind of ICT integration initiative in the initial teacher training. Detailed below are the typologies and countries that present these types of ICT inclusion in initial teacher training.

The countries that have formal specific ICT inclusion policies in initial teacher training are Argentina, Brazil, Panama and Uruguay.

Following this study characterization, Chile[7], Colombia and Mexico are the countries that have formal policies which explicitly mention ICT integration in initial teacher training.

Costa Rica, Nicaragua, Peru, Dominican Republic and Venezuela lack formal specific ICT integration policies in initial teacher training, but have informal initiatives or guidelines.

Finally, El Salvador and Guatemala are among the countries that lack ICT integration policies in initial teacher training but are currently developing strategies towards their design.

A quick look at the region shows a set of existing initiatives that are enabling the collection of experience and knowledge on ICT incorporation in educational systems. Some programs include: Ceibal Plan (Uruguay), Enlaces (*Links*) (Chile), Huascarán Project (Peru), Programa Computadoras para Educar (*Computers to Educate Program*) (Colombia), Programa integral Conéctate (*Connect Comprehensive Program*) (El Salvador), Escuelas del Futuro (*Schools of the Future*) (Guatemala), Nuclei of Educational Technology (Brazil), Programa de Informática Educativa (*Educational Technology Program*) (Costa Rica) and Plan de Inclusión Digital Educativa (*Digital Education Inclusion Plan*) and Conectar Igualdad (*Connect Equality*) (Argentina). In the Caribbean region, some initiatives that have promoted ICT incorporation in the countries of the area include: eConnect and Learn (or eCAL) Project (Trinidad and Tobago), EduTech Program (Barbados), I.T. Project (Dominica), e-Learning Jamaica Project and National ICT Strategy, E-Powering Jamaica (Jamaica). These programs and projects demonstrate the existence of policies aimed to accompany technological transformations, incorporate them to schools and orientate

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[6] Brun, Mario (2011) Las tecnologías de la comunicación y las comunicaciones en la formación inicial docente de América Latina. Serie: Políticas Sociales Nº 172. ECLAC.

[7] Chile was, at the time of preparing the report of ECLAC, in the process of developing a strategy for ICT in initial teacher training. (Brun, 2011).

them in a certain direction. At the same time, there are several initiatives in this region concerning network learning among schools. The Latin-American School Networks Project (REDAL) precisely offers information on networks that take advantage of ICT to promote communication and exchange among schools. Some projects worth highlighting include Red Telar (*Telar Network*) (Argentina), Enlaces (*Links*) (Chile), World Links (World Bank), Red Telemática Educativa (*Educational Telematic Network*) (Costa Rica) and Red Escolar (*School Network*) (Mexico).[8]

The implementation of these projects entails the design of policies that have, as core components, investment in technological equipment and connectivity, specific learning software, teacher training and professional development.

At an educational system level, several analysts stress the inappropriateness of the modern institutional frameworks in providing an immediate answer to the challenges associated with new technologies. This assertion remains despite the fact that the school is recognized as a strategic institution in the implementation plan of ICT, where the process of knowledge transmission can be concentrated. Given the rapid spread of ICT and their adoption by society, it can be hypothesized that educational institutions are being left behind as the market continues to create a new reality.

There still is uncertainty regarding the form in which technology should be progressively being incorporated into schools. The present situation would indicate an increase in the presence of ICT in schools in the short term. Available studies demonstrate differing views on the benefits of ICT in schools. Those that are optimistic and enthusiastic place value on the potential of ICT to provide content and offer training devices, enable exchange networking, promote collaborative work, improve motivation, and many other benefits. These views highlight the fact that ICT and networks help people obtain new knowledge, develop new teaching methods and stimulate multicultural communication between students and teachers in different countries. Other views are more pessimistic about the effect that ICT have on teaching, and warn about the relation between how they are used and presented in schools and their actual effect on learning. Palamidessi (2006) points out that "some authors believe that commercial reasons still take priority over pedagogical arguments (Gros Salvat, 2000 cited in Palamidessi, 2006), while others warn about the limits and risks entailed by the search of technological solutions to social and pedagogical problems (Armstrong & Casement, 2001, cited in Palamidessi, 2006:24). Each of these views and opinions will have to be examined and tested through

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[8] See Redes Escolares de América Latina (REDAL) `s website. Available at: http://www.redal.net (Accessed: 30/01/2012).

investigations and knowledge production that address the relation between ICT and their pedagogical use in different contexts.

2.3. Pedagogical challenges of ICT inclusion

Once digital inclusion is granted, we share Dussel and Quevedo´s (2010) concern about the pedagogical challenges caused by ICT introduction into schools and teacher training institutions. This is true not only with regards to space and time but also knowledge organization and classroom authority relations.

Teachers and their use of technological resources in the teaching and learning processes are indicators to be considered in the analysis of progress of ICT school incorporation (the ways in which ICT are being incorporated into the curriculum, the effective use of ICT in the teaching process, etc.) (Sunkel, 2006)

The organizational structure that schools were funded upon had a specific structure of time, space and tasks based on a classification of knowledge into disciplines. This will have to be adapted to the lines of reasoning created by student use of computers in times and spaces beyond the classroom and under very different rationales from the school experience offered by the traditional model currently used. Flexibility, new uses of time and new spaces will give way to a new school model.

In this regard, it is fundamental to reflect on the role of the school in ICT incorporation, the different shapes it will take, the necessary transformations of knowledge organization, time and space, administrator leadership, teacher needs in reference to current work conditions and their interpersonal relationships are merely a few aspects to consider upon analyzing the impact of ICT on the school environment. Likewise, from the curricular point of view, content related to ICT use that is produced and circulated is not the exclusive responsibility of the experts in charge of defining curricular standards. Producers and consumers share the authorship of an endless amount of content available in global archives.

Manso et al. (2011) point out that recent studies suggest that for a technology integration initiative to be successful in schools and other educational environments, it must be clearly connected with teaching goals beyond the use of ICT and with a deep educational meaning

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(Haukins, Spielvogel & Panush, 1996; Light, Manso, Rizzi, 2006; cited in Manso et al., 2011).

An IIEP UNESCO Buenos Aires report (2006) argues that determining the appropriate goal for teachers in the pedagogical inclusion of technological resources is one of the most difficult tasks.[9] In this sense, it is said that "(...) using ICT in the best way to support, extend and deepen the teaching process, is definitely the most difficult aspect in teacher professional development, and it requires ways of professional development well beyond attending a course (...)" (IIEP, 2006). According to this organization, studies show that, at a global level, teachers display a considerable lack of training and a need for professional development to overcome this deficit. This holds true even in countries with a long tradition of ICT integration. According to the report, the situation of teachers in Latin America seems to be the most disadvantageous:

"In the Latin American area, the IIEP-Buenos Aires research coordinated by Emilio Tenti Fanfani, gathers information about Argentina, Brazil, Peru and Uruguay. More than half teacher households in Argentina (52.1%), Brazil (49.1%) and Uruguay (56.3%) have a computer and a quarter of Peruvian teachers (24.0%) have one (Tenti, 2005). This report shows that teachers still have a long way to go in regards to the availability of ICT basic equipment and their most frequent use as productivity and cultural reproduction tools. Regarding electronic mail, less than one third of teachers use it daily or at least every fifteen days. Most teachers never use this communication tool. In Argentina, for example, almost three quarters of them never use e-mail. In Argentina, secondary school teachers are the least included group; in the rest of the countries, on the other hand, this situation is more common among elementary school teachers. In all countries private school teachers have advantages over public school teachers. Logically, socioeconomic level also strongly influences the use of this communication tool. Regarding the Internet, most teachers in the analyzed countries never use it (Argentina 71.5%, Brazil 54.8%, Peru 54.9% and Uruguay 58.2%). Lastly, participation in discussion groups through e-mail lists is not a usual practice among south American teachers." (IIEP, 2006)

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[9] Following Lugo and Kelly (2011): "In Latin America, the trend indicates that the policies for the integration of ICT in schools tend to have the following four models: the laboratory or computer room, school networks, computers in the classroom and model called "one laptop per child". Note that these models generally coexist, there are no pure or permanent cases.
The laboratory or computer room: One of the most common ways to have technology in schools. It consists of a space/room available for any teacher to use with their students and make them work with some software or digital content, usually in groups of 2 or 3 students per computer. School Networks: They promote the use of Internet as the basis for exchange and cooperation among the participating schools, and the use of the network to expand the horizons of teachers' and students' research and knowledge. Computers in the classroom: In this model, teachers organize some activities based on individual or group work supported by digital resources and content. In recent years, these models of ICT in the classroom have been complemented with projectors showing the teacher's computer screen and interactive whiteboards. This allows teachers to enrich their explanations to the class with multimedia resources. It is also remarkable the presence of initiatives including the pedagogical use of mobile phones. In recent years, progress has been made in various countries or regions, to one to one models, where each student works with their own device, inside or outside the classroom, connected to the network wirelessly."

In reference to the incorporation of ICT in school, the aforementioned IIEP report indicates that professional development content has changed in response to the teaching skills that had to be developed in recent years, ranging from computer literacy to the pedagogical use of ICT.[10] In the Caribbean region, the document published by the UNESCO Institute for Statistics (2012), *ICT in Education in Latin America and the Caribbean: A regional analysis of ICT integration and e-readiness*[11] points out that most Caribbean countries have electricity in their primary and secondary schools, which allows for connection to the Internet. According to the publication, Bahamas, Barbados, Saint Kitts and Nevis, and Saint Lucia have 100% connectivity in their primary and secondary schools. Nevertheless, we should highlight the fact that only 21% of secondary schools in Suriname are equipped with internet capacity. On the other hand, Barbados, Saint Kitts and Nevis, and Saint Lucia report that 100% of their primary and secondary schools have broadband connection, while Saint Vincent and the Grenadines and Dominica have a combination of schools with broadband connection and others with lower-quality connections (narrowband).

Regarding teacher training, we can mention:

"In general, the proportion of teachers with ICT teaching skills is quite low compared to the real proportion of teachers that teach basic computer skills (...) 10% of primary and secondary school teachers in 14 of the 27 countries are qualified to teach basic computer skills. In some countries this is only natural and can reflect national goals, including Suriname and Grenada, where the ICT integration level is very low."

Accordingly, to evaluate the progress in ICT integration into teaching, it is important to consider the TPACK Framework (Technological Pedagogical Content Knowledge) devised by Punya Mishra and Matthew Koehler (2006). This is a useful tool to analyze both the pedagogical challenge of ICT inclusion and teacher professional development. As Manso et al. (2011) point out, these two authors believe that an adequate use of technology in teaching requires the development of a complex and contextualized knowledge which they call "technological-pedagogical-content knowledge" (TPACK by its acronym). This knowledge stresses the need to develop a conceptual framework to standardize the language used to describe different ICT integration experiences, in order to change the conceptualization and teacher training and practice in relation to technology integration.

This conceptual framework considers some of the essential qualities of the knowledge that teachers need in order to be able to integrate technology into their teaching practices

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[10] They are not mutually exclusive options. The skills to be developed on the pedagogical use of ICT are related to the possibility of intervening in the redesign and adaptation of the curriculum, coach, monitor and develop digital materials, develop a vision of what ICT in education should be and cooperate with colleagues to achieve it.

[11] UNESCO; Institute for Statistics (2012). http://www.uis.unesco.org/Communication/Documents/ict-regional-survey-lac-2012.pdf

in a consistent manner while bearing in mind the complex, multi-faceted, dynamic and contextualized nature of this knowledge. The TPACK Framework not only identifies three different forms of knowledge - content, pedagogical and technological, - but also empha-sizes new ones that intersect.[12]

According to this framework, true technology integration requires understanding and managing the interrelations of these three forms of knowledge, A teacher with the capac-ity to manage these relationships possessed a skill set different from that of an expert exclusively in one field, whether that be disciplines, technology, or pedagogy. According to Manso et al. (2011):
"Integrating technology to teaching a disciplinary content therefore requires the develop-ment of a sensitivity that considers the dynamic and transactional relationship among the three components and also the school context and the classrooms."

It is important to mention that, based on the studies analyzed (Villegas-Reimers, 2003; Marcelo, 2009; IIEP, 2006; Manso et al., 2011; Lugo and Kelly, 2010), every professional development attempt aimed at having a deep impact on the teacher educational model of modifying teaching practices should take into account that these practices occur in an institutional environment that affects them. Therefore, it will be necessary to consider the school as a unit of change.

After a review of the discussions on the scope of changes in the teaching and learning process introduced by new technologies, Dussel (2011) describes some teacher views on ICT and points out that, to some educators, digital tools provide more and better teaching resources that enable a closer control over students, especially if they are online, using programs that allow detailed monitoring. According to them, the use of technology should be considered in the same sense as other school materials, such as books, notebooks and binders. From their point of view, change is seen as a motivating factor, while improvement is thought of as what is being done and not as a radical transformation. For other educa-tors, this does not mean a change in shape or degree, but rather a reorganization of what we understand as knowledge, sources, true criteria and of who is considered a creator of knowledge. Educators that uphold this position say that we are facing a time of change and

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[12] As explained by Manso et al. (2011): "In considering the intersection between pedagogy and discipline, we develop a particular knowledge that according to Lee Shulman (1986) may be called "pedagogical content knowledge" and refers to the knowledge that every teacher uses to teach a particular disciplinary content. Similarly, at the intersection of technological knowledge and discipline, you find the "technological content knowledge", which covers all the ways that technology limits or facilitates the representation, explanation and demonstration of the concepts and methods of each discipline. At the third intersection lies the "technological pedagogical knowledge", centered on an understanding of the characteristics and potential of the many available technologies used in teaching and learning contexts. Conversely, it also refers to the ways in which teaching and learning are modified when a particular technology is used. Finally, the intersection of the three types of knowledge is labeled as the "technological pedagogical content knowledge"-."

teaching must be reorganized while taking into account new features of knowledge production, like hypertextuality, interactivity, connectivity and community (Martín- Barbero, 2006 cited in Dussel, 2011). Although these positions represent opposite views, and reality will show temperate versions of each of them, it will be necessary to take them into account to analyze the complexity of the problem of ICT pedagogical incorporation in school contexts.

2.4. The impact of ICT on teacher practice

Institutionalized teaching established an asymmetric relationship between those that possess knowledge – or are able to access to knowledge - and can transmit it, and others that do not possess that knowledge and want or need to acquire it. This dynamic has been one of the pillars on which teacher power and authority was established. Teachers transmit certain knowledge that students cannot access because of age factors and a lack of availability in the immediate local community (Landau, 2006).

In the present historical context, this asymmetry has diminished. One of the reasons for this is due to the discrepancy in access and use of technology between teachers and students. Most practicing teacher biographies lack records of or teaching and learning experiences with ICT. In contrast, most students have been born and raised in computer-mediated environments, which has allowed them to acquire some knowledge that teachers do not have or at least can not obtain with the ease shown by young students. However, this phenomenon cannot be generalized to include all young people. As statistics show, many students are deprived from access to ICT due to economic, social and cultural reasons.

The school system is not the only environment where knowledge is transmitted. There are other places where information and values are passed on to new generations. At the same time, society demands a bigger and more diversified body of knowledge from younger generations. These demands fall under the responsibility of teachers and schools. This is the present dilemma of the teaching profession. It is a scenario where expectations are too high and collect too fast to be met in every particular context.

Devising pedagogical and creative use of ICT in the school context requires that teachers invest a lot of time and dedication. Access is limited for pedagogical-based readings that present reflections on the working conditions of teachers under the multiple demands that

the incorporation of ICT places on them in their daily work. ICT integration implies the addition of several new tasks to habitual teacher work. Frequently, it involves the acquisition of new knowledge and the revision of disciplinary structures. Given this scarcity, teachers need time for the design and reflection on their teaching practices, so that new activities can be integrated into the school curriculum. (Landau, 2006:80).

ICT integration in schools implies, both on organizational and curricular grounds, deep cultural and pedagogical changes to,the conceptions of teachers and administrators. That is why teacher working conditions will have to be considered by those who define educational policies of ICT incorporation. Considering both conditions and contexts will provide an overview of the possibilities and difficulties that this incorporation may bring to schools.

2.5.   ICT and the challenges to teacher training

Changes introduced to the educational system undoubtedly involve a set of challenges to initial teacher training, teacher professional development in general, and in-service training in particular. Concerns seem to focus on the following questions: "What does a teacher need to know about ICT?", "What should the institutional conditions be –organizational, material, and symbolic - to guarantee their appropriation and pedagogical use?" The answers are neither simple nor easily available and require redefining not only academic training and teacher professional development, but also teacher working conditions. The new set of definitions of knowledge and demands of the working environment must be contextualized in terms of the "new working conditions" that involve both the appropriation of ICT with pedagogical and didactic goals and their creative and productive use by teachers.

In Argentina, the challenges are even greater if we consider that the Conectar Igualdad Program (CIP) has distributed computers to students from teacher training institutes. The presence of computers in teacher training institutes and their specific responsibility in the education of the future teachers of the country forced the various levels of authorities (national, jurisdictional and institutional) to design teaching and institutional strategies to cater for teacher training in ICT. Guyana faces the disadvantage of having unqualified teachers in classrooms, which implies another challenge of adequately preparing teachers during their formation to educate. Nevertheless, technology currently facilitates the achievement of this goal.

In general, teacher training and professional development policies are more decentralized and diversified primarily because they often require a smaller amount of initial investment than equipment and connectivity do. Many programs have been carried out by national and provincial governments, educational portals, NGOs, partnerships with private companies, publishers, universities and training centers, or schools and groups of teachers involved in teacher training in ICT13. These initiatives have been varied and included in-person and virtual courses and hybrid forms as well.

Some authors (Dussel & Quevedo, 2010) consider that in Argentina there is no national ICT training plan, even when the National Education Law (2006) includes ICT as compulsory school content, and there are some training programs at national and provincial levels.

As described in the following section, the Argentine National Institute for Teacher Education (INFD) has included among its "Recomendaciones para la elaboración de Diseños Curriculares" ("Recommendations for the development of curriculum designs") (2008:131) the incorporation of new technologies and audiovisual literacy. It has also helped jurisdictions implement new initial and practicing teacher training programs. All the new initial teacher training course plans include one or more subjects specifically related to ICT studies.

3. The Argentina case

3.1. Introduction

The Argentine experience was selected under the following criteria: a) the existence of a defined and explicit ICT policy in initial teacher training, b) the presence of a wide array of institutions showing evidence of articulation in the initiatives and the defined ICT policies, c) the possibility of completing all stages of this research project in due time and manner, and d) the level of interest of the country in participating in the investigation, e) the absence

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[13] A study on "Non-governmental organizations (NGOs) working in the field of ICT with Argentine public schools" conducted a survey of ICT past or current projects carried out by NGOs. It found over 3000 registered organizations, identified 94 projects conducted by 39 organizations. See: Pini, M. (coord.) (2011): "Organizaciones no gubernamentales (ONG) que trabajan en el ámbito de las TIC con escuelas públicas argentinas", Universidad Nacional de San Martín. Escuela de Humanidades. Centro de Estudios Interdisciplinarios en Educación, Cultura y Sociedad

of prior research and publications on the subject in these countries, and f) the need for qualitative research on ICT and initial teacher training in the region.

Teachers in Argentina graduate from non-university tertiary level teacher training institutes and public and private universities. This research focuses on the policies for the incorporation of ICT into teacher training encouraged by the National Institute for Teacher Education (INFD) that depends on the National Ministry of Education. Since its creation in 2007 (LEN N° 26.206), the INFD has set the political priorities for the incorporation of ICT into teacher training in the National Teacher Training Plan (Resolution CFE N° 23/07). It should be noted that, considering the federal nature of the Argentine educational system, the INFD designs policies and sets orientations and recommendations that are later analyzed in new contexts and adapted by the different jurisdictions in charge of non-university tertiary level teacher training institutions.

Within this framework, this research work is focused on the national policies for the incorporation of ICT set by the INFD and, at an institutional level, on the guidelines set by a Teacher Training and Technical Institute from the province of Buenos Aires. We revised information collected from interviews, official documentation and official institution websites: Ministry of Education, National Institute for Teacher Education (INFD), Conectar Igualdad Program (CIP), and the Organization of Ibero-American States

After analyzing and documenting all the information collected, we were able to identify two stages or moments in the definition of policies for ICT incorporation into Argentine teacher training. The first stage can be traced back to 2007-2010, when the first actions towards ICT incorporation were defined and implemented. The second stage, from 2011 onwards, is characterized by the pace and drive that the Conectar Igualdad Program stamped on the policies for ICT incorporation into teacher training. The distribution of netbooks in Teacher Training Institutes (ISFD) all over the country made it necessary to design and articulate pedagogical and didactic teacher training proposals so that teachers and students could use these computers in class in the most optimal manner possible. The first stage describes the initiatives and actions that gradually created the conditions so that the ISFD could raise awareness on work culture with ICT. The second stage focuses on the pedagogical articulation of ICT in classrooms based on the collected experience. In this sense, the description of each stage includes the main initiatives of the policies for ICT incorporation into initial teacher training.

3.2. The inclusion of ICT in initial teacher training. First Stage: 2007-2010

Before the creation of the Conectar Igualdad Program, the National Institute for Teacher Training (INFD) designed and implemented a set of actions as part of their strategy to incorporate ICT into ISFDs. The different actions began in 2007. In that same year, the Virtual National Network of Teacher Training Institutes was created. It was based on a national platform shared by all the state-run institutes. To support and promote its use, facilitator training courses were provided and Revista Digital (Digital Magazine) was created[14].

The INFD official documents explicitly outline the principles for ICT incorporation into teacher training. According to those principles, "Higher Education currently receives students who have grown up in an environment marked by the advance of digital culture and communications, but the classic model –that in which their own teachers were in turn trained once- is still predominant in the formation of these future teachers." (In: http://www.me.gov.ar/infod/rednacional). This reality became a challenging starting point.

Regarding teacher educators, *"ICT integration will be a process that will require adaptations, adjustments, and, in some cases, progress and setbacks. We must be aware that teachers in teacher training institutes have a culture and meaning of their profession that has changed significantly over the years. Sometimes, encouraging a teacher to participate in the institute virtual network, will be hard work"* (In: www.me.gov.ar/infod/documentos/facilitadores).

Another troubling aspect, which is one that ICT might help to solve, is related to the individual characteristics of the teaching profession. In this sense, it is argued that *"teachers´ isolation –probably fostered by the school organization, both in its architectural aspect and the distribution of teaching periods- has its advantages and drawbacks. It can benefit individual creativity, but it is an obstacle for collaborative work, which is one of the most remarkable and positive features of networking."* (In: www.me.gov.ar/infod/documentos/facilitadores).

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[14] A magazine for the educational community that addresses the challenges of education in contemporary society. Covers experiences, achievements and debates about higher education.

As described below, this stage had the purpose of creating optimal conditions –material and symbolic- for ICT integration into institutional work culture in teacher training colleges. For this very reason, the focus was on supplying the necessary resources and connectivity and providing teachers and administrators with basic digital literacy. The accomplishments achieved in this stage would set the conditions for challenges in future stages.

3.2.1. The incorporation of ICT into curriculum designs[15]

One of the first questions to be analyzed with respect to the ICT incorporation policies set forth by the INFD is connected to the guidelines that jurisdictions should follow in defining the new curriculum designs for initial teacher training. The INFD document, "Recomendaciones para la elaboración de diseños curriculares" ("Recommendations for the development of curriculum designs") (2008) presents the basic guidelines to help jurisdictions in defining teacher training policies.

After describing our present society as a "knowledge-based society", the document adopts a wide-scope understanding of ICT that integrates both kinds of technologies -new and older- and is reinforced by the advances that affect daily life, such as mobile phones, TV, and additional audiovisual resources and media that enhance teaching.

Coincidentally, a series of interrelated phenomena is described to highlight the importance of including technological education into initial teacher training. An example of this could be the technological socialization of new generations. "The kind of relationship that children and young people have with technology today is quite different from the link that adults have with it. The way people approach ICT in the Internet age is described in terms of what Mark Prensky (2001) has labeled digital "natives" and "immigrants." (Recomendaciones, 2008: 131).

The importance of "developing basic abilities and skills for using computers and networks as tools to enhance teaching and learning" is stressed. The fact that these "skills are acquired mainly in everyday practice" is emphasized.

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[15] As reported in the INFD website "Students, teachers and principals of teacher training institutes across the country participated in the national evaluation of the curricula for initial and primary level teacher training. The assessment called "Mejores docentes para escuelas mejores" ("Better teachers for better schools" began in mid-2011 and its data systematization stage was launched in November. Results are expected to be ready by mid-year.

Regarding curriculum definitions, it is pointed out that "this does not mean that courses that deal with operative aspects should be avoided." Nevertheless, the notion that "they should be based on a student needs assessment and they should not constitute an end in themselves" is also highlighted. The document also declares that "in terms of decision making, organization regarding students` free access to devices and environments is more important than developing instrumental courses." Since young people are able to solve ICT instrumental aspects by themselves through their own technological socialization process, it is then important to develop courses that go beyond these issues.

The document states that "(...) it will be necessary to work on the development of skills connected to communication aspects –which exceeds the mere technical aspect- to give way to the development of cognitive and social abilities and skills. This has to do with the creation of conceptual and critical frameworks that allow future teachers to analyze the implications of the use of ICT in teaching and learning."

Regarding curriculum guidelines related to knowledge fields or areas, the document points out that "given the complexity of the phenomenon, the curriculum offers possibilities that can be translated into the different academic areas. At a curriculum level, ICT find their best resolution in their cross curricular aspect respect of the other disciplines."

In this sense, ICT in teacher initial training curriculum should have an impact on:

a. General training: providing a framework in relation to the new knowledge society phenomenon and its influence on daily life at school, approaching the construction of social networks with technological tools. In a complementary sense, it implies revising learning theories and teaching approaches.

b. Specific training: linking instrumental knowledge with specific knowledge in each learning area.

c. Professional practice training: giving future teachers the tools that will allow them to develop teaching strategies based on ICT. Collaborative work as a teaching and learning approach is another essential aspect, as well as the development of tools that enable process monitoring.

Finally, the document mentions the existence of at least three levels for the design of ICT inclusion proposals within the curriculum.

1. One related to the digital literacy processes, focused on the development of procedural or instrumental skills.

2. One connected to the educational use of ICT for the improvement of the teaching and learning process, and ICT strategies that can be implemented to enhance teaching and learning.

3. One related to critical reflection on the implications of ICT in the present context and the everyday life of individuals and educational institutions. This implies providing students with a framework for critical analysis that allows them to develop their own criteria for the use of ICT, and produce or participate in ICT projects according to those criteria, while adding research and analysis practices to teaching.

The recommendations suggest that jurisdictional curriculum designs adhere to the classification and revise the meaning of their inclusion within the global learning context.

The document strongly advises that the following technological curricular options for initial teacher training be adopted by jurisdictions subject to the curriculum decisions made:

- Developing a specific curricular unit of technological education within the framework of specific training. Given the nature of the content, a workshop or seminar would be the most adequate formats.
- Articulating technological education content with Science (Natural and Social).
- Frame technological content in the curricular units developed for ICT as a thematic background.

On the basis of this set of recommendations, Higher Education administrations from the 24 jurisdictions of Argentina prepared curriculum guidelines for the inclusion of ICT into initial teacher training curriculum designs. Authorities in the INFD emphasize that "*every province included subjects about ICT in their curriculum designs. Each province devised its own solution.*" At present, the 24 jurisdictions have new curriculum designs that include ICT. Therefore, it can be concluded that the INFD ensured the inclusion of ICT into initial teacher training.

3.2.2. Equipment and connectivity

The purpose of the first stage executed in 2007 was to purchase technological equipment and distribute it to Teacher Training Institutes. Computers were installed in computer labs or rooms that were opened in ISFDs. Every institution was allotted a number of computers according to its total student enrollment. The purchase and distribution process was conducted by the INFDs.

As the individual responsible for the ICT department said, "*From the INFD, Teacher Training Institutes were advised to place computers in teacher rooms or libraries and not in locked rooms. That way we made sure students would be able to use them. We even planned for a college network so institutions could collaborate with each other. Each ISFD would have a node and a website.*"

Simultaneously, a service to create platforms for the Teacher Training Institutes was acquired so that each institution had their own node to secure a virtual platform service. The INFD provided the provinces with resources to pay for the Internet servers and solve problems related to connectivity.

From 2007 to now, important progress has been made in connecting institutions located in isolated regions or that experience bad internet provision service. According to the authorities, at present "*there are no institutions without internet connection.*" This initiative was implemented almost simultaneously in all Teacher Training Institutes.

As described in further detail below, the creation of a special environment at Teacher Training Institutes for the use of and practice with technological tools allowed teachers, students and administrators to gain experience and attempt a gradual incorporation of ICT into institutional life.

The equipment plan states that "the incorporation of equipment to the Teacher Training Institutes will require training programs that ensure the professional, pedagogical and administrative use of ICT." For this purpose, the INFD proposed several lines of action:

- Computer equipment supply to Teacher Training Institutes. Over 15,000 computers, laser and inkjet printers and other supplies have been distributed to the 24 jurisdictions of the country.
- Creation and implementation of a Virtual National Node Network to connect all the Teacher Training Institutes in the country.

The teacher training ICT team of the INFD provided training and support to the Teacher Training Institutes to put up their own nodes. Once this stage was completed (see description below), the team started to work on a more pedagogical line given the need to "*promote an update in the disciplinary contents and their didactic approaches and the application of new technologies in the teaching and learning process*," as established by the National Teacher Training Plan.

3.2.3.   ICT facilitators or counselors[16] [17]

Useful strategy to introduce ICT into schools was the creation of the ICT counselor profile (*facilitador TIC*). This figure also exists in other countries (the Hungarian mentor, the Brazilian multiplier teacher, the British ICT counselor), and their function is to "train teachers to be able to plan for the incorporation of the new technologies and work as school technical support." Research states that it is very important to have a technology coordinator at schools to assume responsibility of technological support and provide advice to help integrate ICT into teaching (Gyuk, 2001). (IIEP, 2006: 39)

As part of the political guidelines drawn by the INFD, once connectivity was established and the equipment was delivered to the Teacher Training Institutes, the presence of an ICT facilitator or counselor became necessary. The candidates for the role of facilitator were from Teacher Training Institutes. They were appointed to that position by the authorities of each institution. Facilitators are college teachers whose tasks are sometimes partially transferred to their facilitator role and in other cases, they assume those tasks voluntarily.

The INFD created that figure as a strategy for the incorporation of ICT at an institutional scale (at the Teacher Training Institutes) and to have an intermediary with whom to establish direct contact. According to the recommendations issued by the INFD, ICT facilitators have to come from ISFDs (thus avoiding hiring external staff) and they must be familiar

[16] The ICT facilitator is a new actor in the education system, who is not necessarily a computer or educational technology professional. They can be teachers who have specialized formally or informally in the use of ICT for educational purposes, and is a key player in the development and sustainability of ICT school projects. A series of attitudinal characteristics are also relevant: autonomy, creativity, leadership, commitment to lifelong learning and interest in the new technology development. In: Lugo, T (2009): La integración de las TIC en el sistema educativo de la Provincia de Córdoba. Un estado de situación. Ministerio de Educación. Provincia de Córdoba.

[17] The INFD has published on its website a document entitled "Facilitadores TIC" (ICT Facilitators) Cuaderno TIC, N° 3. This section takes up ideas from this document.

with ICT. Nevertheless, they do not necessarily have to be technology teachers. The objective was that the selected staff did not have the exclusive use of ICT so that all work with technology did not become their single responsibility. *"The presence in institutions of the role of ICT counselor or facilitator does not invalidate or limit the importance of training all teachers and students"* (cf. Recomendaciones, 2009:135).

The ICT facilitator should then be an enthusiastic proactive teacher, not necessarily specialized in technology, but interested in innovation through the use of the multiple resources that ICT can offer to Higher Education. They might be teachers, computer lab assistants, administrative staff or even a graduate or undergraduate student from the same institution. (In: www.me.gov.ar/infod/documentos/facilitadores).

The INFD authorities say that *"(…) we did not want to hire a computer technician for the role of facilitator. We reject the idea that they be the same people doing tech support. We wanted teachers from any subject field, no matter what their previous training was, but that were active ICT users. We discussed this idea a lot. Our argument was that tech support is efficient but do not involve themselves in teaching."*

Once selected and trained for the facilitator task, they should take on a dynamic role, and become promoters, collaborators, leaders in the use and teaching application of ICT, inviting other teachers to incorporate them gradually and helping them to overcome the obstacles that may arise.

The person in charge of the ICT department at the INFD expresses that in initial stages training focused on *"the knowledge gaps teachers had in technical issues so they would feel safer. Later we incorporated some pedagogical material about virtual classes, discussion forums, etc."* At the beginning, training consisted in getting facilitators to learn the use and function of the platform provided by the INFD: how to administer it, what kind of content to upload, how to build the institutional image for each Teacher Training Institute through their webpage. Later they explored other issues like setting up a virtual class, producing and managing resources. According to a facilitator teacher we interviewed, *"(…) based on the training we got, we were first expected to create each Teacher Training Institute node."*

The ICT Facilitator central node (INFD) was in charge of the training course on technical issues. This node became the virtual environment where ICT teams from all the country had the chance to continue their training, clear doubts, share experiences, suggest improvements, etc. At the same time, the use of the platform to exchange resources among facilitators from all over the country was promoted from this node.

According to authorities in the INFD *"Between 2007 and 2009 about nine thousand facilitator teachers were trained in the virtual classrooms. Thanks to this, when the Conectar Igualdad Program started, these teachers were already expert ICT users."* They added *"(...) in time we turned from basic to more specific courses. Always virtual educational offerings. In order to finish and pass the facilitator course, candidates must be able to design an institutional website and a virtual campus. Some teachers did it easily and –unfortunately- others could not."*

In short, the facilitator duties covered a wide scope, such as:

- maintaining and managing their own institutional node, including the website, virtual campus and blog.
- promoting among teachers the technical skills necessary for the use of ICT, and the value and meaning of communication and sharing.
- solving specific queries from teachers and staff members.
- promoting collective work for the gradual integration of all institution members to the National Network.
- establishing relationships with other institutes that belong to the Virtual Network

The ICT facilitator is supposed to modify some historical characteristics of teacher work such as individual work. According to the definition of their duties, they should *"create links among colleagues to allow them to migrate from an isolated work model to a more open and participative one, stimulating cooperation and offering alternatives for a convenient and timely use of virtual networks."*
The director of the ICT department at the INFD states that from the beginning they planned for a gradual introduction of technologies into Teacher Training Institutes with the aim of getting to the classroom. Accordingly, she says *"(...) we maintain that teaching has to change, that teachers must use technology in their classrooms, because the access to knowledge has changed. So they must be offered an environment with these characteristics, where students can produce, write. ICT support and make visible skills that we want to improve."* The next challenge was to produce training courses to articulate ICT with disciplinary content knowledge. ICT facilitators played a key role at this stage.

In short, the creation of the facilitator role in each Teacher Training Institute was devised as a strategy to gradually create a work culture with ICT and make it possible so that teachers of technology-related subjects and those that could use them as tools to enhance their teaching had the necessary support and guidance.

3.2.4. The INFD Network

The Virtual National Node Network of Teacher Training Institutes connects all the state-run ISFDs in the country. It consists of a group of Internet tools (website, campus and blog) intended to enable communication among institute staff members, institutes and their communities. (See http://portales.educacion.gov.ar/infd/).

Each Teacher Training Institute has its own node in the Network, with a website, virtual campus and blog. These modular components were designed to be integrated into the existing structures of those Teacher Training Institutes that may have developed them previously. The network enables contact among members of the school community in each institution, and is expected to overcome the relative isolation of the institutes from each other. The network is complete with other centralized nodes that include each Higher Education Department from the different jurisdictions in the country.

Each college campus[18] has innumerable spaces that are commonly called virtual classrooms. These spaces can be used as classrooms to develop subject courses, teacher room, administrative office, virtual library or student meeting place.

In summary, the network is intended to enable communication among institute staff members, institutes themselves and between them, their communities, the Higher Education Departments and the central National Institute for Teacher Education node. It was created as the space for building an ICT mediated learning environment, as well as providing a meeting place and communication forum to share innovative experiences among all Teacher Training Institutes.

As stated in the INFD documentation, teachers from state-run institutions all over the country can use these virtual classrooms (http://conectarigualdad.infd.edu.ar) for the following purposes:

- Sending individual or group messages, attaching files (and a tool to check if the recipient opened them and when).
- Publishing material, not only text-based documents (class notes, work guidelines,

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[18] "Campuses are places for communication and transfer of experiences that bring together people from across the country. They function as training and exchange devices where specific virtual actions organized by the INFD are performed. They are, therefore, safe environments where users are identified by a name and a password. These data are provided by the INFD when the activity begins." See: http://portales.educacion.gov.ar/infd/
http://mapa.infd.edu.ar/
They run on the virtual platform e-ducativa. http://www.e-ducativa.com/

digitalized material, practical work instructions) but also images, videos, multimedia presentations, animations, sounds, websites, dynamic or interactive diagrams.

- Using a calendar to record important dates/deadlines, making announcements on courses available to all interested inidividuals and uploading grades with comments available exclusively to each student.
- Starting discussion forums. Potential scenarios include a forum to clear doubts regarding practical work where the answers remain visible to all, a discussion forum where students can continually make queries about the bibliography, write comments and edit texts. Every intervention remains available for reading or printing at any time.
- In the section called "Classes", users can type and format text, add colors and images, insert links to websites and compulsory or optional reading documents. These classes can remain available during the whole semester or year, in an ordered and easy-to-follow sequence.
- A space for collaborative document writing in small groups. This is the section called Wiki.

The person in charge of the ICT area in the INFD holds that the original idea of creating the network was not merely limited to exchanges among Teacher Training Institutes but also between these institutions and the INFD regarding the body of initiatives, programs and projects they promote. It was also conceived as *"(...) an exchange space for the investigation area, the novice teacher project, the student space. Discussions are monitored from the National Institute for Teacher Education."*

According to information from the webpage updated Oct. 2011, there are 717 state-run Teacher Training Institutes connected to the network, 21,526 virtual classrooms supporting institutional activities, 141,515 people enrolled in the classrooms and 4,853,851 registered and guest user logons to virtual classrooms.

In brief, the first stage devoted to the incorporation of ICT into teacher training put all efforts and resources into a variety of initiatives, the most remarkable of which are: a) monitoring the incorporation of ICT into teacher curriculum design guidelines, b) assuring equipment and connectivity ISFDs all over the country, c) creating the role of ICT facilitator and training them for the task, and d) building the Virtual National Node Network to connect Teacher Training Institutes across the country. These initiatives enabled the integration of ICT at an institutional level, and promoted the purchase of technological resources as a fundamental component to implement them at the classroom level.

3.3.   The inclusion of ICT in initial teacher training Second Stage: 2011

The second stage focuses on the use of ICT for pedagogical and educational purposes. Following the delivery of computers to ISFD students through the CIP (Conectar Igualdad Program), the challenge of creating educational and pedagogical strategies connected to the incorporation of ICT multiplied. The ICT team that belongs to the National Institute for Teacher Education warns about the need to *"promote an update in disciplinary contents and didactics and the application of new technologies in the teaching and learning process,"* as established by the National Teacher Training Plan. The plan states that "the incorporation of equipment to the Teacher Training Institutes will require training programs that ensure the professional, pedagogical and administrative use of ICT." (Federal Council of Education Resolution Nº23/07 - National Teacher Training Plan 2007-2010).

The individual responsible for the ICT department at the INFD recalls that they started to work on the incorporation of ICT together with disciplinary content knowledge. She S added that *"when the Conectar Igualdad Program started we had some experience about ICT connected to teaching and not only to the expert command of ICT, but to what teaching demanded from ICT."*

In reference to this point, authorities in the INFD assert that the presence of one computer per student rules at Teacher Training Institute classrooms poses several challenges to teaching training. This includes the need to discuss changes in the organization of the classroom and, consequently, in class management. For this, we must urge the need to articulate pedagogical and educational proposals with ICT, since students who are training to become teachers will in all likelihood practice and work as teachers in a one-on-one context .

Since the implementation of the CIP, a central node has been created in the INFD with the name Conectar Igualdad. This node concentrates the educational offer of ICT in education and different disciplines, the 1-to-1 model (one computer per student, per teacher, per school), for ISFD teachers. In this space there are courses, seminars, online classes and discussion forums for Higher Education teachers and students from all over the country.

INFD Authorities explain that *"when the Conectar Igualdad Program started, we had some experience with ICT in connection to teaching and not only to the expert command of ICT, but to what teaching demanded from ICT."* Nevertheless, they believe that the CIP poses several new challenges to teacher training. In this sense, they argue that *"(...) the one to one model represents different organizational and classroom management models. It is a model*

that breaks with present class dynamics and although we do not think that everything must be taught with netbooks, their presence requires a different teaching sequence."

At this stage, teachers trained as "ICT facilitators" turned into tutors. For this job, they receive financial contributions to help teachers integrate ICT and carry out tutorial sessions in the virtual classrooms. They take part in a continuing teacher training program. Authorities in the INFD estimate that *"(...) from the Higher Education level we were able to provide trained tutors. From the 2000 facilitators selected at this stage, 80 were Conectar Igualdad tutors."*

Creation of the role of CIP jurisdictional counselor

The establishment of the CIP jurisdictional counselor in teacher training aims to ensure policy implementation at the regional, provincial and local levels. The role of this position is to serve as a bridge between the Higher Education Department (jurisdictional level), the National Institute for Teacher Education (national level) and the Teacher Training Institutes (institutional level). In 2011, the CIP gained an accelerated pace of implementation in teacher training as in the rest of the educational system levels. This produced a number of needs, problems and challenges at the jurisdictional and institutional levels.

During the second stage, each province appointed two program counselors in order to establish links between Higher Education and INFD authorities in relation to teacher training initiatives connected to the CIP. The provinces of Córdoba, Santa Fe and Buenos Aires have been designated a larger number of program counselors primarily due to the number of Teacher Training Institutes they have and their territorial dispersion, The exact number of counselors for each province vary in each case. The CIP counselors are also Higher Education teachers.

3.3.1. Disciplinary Seminars with ICT

This section describes in greater detail how these seminars were designed and articulated with a line of work linked to research.

Included in the actions aimed at enhancing the incorporation of ICT into teaching, the INFD issued documents related to eight subject areas: Mathematics, Physics, Biology, Language and Literature, History, Geography and Foreign Languages. According to authorities in the National Institute for Teacher Education, this task was led by disciplinary specialists. To that effect, the starting point was defining *knowledge cores* of these different disciplines that future secondary school teachers were expected to know. These documents had to address the question "What knowledge do students have to acquire on a certain discipline?" Additionally, evaluation indicators were defined to outline what students were expected to learn. Based on the central knowledge cores related to each discipline, work on ICT incorporation began.

Teachers from the ISFDs that participated in the seminars were instructed to design content sequences for classroom implementation based on these knowledge cores. The participants were arranged to plan them in teams with others from the same institution with expertise in the same discipline. At the National Institute for Teacher Education, trainers worked on the analysis for the implementation of that teaching sequence.

The seminar registration requirement was to be a practicing teacher with a solid foundation of knowledge in his or her discipline. The invitation to the disciplinary seminars is open. The seminars are coordinated by area specialists, who were responsible for the creation of each disciplinary document with ICT.

The person responsible for this area at the INFD pointed out that *"(...) the focus is not originally on ICT but on disciplines. The 10-module course is based on a core content or concept. ICT is integrated into the disciplinary content with the creation didactic units."*
As the authorities at the National Institute for Teacher Education state *"(...) this is the first time the institute has carried out disciplinary training with ICT addressed to college teachers who train secondary school educators. These seminars started this year in 2011."*

An example of disciplinary seminars carried out in 2011 is the Mathematics seminar that brought together 100 teachers from 33 ISFDs. Trainees were asked to design a teaching sequence with ICT as their final work. Thirteen institutions were chosen –with the consent of all the trainees involved- to implement the teaching sequences in their classrooms with the support of the INFD research team.

The next stage was focused on documenting lessons learned and best practices. The coordinator of this area says that *"at this stage we recorded the thirteen experiences. This is our first empirical test. (...) the research area was developing a number of experiences to analyze teaching practices in secondary education. Now, we will concentrate on higher education classrooms."*

To that effect, researchers are developing monitoring and research guidelines. In this sense, she points out that *"(...) the research we are carrying out is very qualitative. It implies the observation of sequence implementation, trying to understand how and why teachers in classrooms to do what they do, and how they use computers in the one to one model."*

This line of work is closely linked to research. The theoretical basis states that ICT promotes qualitative changes in teacher training classrooms, which require a systematic inquiry of the processes that occur. As a result, reflection and self-evaluation within institutions on their pedagogical and institutional practices are promoted.

According to the information provided, it is anticipated that the research stages will need to be defined to analyze practices in a methodological order. The aim of the investigation will be to observe the joint activity of teachers and students in the classroom. Teacher interests and wishes will also be included into the analysis.

These ideas were taken from the concept of work psychology originated in France- and from a field study called professional didactics. The basis of this idea is that workplace situations can be analyzed as a basis for the design of training courses. When an activity is analyzed, it is designed with a methodology that highlights particular parts:

- Previous analysis of the activity. The aim is finding out what teachers plan to do in a class sequence. This may be interaction between situation and activity in a certain sequence, classroom, school or students so that teachers can anticipate the difficulties they may find. At this analytical stage, they evaluate what epistemic value trainers attribute to what they are going to teach. This helps answer the question if teachers select content for its relevance or presence in the curriculum.

- Analysis of video recordings. The idea of self-confrontation is used in this analysis procedure. Trainers that participated in the sequence implementation are shown the video recordings to distance themselves from the facts and conceptualize different aspects. The aim is to capture how trainers describe particular problem solving situations that emerge from the video. This stage involves the participation of trainers that implemented the sequence in other situations and who offer a different perspective that of a researcher, who may not express the same point of view given their positions.

The thirteen ISFDs that agreed to implement the sequence are institutions that offer teaching training courses in Mathematics. Experts from the research area consider this a "pilot" experience because this is the first time it has been implemented. It was proposed to the

thirteen teams that completed the sequence that they revise the pilot experience under the consideration of the events that took place in practice and the contributions from the rest of the teachers that took part in the sequence design and gave feedback..

Filming was carried out by teachers of teacher trainer colleges. During the filming of classes, teachers use virtual strategies to enhance disciplinary teaching. This video is then analyzed by teams of specialists (consisting of a pedagogy specialist, Mathematics teacher and various researchers) who select fragments to be discussed with the teachers being observed. There are three focuses of analysis: the teaching of Mathematics, class management and the use of ICT in the classroom. The aim is to carry out "self-confrontation" with the video recording and the teachers, which lead teachers to see certain assumptions on which they base their class design (how they see their students, what their goals are and why they succeed or fail at reaching them) that can be questioned and analyzed.

At the time of research field work, Teacher Training Institutes with a Mathematics degree course had just made the sequence public. The INFD team was set to begin the documentation of the experience.

The team from the National Institute for Teacher Education consisted of three research professionals, a person in charge of the development of the first curriculum documents, a team of four experts in practice analysis with many years of experience in the field and started with the recording of classes in Argentina. There are also people who document and perform previous interviews and then transcribe them. It was formed by fifteen educators that carry out a Master's degree program on practice analysis. Another group of educators from the province of Buenos Aires are being trained in this methodology.

The INFD team notes that *"(…) our concern is discovering what is taught and learned when ICT is used."* The expectation is that the final product will consist of several written documents, including one specifically related to each subject area. The analysis will be based on self-confrontation interviews, which focuse primarily on teacher conceptualizations of problems with ICT incorporation. The research will be done on each subject separately.

According to reports, the INFD had the aim of analyzing teaching practices in one of the most problematic subject fields in secondary school: Mathematics. This analysis was to be done through the filming of ISFD Mathematics teacher classes in the framework of Conectar Igualdad for teacher training.

In turn, this initiative aims to give teachers the chance to analyze and reflect on their own classroom practice with the help of experts. The outcomes of these experiences are ex-

pected to serve as guidelines for the design of new continuing training programs. It was indicated that the first outcomes resulting from this research would be published in the first half of 2012.

3.3.2.   ICT Incorporation at institutional level

In order to get acquainted with the institutional policies for ICT incorporation in teacher education, a visit was made to the Teacher Training and Technical Institute (ISFDyT) No. 5, located in the city of Pergamino of the Nor-Pampa region, province of Buenos Aires[19].

This institution has been carrying out several initiatives for educational technology incorporation since 2000. They have been able to do so due to the fact that they have taken part in various projects financed by the National Ministry of Education. This incorporation responds to an institutional assessment that identified the necessity and the effort of authorities who similarly incorporated ICTs in several of their proposals.

Based on the assessment results, they submitted an ICT incorporation proposal to the Polo de Desarrollo (Development area) application call in 2000. Since 2001, they have continued working in the same lines at the Professional Development and Innovation Center[20] (CAIE) and have developed a project related to ICT. This project focused on "the social representation of college teachers in the subject of ICT" and was complementary to the Polo de Desarrollo project. Later, they developed a project on "institutional culture, collaborative work and ICT." They also participated in the calls for research projects of the INFD and projects for institutional improvement. All these initiatives allowed the institution to focus on the same topic for a long period of time.

All of their different projects were financed by the Ministry of Education and the INFD with a duration of one year. The financial assistance obtained enabled them to cover

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[19] Undergraduate courses offered at the institute are teaching degrees in Special Education, English, Portuguese and Psychology, bachelor degrees in Social Work, technical degrees in Industrial Safety and Hygiene, Computer Systems Analysis, Multimedia Communication, and Logistics. Graduate courses are in Learning and Early Childhood Development (distance program), Adult Education, and Psychopedagogy. Institutional enrollment is approximately one-thousand undergraduate students.

[20] Centros de actualización, innovación y desarrollo pedagógico (CAIE) (Professional Development and Innovation Center). They offer favorable environments for experimentation and educational project design, where educators can find resources and exchange with one another educational experiences to enrich their practices, and opportunities for discussion and debate about the use of new literacies, including information technology and communication and the pedagogies of the image.

expenses related to literature, supplies, student scholarships, travel expenses and specialist fees. With the funding received from different programs, the institution was able to set up a laboratory with 41 computers. From the onset, it was conceived as an open environment for teachers and students.

Currently, they demonstrate institutional needs for ICT through the INFD Proyecto de Mejora Institucional[21]. The most recent call for proposals was focused on "new strategies for the incorporation of ICT."

In addition to the the support given to teachers in the development of ICT specific projects, the ISFDyT Nº5 authorities between 2003 and 2004 focused on incorporating technology into different aspects of institutional life with the hope that ICT would permeate daily life in college and gradually promote a cultural change. They had concluded that roughly 40% of teachers did not have a personal email account and were not particularly familiar with ICT.

In the last few years, they have been carrying out different initiatives to incorporate ICT. This involves using the e-mail and webpage to manage internal and external institutional communication, promote the creation of graduate distance courses, develop internal and external training courses with ICT, and motivate teachers to use ICT in their classes, among others. According to the principal of the institute, these different initiatives helped "create an awareness that technology should be part of the institutional culture."

In 2008, a proposal to create two graduate distance courses was presented to the National Ministry of Education. The courses were titled Learning and Childhood Early Development and Academic Literacy in Adult Education. This initiative allowed teachers to become actively involved with the platform. To accommodate this activity, the institution decided to hire its own server, train teachers and develop content modules.

Since the beginning of CIP implementation throughout 2001, internal and external training courses multiplied. When the initial literacy stage was completed, training addressed the creation of virtual classrooms, platform management, blogs, and other tools. College authorities assert that English teachers have the most extensive experience using ICT in teaching. One possible reason for this is that they have often used a number of teaching materials that they obtain from different sources. This is evident even before

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[21] The Proyecto de Mejora Institucional (Institutional Improvement Project) (PMI) is a line of action of the INFD Dirección de Desarrollo Institucional (Institutional Development Division) which aims to strengthen the initial training provided by Teacher Training Colleges (ISFDs) through promoting the construction, exchange and circulation of knowledge, resources and experiences generated in both the institutes and the system. In this sense, it aims to contribute to state-run higher level responsible for teacher education in our country. Available at: http://portales.educacion.gov.ar/infd/fortalecimiento-isfd/

the presence of computers in classrooms. Gradually, this practice has successfully connected these teachers with a wider community of those involved in similar practices.

The college has four ICT trained *facilitators*. Additionally, the CAIE coordinator is one of the jurisdictional counselors of the Northwest region of the province.

Focusing on ICT at an early stage has helped this institute gain knowledge and experience on the subject. As a result, it has become a local reference on ICT incorporation. Nevertheless, as authorities point out and literature on the subject confirms, the cultural change of traditions moves at a slower pace than political and educational initiatives. They also recall the obstacles and challenges that they have had to face in responding to various needs that arose.

The previous account brings to vision an institution that has been committed for the last decade to the integration of ICT in various areas of institutional life (communication, academic and administrative management, pedagogy and didactics, etc.)

↘ Clickear (Clicking) Program

The Professional Development and Innovation Center (CAIE) from the ISFDyT N°5 designed a plan for digital literacy with a 1 to 1 model, directed at urban and rural elementary school students from the Pergamino province of Buenos Aires. The CAIE developed the project and presented it to the Department of Culture and the Commission of Culture and Education of the City Council of Pergamino. A pilot plan was implemented in two schools where computers were distributed among 1st grade students.

Simultaneously, the institute created the Training Center. Its specific function was to satisfy the demands of elementary school teachers resulting from the creation of the Clickear Program[22]. Courses included initial training, optional workshops on ICT use in education and an e-learning platform for continuing teacher training. Training for administrators and discussions with families were also offered.

Clickear is a digital literacy program targeted at public elementary school students. It is coordinated by the CAIE, the City Council of Pergamino and receives technical and financial sponsorship from UNESCO and additional economic support from local entre-

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[22] Clickear Program, available at: www.**clickear**.gob.ar (Accessed: 30/07/2012)

preneurs. The creation of this program not only accounts for the initiative and leadership shown by the institution and its members, but it is also the result of many years of work and experience with ICT.

The current CAIE coordinator and one of the creators of the Clickear Program stated that the implementation had to overcome some obstacles derived from the use of computers in the classroom. To that effect, they supported classroom teachers given that it is in the classroom where real problems in teacher practice arise. The coordinator underlines the importance of supporting teachers with training and daily assistance at schools.

Throughout the past decade, the institutional policies for ICT incorporation allowed them to gain experience, knowledge and carry out a process of effective gradual ICT acquisition with a pedagogical meaning. The creation of the Clickear Program is a display of the experience gathered.

In summary, despite the fact that the inclusion of ICT policies in initial teacher training is quite recent in Argentina, the experiences described above have served as a foundation and platform to create a favorable setting for the development of these constantly evolving policies.

4. The Guyana Case

4.1. Introduction

The Guyana case was selected following the same set of criteria used for the Argentina case. This includes: a) the existence of a defined and explicit ICT policy in initial teacher training, b) the presence of a wide array of institutions showing evidence of articulation in the initiatives and the defined ICT policies, c) the possibility of completing all stages of this research project in due time and manner, and d) the level of interest of the country in participating in the investigation, e) the absence of prior research and publications on the subject in these countries, f) the need for qualitative research on ICT and initial teacher training in the region.

Basic information on political analysis of the incorporation of ICT into teacher training as it relates to the specific case of Guyana was obtained through interviews with key in-

formants, documents provided by government officials and institutional authorities and information included on official organization webpages, such as the Ministry of Education, University of Guyana (UG), and Cyrill Potter College (CPCE).

The incorporation of ICT into teacher training in Guyana is very recent. As in the Argentina case, two stages have been identified. The first stage lasted from 2008 to 2011 and the second began in 2012 and will conclude in 2015. The first stage related to the identification of a set of preparatory initiatives that successfully established optimal conditions for ICT incorporation. Now that this stage has been completed and the information collected is ready to be used, initiatives to incorporate technology into teacher training classrooms will continue being developed and expanded in the current second stage.

In order to organize the information collected and understand the strategy implemented in Guyana, four important ICT incorporation actions or initiatives have been defined: a) continuing teacher training with ICT; b) initial teacher training with ICT; c) special programs with the use of ICT (Success Maker and the radio program); d) training courses with ICT for trainers at the University of Guyana.

The report begins with the description of some contextual elements and aspects related to the educational system and teacher training subsystem. This information proves useful in understanding the current policies for ICT incorporation in teacher training within the Guyanese context.

↘ Case description and analysis

4.2. The educational system and its context: Brief description

The majority of the Guyanese population lives in urban areas situated near the coast. In the interior regions, most of the population lives scattered in rural zones where they frequently lack basic services. This distribution of the population impacts the distribution of educational service.

Quality education indicators show significant differences between urban and rural populations. In this sense, the National Ministry of Education feels that the use of ICT in narrowing the digital gap would also contribute to narrowing the educational and social gaps. However, the availability of connectivity, which is necessary for ICT incorporation, depends heavily on the urban or rural setting of the institution concerned.

According to an assessment carried out by the World Bank, the educational system in Guyana has a limited budget, which is insufficient for carrying out major innovations and investments. ICT investment, both in equipment and connectivity, demands a specific budget. This explains why an important part of education initiatives are funded by loans from international organizations, particularly the European Union and World Bank.

Through the "*Project Appraisal Document on a Proposed Credit. Latin American and Caribbean*" (2010) of the World Bank, a funding proposal for education projects was analyzed in 2011. This document presents a diagnosis of education in Guyana and the corresponding lines of action. Some central topics from that document are discussed here. They will allow us to understand in greater depth the policies for ICT incorporation in teacher training.

1. The consequences of a long period of divestment in the educational system (during the 80´s and 90´s) can be presently observed. Even if the education budget has increased[23] in the last few decades, it has not been enough to reverse the negative impact of decades of divestment. In addition, Guyana is the second poorest country in the Caribbean region after Haiti (World Development Indicators, WDI, 2008). It is important to note that although Guyana is considered a Caribbean country in terms of culture, it belongs to South America in strictly geographical terms.

2. Long years of economic crisis, - at a national and recently at an international level-, have had an impact on the migration of human capital to other countries. This fact combines with high unemployment rates of youth. There is hope that an improvement in the quality of education will improve employment rates. A more adequately educated workforce will help Guyana become more competitive and face the challenges that persist for the Caribbean Single Market and Economy, as well as the local economy in a global context of withdrawal.

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[23] The education budget has increased from an average of 2.1% in 1991 to 7% of gross domestic product (GDP) in the last seven years. (Project Appraisal Document on a Proposed Credit. Latin American and Caribbean (August, 2010)

3. In spite of the important progress made in access to education for wide sectors of the population, quality and geographical equity in Guyana are poor. Most children start school at the appropriate age, levels of primary school enrollment is high and the completion rate is almost 100%. Nevertheless, their literacy and numeracy skills are poor. This information is based on the low overall student performance in national and regional examinations[24].

4. Performance data reflects that differences persist between the coastal region and the rest of the country. Despite this, there has been progress in narrowing the gap. The Amerindian population (found mainly in the countryside) has less access to quality education than the rest of the population. The quality of education in the communities located in remote areas is well below national standards. Similarly, the repetition and dropout rates in elementary education are higher in inland areas. Secondary school students from these regions also show low performance rates. In recent years, the Government has made considerable efforts to address educational inequalities within the country. Some examples include incentive-based policies being created for teachers who teach in remote areas, providing housing and teaching materials, and creating resource centers. However, problems in remote areas persist, such as connectivity issues from the initial level to secondary school, one-teacher schools, and schools without electricity. In particular, the jungle terrain that covers an important part of the country makes electric wiring difficult.

5. In Guyana, many teachers start work and remain in the profession without the necessary academic qualifications and/or required professional training. Between 2008 and 2009, it was calculated that out of a total of 8,683 teachers nationwide from all levels of the educational system, 36% did not have the required certification for the practice of teaching. According to the World Bank assessment, many teachers persist in traditional teaching methods, what can be considered a deterrent for students to access meaningful learning skills and be trained in problem solving.

These elements have put teacher training into political focus. The situation described above is even more worrying when one considers that students from the countryside or remote coastal regions have the highest levels of non-certified teachers.

In recent years, the Ministry of Education has made a considerable effort to improve

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[24] The World Bank report states that "In the total sample of 2,700 children, 30% could not read a single word correctly on the first line of a simple paragraph. The results are also low in high school students." (Project Appraisal Document on a Proposed Credit. Latin American and Caribbean. August, 2010)

the conditions of teachers in remote areas so that they can join training programs. The number of unqualified and untrained teachers has decreased about 40% in the last eight years. This means that hundreds of elementary school teachers have been trained to reach the minimum requirements to join formal training teacher program (Demas y Sánchez, 2008).

The national education diagnosis focuses on the low quality of education, the inequality of educational opportunity in terms of geographical regions and the retention of good teachers within the system. While ICT is an important tool for the economic development of the country, it will still take time to achieve this objective.

4.3.   Teacher training. Current problems and challenges

Initial teacher training in Guyana is concentrated in two institutions: Cyrill Potter College of Education (CPCE) and the University of Guyana, School of Education and Humanities (UG).

- The UG offers a three-year certification program in Pre-school Education, Elementary and Secondary Education. Upon graduation, students become certified trained teachers. At the UG, teacher trainers have higher academic degrees than at the CPCE. About 82% of the full-time staff at Turkeyen Campus have degrees equal to or higher than a Master´s degree, and at Berbice Campus a teacher is carrying out graduate studies.

- The CPCE has a main campus at Turkeyen (Georgetown), which offers a pre-service program and 14 satellite centers located throughout the country that provide online in-service training for uncertified teachers who have already started their careers as educators.

The World Bank report points out that the quality of teacher training is low. A possible explanation is related to the poor preparation of teacher educators. Only five of the 52 full-time teachers at CPCE have a Master´s degree and five are in the process of obtaining a graduate degree.

Another aspect that worries Guyanese authorities is that teacher training takes longer than in other countries of the region. It takes nine years to get a Bachelor´s degree in Education, which is four or five years longer than the average course length in most countries [25].

Further exacerbating this problem of degree course length has been the difficulty in retaining teachers, especially those with training, in the educational system. During the last three years, 633 trained teachers left the public educational system and the average yearly loss of teachers is approximately 8%. Such information puts pressure on the system and demands that authorities make previsions based on the number of teachers that leave the system. Low salaries are one of the main reasons why they change jobs or go to teach in other countries. In response to this situation, measures have been taken to provide incentives to teachers to retain them in the profession and in the country (since some immigrate to other English speaking countries). This has been carried out in different ways, including a raise in salary, an improvement in the working conditions, allowances and housing for teachers in remote areas, and a monetary compensation after four years of service.

4.4.   The government strategy

One of the main goals of the governmental Guyana Education Strategic Plan (ESP) for the period 2008-2013 consists of increasing the number of certified teachers and those trained in the incorporation of ICT. This policy is based on the belief that improving teacher training will improve the overall quality of education in the country. The Ministry of Education set the goal of achieving 70% of teachers trained by 2013.

The general strategy for ICT incorporation into education as defined by the government is comprised of the following elements: a) infrastructure; b) connectivity; c) curriculum and content; d) teacher professional development; e) supervision, evaluation and research.

Members from the area of Education at the Ministry recognized that in order to achieve the government's objectives, emphasis should be placed on teacher professional devel-

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[25] To obtain a BA, the requirements are three years in the pre-service program of the CPCE, two years of residency training and then four years at the University of Guyana.

opment in the area of ICT and seek ways to contextualize and implement the process.

A task group formed in early 2009 to work together to design policies to improve teacher training. It was made up of principal administrators of the University of Guyana (School of Education and Humanities), the National Centre for Education Resource Development (NCERD) and other areas of the Ministry of Education. As part of their teamwork, they have produced a synthesis document of the educational reform and teacher training in Guyana, which puts together a strategy for change based on the views the best course to follow for teaching training of both institutions.

As a result of the efforts of shared work, the following priorities were defined for teacher training in Guyana:

- Support collaboration between the Cyril Potter College of Education and the University of Guyana on teacher training and the creation of a training program.

- Promote human resource qualification at the CPCE and the UG to improve the quality of teacher trainer education.

- Favor the incorporation and use of ICT at CPCE and UG to enhance their capacities and turn them into institutions where ICT integration takes place in the teaching and learning process.

- Expand library services and improve research capacity.

Government officials and specialists are aware that the main problems with training and the educational system reside in the need to have qualified professionals to develop the teacher professional development modules, retention of teachers in the system, superior equipment and obsolescence of existing equipment in the education system, more computers for implementing training programs, greater financial resources for the implementation of initiatives and stronger connectivity (the country does not have optic fiber service. For example, the UG only has a 1Mg cable broadband service for all its IT center services).

According to the stages defined for this project, the expected goal for 2011 is to achieve stronger connectivity through improving the installation of electricity and the provision of school resources. By 2012, authorities expect to prioritize capacity building strictly oriented towards human resources, i.e. how to train them and generate cognitive conditions to take ownership of the tools and potential offered by ICT to improve teaching and

learning. The last stage (2013-2015) will focus on expanding ICTs to the entire system.

When the plan specifically addresses the steps to incorporate ICT into the system, stages related to goals and provide for a gradual development. The first stage includes **basic ICT literacy** (done in 2011), the second stage relates to the **deepening the use of ICT in teaching curriculum content** and the third stage addresses the **use of ICT focused on the creation of knowledge**. The **UNESCO ICT Competency Standards for Teachers** were used as input for the design of these stages.

In 2009, ministry authorities were invited to the annual UNESCO conference, where they were first introduced to the UNESCO ICT Competency Standards. Following this meeting, they began working on adapting this UNESCO framework for the incorporation of ICT to fit the particular case of Guyana. Ultimately, this adaptation was successfully completed and was made the starting point for teachers wishing to learn the first content modules.

The ICT ministry specialist in charge of content selection for the modules expressed that *"(...) the first thing they did was to put us in contact with a Commonwealth Learning office from the ComSec (Commonwealth Secretary of Service), who sent a South African consultant to help us build the modules for teachers."*

During the first visit of the consultant, the first actions were to organize several workshops to define knowledge needs and specific skills. These workshops attempted to document needs from various perspectives, including education, system management, teachers and students. This resulted in a document called FOOTPRINT, which describes the step-by-step process of ICT introduction in Guyana.

When the ICT Unit at the Ministry finished this stage, the NCERD was asked to carry out the implementation process. Implementation involved the design of training courses for teachers. According to the person in charge of the area, *"we started to implement the project, designed the training modules for teachers and it worked very well, fantastically, I´d say."* They started in 2011 with the literacy stage. Now that practically all in-service teachers have completed the literacy training, they are moving towards the second stage of **deepening the use of ICT in teaching curriculum content**.

4.5. Actions Carried Out

As mentioned above, ICT incorporation policies are divided into two stages. In 2010, a plan called **ICT Professional Development Strategy for Teachers** was approved and implemented for Guyanese teachers. This strategy is in line with the ICT Operational Plan from the Ministry of Education and supports the priority of the Guyanese government to use ICT in facing the challenges of developing and strengthening the country´s economy.

The long-term desired result of the ICT professional development strategy is to ensure that all officials from the Ministry of Education, school authorities, administrators and teachers are competent in the use of ICT in such a way to support quality teaching and learning in schools in Guyana. This means achieving the following:

a) all teachers are able to integrate the basic use of ICT tools into the standard school curriculum, the pedagogy and the ways to organize the classroom. Also, that they know how, where and when to use technology for class activities, presentations, and management tasks, and have access to additional or pedagogical subject knowledge to further their own professional development;

b) most teachers are able to use more sophisticated methodologies and technologies and make changes to curriculum which highlight their deep understanding and capacity to apply academic knowledge to real world problems. Also, that they can also update pedagogy with which they are provided as a guide and incorporate new ways to manage different learning environments so that students get involved into extended and collaborative learning based on projects that can reach beyond the classroom and involve local and global collaborations;

c) upon acquiring sophisticated professional skills with the use of technologies, a critical amount of teacher leaders are able to support students in creating knowledge and committing to planning and managing their own learning goals and activities while serving as models of apprenticeship who seek innovation in the organizations where they are placed.

This strategy is in line with the proposal of UNESCO ICT Competency Standards for Teachers (2008). The decision of the Ministry of Education of Guyana to adopt UNESCO´s framework was made in November 2009 after revising the available options at the national and international levels, and acknowledging the lack of clear direction in the definitions developed. The Minister signed an agreement with the Commonwealth Secretariat

(ComSec) and the Commonwealth of Learning (COL) to secure their collaboration in applying this framework and adapting it to the needs of Guyana. Based on this agreement, in March 2010, the strategy was presented along with a proposal for initial and continuing professional development aligned with the UNESCO framework, as shown below.

Chart Nº 1: Initial teacher training and professional development in Guyana

Initial training

Continuing professional development

Advanced Diploma in Education
(Two specialized courses on ICT and on teaching ICT as a subject, plus ICT focuses in other subject-specific courses)

Introductory Stand-Alone Course on Use of ICT in Education
(Dedicated, generic CPD course aimed at qualified, practicing teachers who were not taught ICT in their Initial Training)

Specific Short Courses
(Specialized introductory courses aimed at practicing teachers, qualified and unqualified, offered alongside generic CPD modules:
• Use of SuccessMaker
• Teaching IT as a Subject
• ICT Maintenance and Support)

Technology literacy

Bachelor of Education
(Two specialized courses on ICT and on teaching ICT as a subject, plus ICT focuses in other subject-specific courses)

Stand-Alone Course on ICT integration in Education
(Dedicated, generic CPD course aimed at qualified, practicing teachers who have not been taught about ICT in their Initial Training)

Knowledge deepening

Specific Short Courses
Menu of specialized CPD courses aimed at qualified, practicing teachers:
• ICT Integration for School Principals (both stand-alone and integrated into current course for principals)
• The Role of an ICT Coordinator
• ICT Maintenance and Support
• Incorporation of new courses as demand arises

Knowledge deepening

Source: Teacher Professional Development: with emphasis on the contextualization and implementation of a teacher competency framework for ICT in education: Implementation in Guyana

In order to understand the components of the teacher training strategy implemented in Guyana, four large actions or initiatives for ICT incorporation were defined: a) Continuing

teacher training with ICT; b) Initial teacher training with ICT; c) Special programs with the use of ICT (Success Maker and the radio program); d) Training courses for trainers with ICT at the University of Guyana.

a. The inclusion of ICT in continuing teacher training

As previously stated, the most important problems that teaching faces in Guyana are the presence of unqualified teachers in classrooms, the loss of teachers who leave the system, and, to a lesser extent, are employed in other English-speaking countries in the northern hemisphere. The latter problem creates a complex scenario, in which they must train a surplus amount of teachers in order to compensate for those who leave.

With regards to alleviating the problem of unqualified teachers, there is a distance and in-service program that offers continuing education, even for those in remote areas. Teachers that participate in this training receive certification as elementary school teachers. There is a similar program for secondary school teachers.

The Ministry of Education is interested in having unqualified teachers enroll in a distance training program that offers quality comparable to that of a classroom experience. These initial in-service distance training programs for teachers are intended to respond to this interest. The training promotes the use of multimedia in presenting content and new methodologies. It also has the aim of preparing teacher trainers to adequately develop their own e-learning materials.

The National Centre for Educational Resource Development (NCERD) is the department from the Ministry of Education responsible for designing continuing professional development programs for practicing teachers. The ICT unit at the NCERD is formed by three people and is in charge of all the training projects.

Its objectives are:

- Having all teachers trained in basic digital literacy by the year 2012.
- Managing all computer laboratories in schools (60 elementary schools and 80 secondary schools).

- Implementing the SuccessMaker software26 in 50 elementary schools, which implies training 2,000 teachers for competent program use.
- Training all secondary school teachers to use the ICT program with their students, as well as prepare and manage electronic documents from the Caribbean Examinations Council. This means training 109 teachers.
- Researching and developing integral modules related to ICT training for the education sector.
- Identifying, training and implementing low-cost technologies within the educational system. This includes, for example, television, DVD, whiteboards, etc.

The unit was put into operation in 2009. A five-year work program was defined to carry out the following actions:

- Hire local ICT experts from the UG.
- Request permission from Microsoft to use their materials and create the first set of training manuals for basic digital literacy.
- Once the manuals were designed, 20 tutors were trained to teach the content. These tutors were IT experienced teachers from the secondary level with a degree in Computer Science from the University of Guyana and with teacher degrees from the Cyril Potter College of Education (CPCE).

As part of the work program, it is expected that 13,000 teachers from Guyana will be trained, at least at the basic digital literacy level, by 2013.

Among the actions carried out by the NCERD, the following can be mentioned:

- An average of 15 ICT training classes delivered weekly in Georgetown and throughout the country.
- SuccessMaker software was incorporated in 14 elementary schools in 2010 and has been implemented in 50 other schools since October 2011.
- 109 secondary schools teachers trained in within a period of one year.
- 3,500 teachers were trained for a basic level of computer literacy.
- 30 schools successfully use SuccessMaker.
- The number of students that enrolled in these subjects tripled in two years.

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26 SuccessMaker program is a set of computer courses in reading and math, which are used to supplement the regular instructional classes in grades K-8. The reading course reinforces concepts and skills that will help students understand the variety of instructions within the five major components of reading. The math course reinforces The New Mathematics Standards and individualized instructions for those who have difficulty with math concepts at grade level.

Despite these significant achievements, the ICT unit from the NCERD faced difficulties in recruiting qualified staff to write the modules and retain them given the lack of computers for the training programs. In addition to this, one must consider the limited financial resources to take care of logistics and other problems related to connectivity that typically arise.

The official responsible for the ministerial unit notes that *"(...) the integration of ICT in the teaching and learning processes does not have a sole focus on the teaching of technology or the use of specific tools."* And she adds *"(...) at the beginning we had a plan to integrate technology to teaching, which was based on a national policy. We were responsible for its implementation."*

From interviews with ministry officials it is conceivable to assume that the focus was on training teachers to integrate technology into the content taught. For them to be able to do this, it was necessary to teach them basic computer literacy use. "(...) *we did the basics first. Then we used the curriculum as a guide to decide what technology they could integrate for Mathematics, Language and Science."*

To promote the integration of ICT in the curriculum areas (Language, Mathematics, Social Studies), teachers were offered help in finding ways to answer the question "How can technology be used to teach the content associated with these subjects?" The aim was, in turn, that trained teachers *"would return to schools to show other teachers how to use these skills with their children."*

To that effect, a pilot program was carried out in a number of schools to train in-service teachers and some students of teacher training institutes. Though the focus was put on in-service teachers, future teachers were also trained before they started working at schools based on the premise that *"these are the teachers that often bring new ideas."* Regarding in-service teachers, the selection included teachers who had already been trained and had years of experience in the classroom.

Training consisted of six meetings with the same group throughout out the year. *"We met six times and in those meetings we were able to see the results we were getting."* Fifteen teachers were trained, who eventually began to train other teachers. Each of them trained 5 others from their own school, which means 90 trained teachers in total.

The teacher selection process took the following criteria into account: previous experience with ICT, curriculum areas, seniority level in teaching, and skills in developing curriculum. The first 15 teachers were selected based on a combination of these elements. After the selection process, the pilot commenced with the intention of seeing how it worked to consider its possible expansion.

Only schools equipped with a computer laboratory were chosen. Other factors considered were different geographical areas and student populations from different socioeconomic backgrounds.

It was expected that this program would lead to a transfer of knowledge, or in other words, teachers trained in this program would use their learning experience to train other teachers in the same way they had been trained. For evaluation purposes, NCERD analyzed what had specifically been transferred.

Prior to elementary school curriculum reform, the Ministry had not provided guidance for integrating technology into curriculum topics. This encouraged specialists to draw up some guidelines. They started by selecting topics from the curriculum, parts of the curriculum guide and building individual weekly class plans where technology was included.

With regards to the integration process, the individual responsible from the NCERD for the selection of ICT content affirmed *"(...) what we found was that most teachers included the use of Power Point They love Power Point, and also included Paint".* As such, they encouraged them to use the Internet in working with primary and secondary school teachers, especially for projects and software to build simulations. She also added that a common feeling among teachers was that *"children seem to know more (about ICT) than we do."*

When referring to the results, she says that *"(...) teachers are happy because it makes teaching easier and allows them to keep students focused since they get less distracted."* They find that children interact more, are more willing to ask questions on a regular basis, materials are colorful and more attractive, all of which improve motivation. Nevertheless, no results have been measured yet to estimate whether technology integration improves educational quality indicators, mainly because it is too early to measure the impact.

During the course of training, teachers complained about the lack of connectivity and equipment in schools. Several cases were reported of six students or more being required to share one computer or a lack of an available projector. Another common problem was if the lesson required computer work without any machines being available. However, they say *"(...) in spite of all these difficulties, we try to give our best with the few resources we have."*

Each of the 15 trained teachers had to develop their own class plans and then share them with the five teachers they trained at their schools, so that, in turn, they could design their own classes with ICT. Furghermore, each teacher is supposed to know their own students' skills and interests.

The head of the NCERD claimed that *"(...) we have not yet reached the stage of integration with the university. So far we have been working with this center and the CPCE. In two or three months´ time we are going to start working with the University of Guyana to teach these courses to university teachers."*

Training began with 2nd and 3rd grade teachers. The next stage will be to expand this experience to other grades. The plan includes to implement training in 9th grade and then expend it to all other grades. At that stage, the intention is to cover the whole curriculum instead of taking two or three isolated topics from the syllabus.

Teacher attitude towards these innovations was described in further detail by the head of this area, stating "(...) many take ownership of technologies. *At the beginning they thought it would be harder for them and resisted, but after we talked to them, they realized that they made their job easier. When students interact with the systems there is more time to revise, observe, and monitor them, in addition to seeing how they work. So instead of finding their job harder, teachers realized that it became easier. Many of them are "digital immigrants" and afraid of technology. We put together enthusiasts and doubters so that the former group could support the latter. "*

The same official is optimistic that the incorporation of ICT will promote collaborative work among teachers. When asked about the inclusion of more teachers and schools in the experience, she foresees the greatest resistance and difficulties appearing in the countryside, where there is no connectivity and teachers are not familiar with technologies.

↘ **The design of the training modules**

Printed and digitalized materials were used for the in-service training. Digitalized material is used when there is connectivity.

Module content covers different topics: 1) understanding ICT (connecting ICT with national policies), 2) curriculum and assessment, 3) pedagogy, 4) organization and administration, 5) basic ICT skills, 6) professional development (how teachers are supposed to use ICT to achieve their personal growth and improve productivity).

These modules were designed with the collaboration of a South African consultant whose services were engaged by the SecCom. The head of the area says *"(...) we obtained materials from campuses, e-learning platforms, free-to-use campuses for the development of mod-*

ules. This seems great. Our task was to analyze what software and tutorials were available and evaluate what could be useful. The consultant was very good, but he had already left because the project finished two weeks ago. He worked with us from 2009 to 2011. Now, we have to support the project ourselves. Available materials were carefully mapped. The modules we created have been already used by trainee teachers so we know they work. This is basically where we are standing now in terms of teacher professional development."

b. **Initial teacher training with ICT**

In the CPCE new curriculum for teacher training two new courses have been incorporated: "Technology and Learning" and "Technology for teaching and learning", which were Levels 1 and 2. It is expected that in the future, teachers will be able to use any available technology to teach in their classes. In order to be able to do this, the CPCE worked together with the World Bank and UNESCO. This course is in the pilot stage. Student reaction to the pilot proposal is currently being analyzed. An introductory course to ICT use was offered to those students that had no experience at all with computers.

These courses are part of the **deepening knowledge** stage.
Each course offers teacher credits. They consist of face-to-face meetings facilitated by tutors, self-study material, online resources and virtual tutor guidance. The tutor teaches ICT content. The task consists of the elaboration of classes with ICT, in which it does not serve as the focus but rather as an instrument.

Some of the tutors have started developing their own websites to make the experience more technology mediated. At present, they are developing a program to allow prospective secondary school teachers to finish their bachelor´s degree in Education in less time.

As reported by the CPCE principal, the present program consists of three years of college studies, four years to get the bachelor´s degree and two more years of in-service training. This equates to a total of nine years, which partly explains drop-out rates. The new program will provide for a shorter and more intense period of teaching practice that will favor training completion.

In their teaching practices, students will have to incorporate technologies and all the methodologies learned. This is not compulsory if the school where they practice does not offer the necessary equipment. This will be solved when netbooks are delivered to students through the World Bank project.

This World Bank project for initial teacher training includes the training of human re-sources and infrastructure. Some project components have been implemented since the middle of 2011.

In brief, the overall priority is to improve the quality of primary and secondary teacher training. To that effect authorities aim to increase the quantity of qualified staff. The two goals are achieving more effective performances from teachers and teacher educators, and reducing the duration of the training program to ensure proficiency with content. If these two goals are achieved, resources and teacher training program management will ultimately be improved.

The CPCE is currently in the implementation phase for new curriculum. At the same time the ICT modules implemented in the college computer lab have been established with the assistance of NERC.

c. Special programs that incorporate the use of ICT (Success Maker and the radio pro-gram)

Since 1999, Guyana has been using a type of commercial software named Success Maker has been used in Guyana for ICT classroom integration. This software program can be used to carry out diagnostic tests and ongoing assessments of student learning and produce reports. Additionally, several topics can be taught with this software and is used for initial literacy and numeracy for low-performance children. Students go a laboratory equipped with computers and earphones to do exercises for 20 minutes, for which receive immediate feedback from the computer. Teachers believe that Success Maker has proved useful for primary school but not for secondary school.

The person in charge of the ICT department from the Ministry of Education notes that *"(…) if we think of ICT integration in terms of the use of Internet in schools, then it can be said that it is not happening. You may find one or two schools doing it. They are the exceptions. Now we are improving school infrastructure and computer labs are being equipped, along with computer networks and projectors being set up, and so forth. I would have liked to install technology, namely digital blackboards with projectors connected to computers, but this is not possible at the moment."*

The NCERD focuses on guiding and leading the use of ICT in schools. The infrastructure area is delayed in the installation of computers at schools. That is why *"these have been isolated experiences so far and the integration focus is on the primary level. In primary school*

we are also carrying out the project INTERACTIVE RADIO, where we teach Mathematics simultaneously to the entire country through the radio." This program is the only media through which mathematics is taught to 1st grade to 6th grade children in Guyana.

The Interactive Radio program has a partial-attendance modality and is offered to students from 1st to 6th grade. Before the beginning of the Mathematics class, the teacher must assure that resources are working appropriately, checking the radio tuning and the availability of a CD player in case any problems arise with the radio connection. Broadcasted programs are complemented with activity guides for students to complete. Students listen to the radio program and then complete the activities. Teachers monitor the successful completion of activities and exercises.

Additionally, there is a project called **One Laptop Per Family** that was launched at the end of October 2011 with the distribution of computers to 3,000 families. The people in charge of the area indicate that *"(...) we suggest the first computers be delivered to families where there are teachers. It is a proposal that aims at acknowledging that teachers are responsible for leading the process on which we are working."*

Regarding results, the head of the area showed her optimism and said *"(...) If we analyze the educational outcomes, there is a increasingly larger gap between the inland and coastal area. We are working to narrow this gap but there are many cultural and social differences that make it difficult. We are working on reducing the distance. The outcomes we get are very different with the exception of Mathematics, because we are using the radio program and everybody is doing the same all over the country. So if we find that this works, we will have the chance to apply this program to other content.*

d. ICT Training courses for trainers at the University of Guyana

Some teacher trainers use ICT as teaching and learning tools to improve didactic and pedagogical processes. These trainers represent 5% of the total amount of teachers. It is hoped that ICT inclusion will progress in the right direction in 5 years (which is the validity time for the credit).

The purpose of this project is to integrate ICT into teaching and learning processes in institutions and give training to teacher trainers and distance learning tutors so that they can use alternative teaching and learning methods with multimedia resources.

The UG Technology Center manager informed of the institutional ICT policies. The university has a Technology Center that offers wireless connection to the entire university equipped with four computer laboratories. Each course delivered at the university and requires the use of computers must make a request for the services of the center, especially all the courses for the Computer Studies degree[27]. In addition to the four laboratories, the university has an Internet laboratory for students who must pay a small fee for its maintenance.

The computers on average are two years old. The university has made an agreement with a company to update them for a moderate fee.

The University of Guyana has an e-learning platform (called the Institute of Distance and Continuing Education). The university offers courses across the country on this platform (MOODLE).[28] As part of the World Bank project, the university will have one additional laboratory. The University School of Education together with Cyril Potter College will be responsible for the courses.

Presently, several compulsory and optional technology courses are being offered at different university schools, including the Education School. It should be noted that these courses are based in introductory or digital literacy and not programming. At the university, the priority is to offer courses for both degree students and teachers.

The digital literacy course content includes the use of office software programs and programming language courses for secondary school teachers. Both of these programs are still under construction.

The main challenges that they face are related to the acquisition of more equipment for the university and increasing current bandwidth, which is only 1 megabyte.

The government is considering a project which involves a large investment in equipment. To that effect, they are analyzing the possibility of incorporating optic fiber from Brazil to offer free Internet.

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[27] If digital art classes are being delivered, the center provides the software, installation and offers to deliver the lessons. They offer extension workshops for people and organizations that do not belong to the university.

[28] MOODLE platform, available at: http://moodle.org/ (Accessed: 15/05/12).

5. Conclusions

The following are the main conclusions of the cases investigated.

↘ The Argentina Case

The reconstruction of the policy for ICT incorporation into the initial teacher training was a laborious task. The main difficulties were not related to access to information but rather how to account for multiple initiatives of different origins (ministries, organizations, foundations, universities, etc.) and make them coexist while identifying their political and educational significance. It seems that in the same sense that technologies provide speed, simultaneity and hypertextuality, political initiatives adopted a similar style to address them.

The actions taken have unquestionably placed ICT in the spotlight of educational policy for the sector. Furthermore, it seems that within them lies several questions regarding what knowledge a teacher must have on ICT beyond their diversity and peculiarity, what are the optimal organizational, material and symbolic institutional conditions to guarantee their appropriation and pedagogical use, and what the state must do to ensure it. Answers are not simple or easily available.

Two issues emerge from the case description:
Firstly, the National Institute for Teacher Education has since its creation defined basic principles and guidelines connected to the incorporation of ICT into teacher training. Secondly, the creation of the CIP accelerated the actions and decisions connected to the incorporation of ICT into teacher training.

A number of other simultaneous initiatives have also been promoted, although they are still ostensibly scattered given that they come from different areas of the National Institute for Teacher Education and Ministry of Education. These include teacher training programs, facilitator training, qualitative and quantitative lines of research, establishing lines of work with higher education administrations, platform configuration, creation of a digital magazine, creation of the network Akana[29], promotion of institutional improvement and research projects with the use of ICT at academic institutions, generation of voluntary work projects between universities and teacher training institutes, creation of the role of CIP counselor for teacher training in jurisdictions, etc.

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[29] Akana Network, available at: http://akana.infd.edu.ar/

The intensity of the actions adds to the accelerated rhythm. This analysis promotes re-flection on the problem of change and the effect of policies on an institutional and in-dividual level. Viewing this from the ISFD´s point of view promotes examination on the ways in which politics creates changes and innovations based on the institutional, orga-nizational and labor dimensions of teacher work. These are issues that are at the core of every definition of educational policy, and give rise to a number of questions:

How is change represented from a political standpoint?,
What elements are taken into account and which are neglected?
What kind of change is expected?
On the other hand, how do politics embody the process and contextual character of im-plementation and innovation? In this sense, this set of initiatives affects the labor organi-zation of teachers in colleges. Innovations that represent the incorporation of ICT into the curriculum of teacher training require that educators invest a lot of time and undertake a significant amount of training. The incorporation of ICT with teaching content demands that trainers develop new strategies and acquire new knowledge. This implies new ways to organize teacher work, which is a dimension that is rarely considered by policy mak-ers. Nevertheless, we believe that this vision of politics would require more and deeper inquiries.

Below we will discuss three aspects that refer to policies in ubiquitous learning contexts: the incorporation of ICT and teacher working conditions, the incorporation of ICT, and the pace of technological change.

How can we analyze policies in ubiquitous learning contexts?

The definition of public policy expresses in some way the tension between what is cen-tralized and decentralized. In other words, public policy refers to the way in which poli-tics views the margins of autonomy of different stakeholders taking part in the imple-mentation. The definition of policies for the area is carried out by a central authority in dialogue with jurisdictional authorities, in which they outline the priorities and distribu-tion of computers in schools. Nevertheless, ICT innovation strategies coexist in different contexts with their peculiarities. In this sense, it is important that teachers are able to decide where, when and how to use these new technologies. Politics acquires dynamism and meanings at a local or institutional level that are difficult to anticipate by the central organisms where the definitions are initially laid out, but it is necessary that it takes them into account.

Is it possible to view the incorporation of ICT into teaching without considering the conditions and organizational standards of teacher work? Do they intensify or facilitate teacher work?

As has happened with other innovations, the incorporation of ICT has led to an intensification of teacher work. Using ICT in a creative and pedagogical way had required teachers to invest their personal time beyond the standard work day, meaning an increase in working hours. Some institutional time must be added to this personal time to create the appropriate conditions to use ICT in the classroom context. One might think that this initial investment and the experience gathered by the teacher will facilitate his or her work in the future. For this reason, policy guidelines will have to measure both personal and institutional-organizational time from a standpoint that is consistently contextual, singular and heterogeneous.

How do ICT incorporation policies forecast the speed of technological change?

Educational systems have a disadvantage in terms of size or scale and ICT has the disadvantage related to their rapid obsolescence or outdatedness. In this sense, constant updating appears to be an emerging need for ICT incorporation. The challenge seems to be how to ensure continuous updating of technological equipment and ongoing training in resource-limited areas and contexts. What political decisions need to be made to leave installed capacity in the medium term? In this specific case of policy analysis, the training of facilitators to work in institutional settings requires constant updating in order for them to be able to respond to the responsibilities of their position.

There is no doubt that teachers still remain on the political focus as shown by those reconstructed for this research work. Beyond the political and educational importance of ICT incorporation in schools and classrooms for critical and creative use, the teacher's work remains central. In that sense, there is no computer that can replace a good teacher. Hence, the importance is that the policies must focus on the teacher in an integral way, prioritizing not only their training but their working and living conditions as well. Training should not be made separate from other teacher conditions (recruitment, salaries, working conditions, promotion mechanisms, etc.).

Likewise, experience has shown that consensus building with teachers, in relation to policy definitions, promotes greater commitment and compromise with innovation in the singular contexts where they are implemented. This approach facilitates the process of turning policies into actions that promote effective change, learning about those changes and their improvement.

Great progress has been made by the Argentine state to guarantee the incorporation of ICT into the educational systems. However, there is still undoubtedly a great deal to be learned as to the best ways to ensure that teachers eventually find the meaning of using them in an educational context.

↘ **Guyana Case**

As research on the history of education demonstrates, innovations in education interact with the traditions of centralized educational systems, pedagogical traditions that can be observed in school teaching practices, and theories resulting from the production and circulation of knowledge available in each context. At the same time, the economic development of the country and its geopolitical location account for the cultural, social, economic and educational features of the country in question.

Concerning ICT introduction in initial and continuing teacher training in the analysis of the Guyana case, the historical matrix of the country partly accounts for the way in which such incorporation is carried out.

When it comes to innovation that requires great initial financial investment, as is the case of technological resources and their installation, the development of the national economy and historic investment in education can explain from the economic point of view the difficulties that Guyana has encountered with investing in ICT using its own resources.

For this reason, Guyana needs the assistance of international financial organizations to design and implement an education policy of ICT inclusion. The programs developed on such loans include a number of components and stages. To fulfill the commitments made with the international financial institutions, local authorities had to redefine their educational policies and strategic plans.

From the case analysis, we can highlight some critical points to consider:

- Pending challenges in the pedagogical integration of ICT use in elementary and secondary school.
- Schools that have connectivity for the use of Internet are exceptional.
- Connectivity is one of the most important limitations.
- The problems with teacher academic training and a big number of unqualified practicing teachers become obstacles in the design of the pedagogical use of ICT.

This is to be understood not under the meaning of tools or resources but rather the deep cultural change they represent for children and young people.

- Teacher trainers need to get familiar with ICT to be able to design the training of future teachers from the moment they join the teaching profession.

Nevertheless, they have made progress in:

- Implementation of a first stage in ICT incorporation into teacher training and the beginning of a second deepening stage.
- Articulation of simultaneous activities: Teaching digital literacy to in-service tea-chers, developing ICT literacy modules and reforming curriculum for initial teacher training.

In this case, this restructuring accounts for the various efforts that, both institutions and actors with political and technical responsibility in restrictive contexts are carrying out for the improvement of the Guyanese educational system, especially in connection with initial teacher training by means of incorporating ICT.

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↘ **Appendix**

ICT in Argentine educational system[30]

The incorporation of ICT into Argentine schools went through different stages and strategies. From the first incorporations of school subjects dealing with computer use or science where students were taught the Logo program in the mid 80´s, to the present campaigns of computer distribution at primary and secondary schools, different policies for the equipment supply, training and topic introduction can be described. (Dussel y Quevedo, 2010)

In Argentina, as in the rest of Latin America, where the levels of social inequality are high, public policies for the universalization of ICT access have a different weight and demands from those that exist in more developed countries, where access can occur through other ways beyond school, mainly at home. In Argentina, school plays a fundamental role to guarantee a democratic access to knowledge (Tedesco, 2007).

If we refer to the history of technology incorporation into educational institutions, the main experiences were connected to the teaching of computer science. For its foundational character within the field, computer science has occupied an important place, in such a way that this precedent is sometimes overvalued and the field of ICT is reduced to that of computer science. From the 1980s various experiences have been carried out with the aim of promoting the use of digital tools in schools. However, it is not before the 1990´s that the national government start a series of systematic actions in which ICT occupy a prominent place. At present, the problem of digital literacy and equitable access to ICT has become a task in which the state plays a fundamental role. In fact, it is the first time that they are included in the policy framework, being present in the National Education Law Nº 26.206 (2006) that regulates the functioning of the educational system.

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[30] In the last decade, the research area of the Dirección Nacional de Información y Evaluación de la Calidad Educativa (National Department of Information and Assessment of Educational Quality) from the National Ministry of Education, has developed a set of papers that describe the equipment and connectivity schools have, national and international programs for ICT integration and the uses and educational practices carried out in the Argentinian educational system among others. Updated information about equipment and connectivity available at MECyT – DiNIECE, (2006). Other works on the topic can be obtained in Galarza, D. y Gruschetsky, M., (2001); Hirschberg, S., (2001); Palamidessi, M. (Coord.), (2001); Galarza, D. y Pini, M., (2002); Gruschetsky, M. y Serra, J. C., (2002); Landau, M., (2002).

When reconstructing the educational experiences with ICT in Argentina in recent years, it is important to consider both the technical aspect related to equipment and connectivity[31], and the capacities, skills and forms of use that interaction with technology promotes or that it requires as a starting point from those involved. In other words, decisions and strategies defined should include both policies towards equipment and connectivity, and pedagogical policies. The reconstruction of initiatives and programs from this point of view helps us to understand the role of the state, its responsibilities and competencies around the definition of priorities and the meaning assigned to digital literacy at different moments.

Without claim to be exhaustive in the reconstruction, because it is not the purpose of this study, sources consulted and specific research warns us that in Argentina we can identify two types of interventions aimed at spreading the use of digital tools in the educational system: specific programs for ICT in education and programs aimed at the improvement of the educational system as a whole, and that consider the incorporation of ICT into teaching as one of their components. In the first case we find the programs Redes[32] and Educ.ar[33] (at the end of the 1990´s). In the second case, they are programs that form part of the social policies that favor the attention to the most vulnerable segments of the school population, to ensure more equitable access to digital tools. In this group we find Programa de Descentralización y Mejoramiento de la Enseñanza Secundaria II (*Secondary School Teaching Decentralization and Improvement Program*) (PRODYMES II) and el Plan Social Educativo (*Social Educational Plan*) (PSE). Since 2003, new initiatives have been undertaken: Programa de Mejoramiento del Sistema Educativo (*School System Improvement Program*) (PROMSE); Programa Integral para la Igualdad Educativa (*Integral Program for Educational Equality*) (PIIE); and Fortalecimiento Pedagógico de las Escuelas del Programa Integral para la Igualdad Educativa *(Pedagogical Strengthening for PIIE beneficiary schools)* (FOPIIE 2006-2009). (Serra, J.C y Landau, 2005)

State initiatives in Argentina come both from the national and provincial administrations. A comprehensive report issued recently by the CIPPEC (2011) describes the provincial initiatives designed and implemented for the introduction of new technologies in educational settings. Without ignoring national initiatives in this area, mainly developed by Educ.ar S.E. and Conectar Igualdad, the CIPPEC report describes strictly provincial initiatives designed and implemented to introduce ICT in educational contexts.

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[31] Between 1998 and 2005 there was a significant increase in computer equipment in the Argentine educational system, though important gaps still persist. Most computers belong to urban schools, private schools and highly populated schools. These differences become deeper if we analyze Internet connectivity.

[32] Redes (Networks) Project (1998-1999), was a national government initiative with the aim of getting school communities in contact with ICT.

[33] This project was started in 2000. The focus was school equipment and connectivity, teacher training and the production of educational contents.

The launch of Conectar Igualdad Program[34] was a massive government measure, whose first stage was implemented during the 2011 and still continues. Conectar Igualdad was devised as a social inclusion program, with the aim of ensuring digital inclusion to narrow the gap between social sectors and between generations in the access and use of new technologies. The report by the Centro de Implementación de Políticas Públicas para la Equidad y el Crecimiento *(Center for the Implementation of Public Policies to promote Equity and Growth)* (CIPPEC) (2011) states that "the launch of this national program directly questioned the provinces since its implementation requires coordination between the two government levels in different dimensions and competencies."

This report describes the heterogeneity of the 24 jurisdictions of the country. On the one hand, provinces that before launching the program were developing various initiatives in this area, including some of a comprehensive nature covering various levels of intervention. Others, however, before the start of this program, developed complementary programs to target educational levels that were outside the scope of CIP. On the other hand, there may be jurisdictions where the implementation of CIP is the main ICT and education policy developed in that territory. It is worth mentioning the experimental nature of many of these initiatives and even the progressive redefinitions of those who were more successful (CIPPEC, 2011).

The report says that since 2000, the link between education and new technology has begun to be reinterpreted in various ways by educational governments. Initiatives that overcome the instrumental use of new technologies have arisen and a cross curricular view of ICT incorporation has begun to settle.

However, gaps remain in terms of access and digital literacy, which are, even today, a factor of educational inequality among students and that challenge provincial education systems.

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[34] Conectar Igualdad, a digital inclusion policy with federal scope, will deliver 3 million computers nationwide in the period 2010-2012, to all students and teachers from state secondary schools, special education schools, and teacher training institutes. www.conectarigualdad.gob.ar

↘ **Images**

Argentina Case

Interview with María Susana Espiro, head of the ICT area for the National Teacher Trai-
ning Institute (INFD).

From left to right: teachers Ana María Testatonda, Alejandra Foschia from ISFDyT Nº 5 – Norpampa Region, Pergamino, Province of Buenos Aires, Argentina. During the interview carried out at the institute as part of the research, the teachers shared their work experiences for the past decade in the incorporation of ICT in their teaching practice.

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Interview at ISFDyT Nº 5 – Norpampa Region, Pergamino, Province of Buenos Aires, Argentina. From left to right: Alicia Merodo, principal researcher and interviewer; Gabriel Almada, technical pedagogical trainer for Clickear and Head of the Centro de Actualización e Innovación Educativa (CAIE); E. Gustavo Zucaro, Head of the teacher training institute; Lidia Valentini, academic director at the institution.

↘ Guyana Case

Photograph of the main facade of the Ministry of Education National Centre For Educational Resource Development (NCERD), in the capital city of Guyana, Georgetown.

In the picture you can see students focused on their work mediated by computers. The class takes place in the computer lab at elementary school Juan Amos Comenio, in the city of Georgetown, Guyana.

In the picture you can see Guyanese students in a classroom divided by blackboards and shared among students from different grades.

The photographs were taken during a class in the computer lab at elementary school Juan Amos Comenio, in the city of Georgetown, Guyana.

Buenos Aires, September 19th, 2012