

## ***Learning from the pioneers: A Study on the Best Practices of the network TELAR***

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### ***Abstract***

Rapid technological transformations have created immense pressure on governments, schools, and other educational institutions to integrate technology into education. But, little is known about what is needed for technology projects to be integrated successfully into Latin American schools. Learning from the Pioneers is an investigation into the best practices of the Red TELAR-iEARN that enables us to identify the key factors that helped certain schools to be successful despite the challenges of being in poor neighbourhoods and in areas far from the urban centers. The results include recommendations on the factors that should be considered in future educational technology projects. One conclusion is that teachers have a decisive role to play in bridging the digital divide.

### ***1. Introduction***

This article has been written using as a basis, Learning from the Pioneers: An investigation into the best practices of the TELAR network that was carried out under the auspices of a Call/Contest for studies on the impact of ICT in Latin America and the Caribbean, organised by FLASCO (Latin American Faculty of Social Sciences), Ecuador, with finance from CIID (Canadian International Development Research Centre).

From the 1960s onwards the constant changes in microelectronics, information technology, computers and communications, resulted in a wide-ranging and profound transformation that in the 21st century culminated in a new global economic, social and political system (Castells 2000). Today, the divide that existed between the developed and under-developed countries, and between rich and poor people is expanding because of

the lack of access to the new global system whose entry point is constituted by the new information and communication technologies (ICT). According to Bonilla (2000), until 1998 in Latin America only 0.8% of the population had the possibility of access to the Internet and a high proportion of this population belonged to a select group of high earners.

The problem that exists in Latin American societies is not only about the minimal presence of computers and the Internet, it is more complex than this. The resources necessary to access this new technological world not only require that the people possess the technology and technical training but also the intellectual ability to use the technology to achieve their own aims (Wilhelm 2001). ICT are not only simple tools to use but also processes to be developed – communication, information or production processes. With these processes, with the facilities (“user-friendly” programs, digital production) that new technologies offer, the division between users and creators is disappearing, and those who before were users of (ICT) can now become creators. But for this the users must have the intellectual and technical preparation to create for themselves (Castells, 2000: 31).

Bonilla (2000) argues the following:

"Cyberspace, virtual communities or networks, constitute new playing fields that are reproducing and expanding the unequal social and cultural distribution which already exists for material and symbolic capital in the western world; however they also constitute playing space that offer the potential of empowerment for excluded social groups that through a strategic use can improve their standard of living, and promote processes of strengthening identity and constructing citizenship.

The rapid transformations that have been generated from the impact of new technology have created immense pressure on governments, schools and other educational institutions to successfully integrate technology into education. While various government projects have good intentions, they face complex barriers that impede the achievement of an effective and successful implementation. Schools are complex institutions and difficult to mobilise. Generally many technological projects fail due to a lack of planning. The task of transforming a school is so daunting that it is easy to understand failure, but the truth is that little is known about what is needed to successfully integrate technology projects into Latin American schools."

As an early response to the growing divide, and within the auspices of education reform in Argentina ruled by the Federal Law of Education 24.195 passed in 1993, the Government implemented the Social Education Plan<sup>i</sup> in 1994, to encourage, amongst other aims, the integration of technology as a way of improving the quality and equality of public education. In collaboration with iEARN<sup>ii</sup> Argentina, ([www.earn.org](http://www.earn.org)) which had been in existence since 1989, the TELAR network ([www.telar.org](http://www.telar.org)) was promoted. The TELAR (*TOdos EN LA Red*) network is a network of Argentinean schools, teachers and students administered by the *Fundación Evolución* and its expansion between 1994 and 1998 was supported and financed by the Program 1 of the Social Education Plan of the Argentinean Ministry for Culture and Education. The TELAR network is associated with iEARN (International Education and Resource Network), an international education network that enables students' access to international collaborative projects, constituting the Argentinean chapter of iEARN. In Argentina this network is known as

TELAR-iEARN in which more than 6,000 students currently participate with their teachers in the different projects.

The schools in the TELAR-iEARN network have access to databases, communicate through email, and work in virtual spaces called “conferences”, where they develop collaborative projects that can be included in the school curriculum. They also have access to all the basic tools for working with the Internet (web pages, video-conferencing, online chat, etc.) which complement the pedagogical work carried out around the existing projects in the conferences.

Work in conferences is the heart of the TELAR-iEARN Network Argentina. The conferences are public forums where there is a register of all the messages sent. They offer topics that structure the interaction in such a way that a wide range of opinions and writings from different parts of the world can be discussed in an organised way. Due to the fact that they keep a record of the exchange of messages past and present, they are ideal for the work of projects that involve students from different countries and hemispheres, who have different timetables for their school activities. Those who have been away for some time, can easily return to the chat or work. The conferences are organised in topics that include the most diverse subjects, from literature, social sciences, mathematics and languages, as well as ecology and care for the environment, health education, sports and human rights.

Each open conference on the TELAR-iEARN Network has a facilitator in charge, who assures that the participants periodically receive answers to their contributions and requirements. The facilitator also participates in the organisation of the conference activities, sends reports and collaborates with the publication or organisation of a final event in which the participating students share or show their work. The TELAR-iEARN Network sustains itself with the initiative and the contributions of all the people who participate. A global community of committed people and educators that orientate and facilitate learning inspired by the philosophy and vision of its founder, school master Daniel Reyes.

Program 1 of the Social Education Plan, “Better education for all”, supported those teachers who were implementing new teaching methods, particularly the use of technology. As part of Program 1, computers were sent to schools to be used as much for computer studies as for telematics. The *Fundación Evolución*<sup>iii</sup>, in collaboration with the Argentinean Ministry of Culture and Education was in charge of the initial training of one thousand teachers from 400 schools belonging to the Social Plan. This training had the objective that the teachers could take advantage of e-mail to communicate with their peers in other parts of the country and the world to associate classroom practice with the theories promoted by constructivist pedagogies, critical thought, the resolution of real-life problems and transforming practices. Although the Social Plan ceased to exist as such in 1999, *Fundación Evolución* continues with the task of bringing ICT to Argentina’s most impoverished schools. Through its network of provincial facilitators, *Fundación Evolución* now works in collaboration with the Ministry of Education, the educational portal [www.Educ.ar](http://www.Educ.ar) and other non-governmental organisations.

The degree of adoption of ICT in schools that received training from the Social Plan, varied from none or very limited in the vast majority of schools, up to the massive adoption within a small number of institutions (Lafontaine 1999). This study concentrated on

studying the reasons that favoured that, in two Argentinean state schools in unfavourable conditions, from geographically isolated zones, with few resources, situated in needy communities, the use of this technology could have an unusual impact on the educational community. Because of this, it studied exhaustively the *Centro Provincial de Enseñanza Media* N° 3 (Provincial Secondary School Number 3) (C.P.E.M.) in Zapala, Neuquén Province and I.P.E.M. 84 “Jorge Vocos Lescano” in Tanti, Córdoba Province, that adopted and successfully integrated ICT and whose practices went far beyond expectations, ending up as being national and international models.<sup>iv</sup>

Learning from the Pioneers is a study of the best practices of the TELAR-iEARN network, which has as its main objective to study the process that culminated in the integration of technology into school life.

The documentation of the process of integration of ICT into both schools enabled the identification of the key elements that helped these experiences to be successful despite the difficulties they faced for the fact of being marginalized and far from large urban centres. The results of this study, therefore, will enable *Fundación Evolución* to take these schools as models to reflect on the development and improvement of its activities, as well as making recommendations to the ministries of education and other educational entities on the factors that must be taken into account in the implementation of programs that have the objective of promoting the successful integration of ICT into schools.

## **2. Theoretical Framework**

In the industrialised countries of North America and Europe there is ample literature on the key factors in the design of a model for a technology project (Ely 1990, Read 1994, Fullan 1991, Hawkins et al 1996, Honey and Henriquez 1993). Although this literature corresponds to a different reality and context to that of Latin American countries, we start from these models to structure our study of the conditions and factors for the success of TELAR-iEARN schools. This work is the first step to develop an appropriate model for the Latin American context.

Studies in the United States have demonstrated that there is a series of aspects or factors that are constant in every technology project that has been successful. The exact number of these important factors varied from author to author. There is a minimum group that is present in all the lists. As an analytical framework to analyse the results obtained from the surveys and interviews of teachers in these two schools for this study we have chosen the five constant factors. These are:

### **2.1 Objective**

A factor that appears in the literature as important is that successful projects have a clear objective for the integration of technology. Moreover, the objectives have a clear and meaningful connection with wider educational objectives. In the majority of the cases these were understood by the teachers, parents and the local community in very specific ways, for example to improve reading and writing, increase technical abilities or to involve the community in projects. The objectives could vary between the different technology projects, but a consistent element in all was to directly associate the technology with the students and their experiences.

## 2.2 Leadership

Leadership at various levels is important for an innovative project to start, get rooted and grow. Between them, our study is more interested in leadership at the school level, which is divided between the director and the coordinators of the project. For a project to become well established there has to be a person that takes the initiative of directing it. More specifically, there are different aspects of directing that stand out in importance in a technology project.

- (1) Pedagogical vision: leadership needs to have a pedagogical vision focused on what is a good education and what is the role of technology within this pedagogy. The literature indicates that in many of the successful projects, technology is a medium to improve the educational experience, but never an objective in itself.
- (2) A long-term commitment to integration of technology: another characteristic of the successful cases is that the schools had a perspective of long-term changes. A complicated project must have an ambitious vision because they hope to achieve a big change, but at the same time, a patient attitude to make modest steps every year. Success seems to come to the schools that are prepared to cultivate and foster change with a horizon of 3 to 5 years.
- (3) Acknowledgement of the extent and depth of the problem: according to the literature the management and coordination in the successful cases acknowledged that the challenge of integrating technology has many facets and is linked with all the other aspects of managing and running a school – finance, pedagogy, teacher training, assigning classroom spaces, timetables, etc. On acknowledging the complexity of the process of integration, the school management and the project coordinator were willing to solve all the problems that could surface.

## 2.3 Professional development

Training is one of the most important elements. Teacher training both at a technical and pedagogical level consistently appears in the literature. This enables teachers to acquire new skills and to implement new practices and strategies for teaching. In the best case, the training has been designed to directly support a project's specific activities. Moreover, a successful project sometimes has adopted training strategies supported by local experience in the heart of the school or community.

## 2.4 Reflection and experimentation

Another strategy for the successful integration of projects is to start on a small scale and to experiment. With every small step the progress can be examined and reflected upon, strengthening the positive elements and revising the negative ones.

## 2.5 Time

Another key factor, which is multi-dimensional, in order to effect such a big change, is time. Time must be conceptualised in various dimensions because it is related to professional development, the pedagogical vision and the commitment of the school management. In the area of professional development, sufficient time needs to be programmed

for the teachers to be able to learn how to integrate new technology into their curriculum. Bearing in mind an active and constructivist pedagogical vision, time must be available so that the students can carry out technology projects. The timetable structure in schools – divided into 40-50 minute lessons is a big obstacle for students to concentrate and to delve into a complex project. And finally, is the commitment of the management to wait and to give the school sufficient time to go through the whole complex process involved in the integration of tools as powerful as those offered by ICT.

## **2.6 Infrastructure**

Infrastructure is very important for the long-term success of any project that intends to transform an institution. Time can be divided between pre-existing infrastructure and the infrastructure that is developed with the project to adapt to the new needs. There are various important elements of infrastructure:

- (1) Specialists and technical support: support from specialists and technicians is crucial for the long-term success of any technology project. The type of support needed transcends mere technical knowledge. Pedagogical and curricular support is essential. The coordinators have to start by instructing the teachers how to make significant use of technology.
- (2) Physical space: in North America no model exists that is more effective than another with respect to the way of distributing the computers. Schools have had success whether with laboratories or with computers in the classrooms. The only important factor has been that the computers are situated in a place that corresponds with their planned use, in such a way that students have the equipment available when they need it. The siting of computers in all cases corresponded to the pedagogical needs of the project.
- (3) Support from the professional community: the literature indicates that the schools with successful technology programs have had the support of the teaching community. Its role has been to collectively support the participating teachers as they struggle with innovation, to analyse the problems that emerge and to give advice.

## **2.7 Finance**

Finance is a continual challenge, but a project's success depends on the development of strategies for a sustainable development in the long term. The successful projects accepted the fact that technology is not a one-off investment, but a permanent cost that will be part of institutional spending.

## **3. Methodology**

A mixed work methodology was employed based on documenting the educational experiences in the classroom. A quantitative methodology has been integrated to complement the qualitative research. The central methodology consisted of carrying out a study of two cases of successful schools in the TELAR-iEARN network. Each school is a world with its own social system and, at the same time is situated within a wider context. Case studies enable the researchers to get closer to the experience lived in each school, illustrating in this way the particulars of each case that made the TELAR-iEARN network grow, put down roots and had an impact in each school.

The two schools included in the study, C.P.E.M 3 in Zapala (Neuquén) and I.P.E.M. 84 in Tanti (Córdoba), were selected under three criteria: the length of time in the TELAR-iEARN network, the consistency of the students' participation in TELAR-iEARN projects, and the commitment to the TELAR-iEARN network demonstrated by the coordinators. It was considered that these factors would indicate how deeply rooted educational technology was in the school, and the school's connection with the national network. To begin with, the team's interest was communicated to four schools, two of which were willing to collaborate with the study. Although it was borne in mind that the schools were not from the same region and that they reflected different socio-economic and urban situations, a study of this small magnitude could not represent the diversity of contexts that exist within the schools of the TELAR-iEARN network.

In each school the research team carried out a series of interviews and observations during one week. In each one they interviewed the following people:

- The original TELAR-iEARN coordinators
- The current coordinators, if they had changed
- The current directors
- The old directors, when it was possible
- The teachers that have participated in TELAR-iEARN
- The teachers that have not participated in TELAR-iEARN
- Participating students in TELAR-iEARN projects
- Ex-students who that had taken part in TELAR-iEARN, when it was possible

The team observed classes and took part in them. They also observed the computer and telematic laboratories, breaks, the teachers' room, the students' extra-curricular activities and TELAR-iEARN activities.

To complement the qualitative picture of the two schools, the research team implemented in Argentina a survey developed for the Stanford Research Institute Center for Innovative Learning Technologies (<http://scil.stanford.edu>) and the University of California, Berkeley (<http://www.berkeley.edu>). This survey is based on key factors for the integration of technology into schools, mentioned in the theoretical framework and it enables the measurement of the presence of these factors inside a school. The survey was translated and modified for the Argentinean context and was given to the teachers in each school so that they could give a global picture of its philosophy and pedagogical activities, its training and use of technology, and its relationship with the students, so as to later see the possibility of correlating those factors with the success of TELAR-iEARN.

## ***4. Introduction to the case studies***

### **4.1 Characterisation of the schools**

#### **4.1.1 Centro Provincial de Enseñanza Media N° 3 (Provincial Centre of Secondary Teaching Number 3) (C.P.E.M.) in Zapala, Neuquén Province.**

Zapala has a population of approximately 33,000 inhabitants with an average annual rate of growth of 29.8%. It is a city with a comparative disadvantage with respect to Neuquén's other cities because of its geographical and cultural isolation. The closest city is Cutral Co 80 Km. away and the capital city is 180 Km. away. The population's socio-economic level is low and the young people have little or no meeting spaces.

Sport does not even have a significant presence due the lack of enclosed spaces and the rigors of the climate.

C.P.E.M. No. 3 was created on the 19<sup>th</sup> of April 1960 and since then it awards the Perito Mercantil (commercial studies) certificates, which include a title of computing assistant. There are 1150 students enrolled who are distributed in three shifts, with a working staff of 140 teachers. C.P.E.M. 3 was one of the first five pilot schools in TELAR-iEARN, after the Escuela de la Costa school, and it is the only one in this group that is still committed to TELAR-iEARN 10 years later.

#### **4.1.2 Instituto Provincial de Enseñanzas Medias N°. 84 (Provincial Institute of Secondary Teaching Number 84) (I.P.E.M.)**

“Jorge Vocos Lescano”, Tanti, Córdoba Province is the only public educational establishment located in Tanti, a town 47 Km. from the provincial capital (Córdoba Capital) and 750 Km. from the federal capital. Tanti has a population of 5,000 inhabitants and its economy is based on tourism and the manufacture of regional products.

I.P.E.M. 84 “Jorge Vocos Lescano” was created in 1987 by a group of parents with the objective of creating a public secondary school in the town. The school consists of *EGB3* (years 7 to 9) and *Polimodal* (years 10 – 12) orientated towards Electrical studies and Electronics. The school’s infrastructure is in a precarious state, the classroom ceilings need maintenance, the rooms do not have heating and, because of this, winters are difficult for the students. The number of students enrolled in the year 2000 was 286 and about 41 teachers work there, a staff that is very united, many of who are founders of the school. On leaving, a very low percentage of the students go to university due to lack of resources. For the same reason many of them do not know Córdoba Capital which is only 47 Km. away.

#### **4.2 Demographic profile of the schools**

A survey was carried out to obtain a more accurate description of each school. The survey was designed to have more precision concerning the general context of the school, looking at areas such as culture and educational support, educational philosophy, teaching practices, the use of technology and professional development.

The survey was distributed to a total of 90 teachers in the two schools. These teachers had been in the school for more than one year and they teach more than one class in the school. The return percentage of the survey was 50% (45 replies), 36 from Zapala (C.P.E.M. 3) and 9 from Tanti (I.P.E.M. 84).

The people surveyed who replied included 2 directors, 37 teachers, 4 assistants and 1 pedagogical adviser. 80% of the teachers are women. All together, they form a staff with an average of 13 years in their profession (see figure 1), and more than 58% have worked for more than 10 years.

Figure 1: Years of experience in the profession	
Years of experience	Percentage of teachers
1 year	9%
From 2 to 5 years	5%

From 5 to 10 years	28%
From 11 to 20 years	33%
More than 21 years	25%

The survey examined how many teachers used the technology with their students and the way they used it. Of the total sample of 45 teachers, 47% (21) use computers with their students (users) and the remaining 53% (24) do not use them (non-users) (see figure 2).

<b>figure 2: Manner in which a teacher employs technology in his professional activity</b>		
	used with students	Not used with students
Assigned tasks and supervised the student in the use of the computer	15	
Assigned the use of the computers to students but they are supervised by another teacher	6	
Used computers in the school but not with my students		6
Did not use computers in the school but used them in other places.		13
I have never used computers to teach nor for other reasons.		5
TOTAL	21	24

The exercise of the teaching profession in Argentina is contextualised by important factors such as the number of hours of work, and the number of students they have in their class. Unlike in developed countries Argentinean teachers do not have hours assigned for preparing their lessons. The paid lesson hours are the hours spent teaching in the classroom. The sample of teachers represented in this survey work an average of 23.5 hours of lessons a week in the school (see figure 3). But, as it is common in Argentina for teachers to have various jobs and to work in various schools, we asked them the total number of hours they worked. All the teachers worked an average of 32 hours but the teachers who were users stood out as having more hours of lessons in the school in question.

<b>Figure 3: Average hours of lessons which teachers worked in the school studied and the total of hours the worked per week</b>		
	Lesson hours in the school (per week)	Lesson hours in the school (per week)
Users	27.2	34.9
Non-users	20	29.3
All teachers (n=45)	23.5	32

Another important aspect to understand the context in which they undertake their work, is the number of students per class, and the frequency of meeting them. As this data usually varies from class to class, we asked the teachers when responding to this section to think of the class in which they believed that they best carried out the work as a teacher (see figure 4). The teachers have an average of 28 students per class. 40% of the teachers only meet their class once a week and the remaining 60% meet with their class twice or more times a week. A correlation is observed between the use of technology with students, and spending more time in the same school and meeting the students more often.

<b>Figure 4: Results for the number of students per class and the frequency of meeting.</b>				
	Average	Frequency of meet-	Teachers whose	Teachers whose

	number of students	meeting per week (average)	classes only meet once a week	classes meet twice or more a week
Users	28.1	2.25	20%	80%
Non-users	23.3	1.5	57%	43%
All teachers	28	1.9	40%	60%

## 5. Case study: Centro Provincial de Enseñanza Media N° 3 (C.P.E.M.), Zapala

### 5.1 Objective

In C.P.E.M. 3 the department heads met to discuss the proposal. In 1990, the Internet was little known throughout the world and even more so in such an out of the way place as Zapala. Thus the discussion did not start from previous experience with the technology but from the possible pedagogical impact that the teachers could envisage from the little that they been told about the project. The not knowing in itself was considered a point against accepting to participate in the project. There was a certain fear towards this unknown technology and not being able to make it work, and rejecting the proposal was considered. Related to the fear of technology, was also the worry that it could be a waste of money. The cultural impact that a collaborative project from the United States and Russia could have was also discussed. The main worry was about the penetration of a pedagogical activity that would possibly follow the United States curricular guidelines and, therefore, would not respond to the needs of Argentinean students; and would end up extending the already strong influence, of the culture and values of the United States. A third factor against was the resistance to making changes in the method of teaching that would be needed to carry out the collaborative projects.

Factors in Favour	Factors Against
More resources for the students	Not knowing the technology
Contribution to the computing studies and English	Waste of money
Collaborating with other schools	Cultural penetration
Professional development of the teachers	Pedagogical changes
Breaking isolation of Zapala	

The points in favour of participating in iEARN that were discussed at the time were: the impact it could have on the students and on the teachers. Amongst the factors that could affect the students, the first point teachers found attractive was the fact that the project would entail providing more resources for the students in a school with a lack of resources. Whether it was successful or not, these were resources to which the students otherwise would never have access to. Also, that it would be unheard of that a state school had access to such technology. It meant a way to finally start introducing equal opportunities, which is one of the key concepts in Argentina's education reform. The second point in favour was the link the activities to be carried out had between technology and the subjects that were taught. For the Information Technology and English departments particularly, iEARN would be an excellent curriculum resource.

In the case of English, teachers stated that the arrival of the first messages in English from students in USA caused a very positive impact on students' attitude towards the subject. For the first time, students could see that a foreign language had some sort of significance for them. Furthermore teachers quickly felt that the incorporation of this technology had a potential that they would have never imagined. The English Department became an essential pillar for the participation in international projects.

The main positive impact on teachers was that the professional experience of participating in iEARN offered a change, the chance to experiment and to learn something new. It would not only be innovative trying to carry out the collaborative projects, but also that the global connections provided by Internet would put them in contact with teachers all over the world. It would be constant professional training on teaching practices in many countries.

The last factor that attracted them to participate in iEARN, and not the least important was the hope to break the isolation of the school. This could have an enormous impact on the educational community. Zapala is on the North Patagonian steppe. The nearest city is 80 Km. away. The technology promised to connect them to the whole world, through a virtual world where geographical distances lose all meaning.

In spite of the fact that at this stage work in iEARN was predominantly in English, the first project the school got involved in, was in Spanish with the *Escuela de la Costa* school. It was a project about an oil fuel spill that occurred near Puerto Madryn in which many penguins were covered in oil, putting their lives in grave danger. Students at the *Escuela de la Costa* shared with C.P.E.M No. 3 the actions that were carried out to save the penguins. This first project was successful for teachers and students, but coordinators were still facing the problem of increasing participation. It was easy to motivate students, since a project with penguins had a big repercussion and they were thirsty for more projects. Their motivation was, in fact, an important factor to encourage the participation of other teachers.

## **5.2 Leadership**

The coordinators lead the project and developed strategies to help disseminate the project amongst teachers. They planned and designed training courses in order to deepen the knowledge on the pedagogical advantages of iEARN, creating easy and clear ways to promote participation in iEARN. In order to improve technology skills, coordinators organised and gave a workshop on e-mail and discussion groups to their colleagues. This workshop helped teachers to overcome their initial fear of the technology and confirmed their confidence and ability to introduce technology into the classroom.

The coordinators also followed a strategy, which demonstrated the use and impact of ICT and iEARN. The first projects of C.P.E.M. 3 had a very public component so that other teachers, students and the community could see the impact of participating in these projects. The best example, maybe, was when the school participated in a video-conference with the Argentinian Ambassador in the United States. During the interviews in C.P.E.M. 3, many teachers remembered that it was that occasion which enabled them to realise the power of this technology.

A third strategy that the coordinators put into practice was to create small activities for teachers to incorporate into their classes. For example, in history and geography, the teachers asked their students to design very simple questions relevant to the curriculum. These questions were sent to various schools around the world by e-mail. As the answers arrived, the students learned about the similarities and differences between people through an authentic communication. Thus, geography and history teachers who before were sceptical about the technology, could see how they could enhance the learning of their students.

A fourth strategy developed by the coordinators while participation grew, was to identify projects specific to iEARN which were appropriate for certain teachers, to create a plan of specific activities and to help the teachers to carry them out.

The leadership of the directors, even though they were not directly involved in the project on a day-to-day basis, was decisive too: from the start, the directors of C.P.E.M 3 gave their total support to the project. This support was shown in several ways. The most important function of the directors was to promote and protect all the changes needed in the infrastructure, the use of said infrastructure and the money for the project to proceed.

A final factor that was fundamental to the institutionalisation of the technology within the life of C.P.E.M. 3 was the creation of a Telematics department by the management. This department is the only one in the province. It is an interdisciplinary department because it uses its resources to promote and support collaborative projects using technology in all curricular areas.

### **5.3 Professional Development**

The initial training of the coordinators was complicated because of the distance between participating schools (one in each province). Therefore it was impossible for all the coordinators to meet frequently at the school in Puerto Madryn, which was the main headquarters of iEARN -Argentina. Furthermore, the school at Puerto Madryn did not have much experience with the project, but there was a telematics technician. People with more experience were in the USA. iEARN provided manuals and printed materials so that schools could train themselves to a large extent.

In Zapala, the coordinators used other ways of training apart from those that were programmed. On their own initiative they asked the provincial Education Board to finance more trips to Puerto Madryn in order to work with the technician there. But, the coordinators trained mainly in telematic areas (the appropriate configuration, software, cables...) using a short-wave radio. From 10pm at night, they would gather at a friend's house who was an amateur radio fan to communicate with the technician at Puerto Madryn, so they could explain technical questions. They would take notes, and next day they would try it out again at school. If it did not work they would go back to the radio the following night. Apart from the total dedication both coordinators showed, it must be stated that they already had a good knowledge of English and computing. The only technological aspect that was new to them was that of telecommunications. The head of computing already knew the part on information technology. The presence of this knowledge was not always given at schools invited to participate in the TELAR network.

## **5.4 Reflection and experimentation**

The fact that the project started at that same time in the USA, Russia and Argentina, made it possible for directors, coordinators and teachers, as well as international coordinators, to jointly look for the way forward and to sort out common problems. This gave more assurance to the first participants, since the challenge was common to all. The first successes were as small as a message interchange between students from Puerto Madryn and its school brother in the United States.

## **5.5 Time**

The heads: one of the conditions for participating was that the Education Board asked the first school for full commitment on the part of the heads of the English and computer departments. At that time, in the Neuquén Province, the heads only had twelve hours per week as heads. This means that, at C.P.E.M. 3, the two coordinators had some free hours to dedicate to the project (hours that they did not have to dedicate to students). Obviously, the coordinators dedicated more hours to the project, but those hours gave them time to coordinate with other teachers and/or the students.

## **5.6 Infrastructure**

Within C.P.E.M. 3 there were various factors that helped to start up and successfully maintain the TELAR-iEARN project. Some factors were present before the project was up and running and others were incorporated during the project.

Faced with the difficulties of integrating an interdisciplinary project into a traditional curriculum, and without the initial participation of many teachers, the coordinators decided to establish a club for the promotion and development of projects. Thus the Telematic Club was born. This club is in charge of choosing the projects, looks for teachers who are interested, and coordinates with them the students' work and the use of the technology. In general, the teachers and students who belong to the club look over all the projects offered through TELAR-iEARN and choose those which are interesting. If there is no one in the club who can help to coordinate the project, they look amongst the other teachers. Sometimes the project is incorporated into the curriculum of a class and sometimes they are extra-curricular studies.

## **5.7 Finance**

Finance is the weakest point of TELAR-iEARN in every school. It very much depends on the support and the bureaucratic skill of the director. The TELAR-iEARN project receives a lot of support from the community in Zapala. The local Internet provider subsidises part of the fee and a few companies pay for the rest of the fee, stationery and other materials. In order to fund the Telematic Club, many young people who belong to the club have sponsors among the businesses in Zapala and the neighbouring towns, who pay a small monthly quota. To renew equipment, they also organise raffles and other activities to collect money. Were it not for these additional contributions from the community, the project could not continue in the school.

## **6. Case study: Instituto Provincial de Enseñanzas Medias N°. 84 (Provincial Institute of Secondary Teaching) (I.P.E.M. 84) "Jorge Vocos Lescano", Tanti, Córdoba Province**

The secondary school I.P.E.M. 84 "Jorge Vocos Lescano" has been part of the Telar network since 1994. Its incorporation was part of the Argentinian Government's Social Plan. I.P.E.M. 84 was one of 20 schools in Córdoba in the Social Plan. The Education Social Plan would connect 500 schools that year, but only two teachers per province went to the meeting. The two people from Córdoba that went there, represented the only schools in Córdoba in the Plan Social which today actively participate in the TELAR network.

### **6.1 Objective**

Tanti is part of a community isolated because of exclusion and poverty in an urban area. This new opportunity which emerged for the school to participate in the TELAR network, whose potential was identified by the leaders who instigated and supported the project from the start, offered the school and the Tanti community an enormous motivation and the only chance, due to its limited resources, to interact with other educational establishments in Argentina and around the world.

In order to understand the pedagogical vision of the TELAR network, the Tanti coordinator emphasised the importance of the First iEARN meeting. In this meeting she met the Zapala teachers and teachers from many other places, among them teachers from countries who already had years of experience. For her, to be part of the TELAR network offered an opportunity for her own professional development and that of other teachers, and for her students' personal growth. Her aim was that all the students had access to the new technologies and new opportunities. She used to say: "My students are the same as others (...) they must have the same opportunities".

In 1997 various students participated in a project which had a great impact on the community. Supervised by the UN, they were part of the *Atlas del Movimiento Estudiantil* (student movement atlas) project, where they reforested areas affected by forest fires. At the start of the project, their aim was to study the soil because of the amount of fires that took place every year. The research carried out led them to get into contact, through the TELAR network, with a school 300 km. away that was working on a forestation project. The students at the I.P.E.M. 84 researched which trees they needed and asked for them. When these trees grew, both schools were able to work together planting the trees in areas that had been burnt. This was an opportunity remembered by many students for the contribution they made to preserve the environment, the acknowledgement of their work in different domains and because they had the opportunity to present it, to be acknowledged for their efforts outside of school and to do real field work.

Also through the TELAR network many of the teachers had the chance to participate with their students in different Olympics: the Geographic Olympics, a competition coordinated by the *Fundación Evolución*, sponsored and financed by the national Ministry for Education and with the support of The National Geographic Society whose main objective is the promotion of knowledge and understanding of the geographic space; the Invention, Science and Technology Olympics; and the Argentina Health Olympics or-

ganised as part of a national health education project. Witnesses emphasised that they could:

- Share their day-to-day work and to be acknowledged for it;
- Reflect on their role as teachers and the way in which they would structure their class the following year from the methodology used with their students to carry out the necessary research to participate in the Olympics;
- Acquire new knowledge in their own subject;
- Encourage their students to be more responsible for their own learning and that they should be more involved in real and meaningful experiences

## **6.2 Leadership**

The information technology teacher led and was the coordinator of the integration process of the TELAR network at the school. She had the time to carry it through even though she was not allocated extra institutional hours. She had total flexibility to introduce the projects into her information technology classes because she could teach computing tools through participating in the projects. When the TELAR network started in Tanti, the information technology teacher, who was also working in another school in Carlos Paz, decided to move her hours to Tanti in order to have more time in that establishment and thus dedicate her time to moving the project forward. The fact of dedicating more time to the school in Tanti coincides with the results of the survey that indicate that one of the most important factors for integration of ICT is to have a high concentration of hours in the same school (See figure 3).

With all her enthusiasm and her great relations with her peers, she found two strategies to integrate the TELAR network projects into the school and promote their integration into the curriculum. The first one consisted of identifying the relevant project and showing it to the teachers who might be interested (for example because it was related to the subject they taught) and in this way motivate them to participate offering pedagogical support and constant technical support, since she had the knowledge to do it. The second strategy consisted in motivating the students showing them the projects first so that they would motivate their teachers.

The management also played an important role in strengthening the project over the years. The support of the director was important when choosing the coordinator and also organising their responsibilities for incorporating the project. But more important was the support of the management to finance the project and its infrastructure.

## **6.3 Professional Development**

The Social Plan program offered a few workshops on information technology and telematics. The teachers in Tanti recall that only two workshops were given apart from that meeting in Puerto Madryn, which was attended only by representatives from two schools, and where they were introduced to the TELAR network's pedagogical view. These two workshops were the only training received by the schools involved in the Social Plan from the TELAR-iEARN network.

Tanti was an unusual case, since the information technology teacher had a diploma as a systems analyst, was a qualified teacher and also had another certificate in education

technology. Therefore she started organising and offering training courses, in the school, for the teachers and directors.

#### **6.4 Reflection and experimentation**

The space to experiment in Tanti enabled them to find solutions to obstacles that arose in other areas: lack of sufficient institutional time to incorporate projects into the students' and teachers' day, and the need to widen the technical support. In Tanti, the possibility of adapting the information technology class curriculum in order to incorporate ICT was decisive. With this experiment, the coordinator managed to respond to two problems. On the one hand, she created institutional time so that the students worked on the TELAR projects. On the other hand, she is training a technical support group amongst the students who can help to maintain the infrastructure.

#### **6.5 Time**

Before entering TELAR, the school had information technology classes. However, on introducing telematics and the concept of working in projects, some changes had to be made to the curriculum. The director at the time encouraged and allowed the coordinator to modify the information technology curriculum in order to include telematics and that it should be more project-based teaching. Thus the coordinator created her own curriculum. Project-based work enabled students to learn information technology writing a final report, designing a web page, or analysing data through spreadsheets within interdisciplinary tasks such as research on the environment or local history.

#### **6.6 Infrastructure**

The support of the director was continual from the start. I.P.E.M. 84 was a technical school and so the majority of its members considered the integration of the TELAR network as a logical and important step they had to face. In the same way, the community, which has a very collaborative and communal atmosphere, was a great support, since it was the parents and teachers themselves who founded the school. It was through the support of the community that the information technology lab could be equipped. To date, it has 9 computers connected to the Internet.

The coordinator was in charge of the technical support at the school. However, as the school has a technical orientation, she decided to train the students so they could also carry out the technical support. These students have access to the computer classroom any time it is empty. Since the telephone line that enables them to access the Internet is connected to a cooperative and communication is difficult to achieve, students take it in turns at various times and persist until they manage to get connected. Then they call everybody so they can read the messages related to the projects in which they participate.

#### **6.7 Finance**

The support of the community was crucial for the finance of the connection. The parents association pays for the telephone line. The local telephone cooperative, which is the town's telephone company and the only Internet provider, allows the school to connect

to Internet free of charge. The students collaborated with raffles to renew the equipment, as the establishment did not have financial support of any other kind.

## ***7. Benefits of the TELAR network and telematics***

During the field research in both schools, the teachers involved in the TELAR network explained how they observed several changes at the school and amongst the students. These changes go beyond technical knowledge. There have been changes in the activities carried out in the classroom, in students' motivation, the level of autonomy and the responsibility they have. In the two schools visited, the students at the telematics club or from the technology support team, perform an important role in maintaining the activity at the school. These students are in charge of the maintenance and repair of the machines, the selection and promotion of projects and recruitment of teachers to work in the TELAR-iEARN network. These projects have expanded the students' learning activities beyond the school walls. An important aspect is that in order to communicate through the net, the students study more about the various aspects of their own community.

The results of the survey correspond with the comments of the teachers interviewed. The survey included an item on the benefits observed amongst students within two global dimensions: the psycho-social development and the learning of knowledge. The results of the survey indicate that teachers observed that learners experienced benefits with relation to various dimensions (See figure 5). In the area of psycho-social development, 91% of teachers observed an improvement in self-confidence, 86% saw benefits in the ability to work independently of the teacher, and 86% think that students were making bigger efforts. In the area of intellectual development and learning, 76% of teachers observed an improvement in comprehension, and 67% think that the increase in abilities extends to more students, and not only among a group of gifted students. Furthermore, 62% of teachers indicated that their students are researching more complex information.

Figure 5 - Percentage of teachers who noticed the following benefits among their students from using technology	
The students feel more confident about themselves	91%
The students work more by themselves without direct supervision of the teacher	86%
The students make more efforts in tasks when they use computers	86%
The students have a deeper understanding of the concepts they come across	76%
The students can show their abilities more evenly, it is less concentrated in a few gifted ones	67%
The students research and interpret more complex information in a more reflexive way	62%
The students' quality of writing is better when they use a word processor	48%

These observations have encouraged teachers to integrate TELAR and ICT into their pedagogy as a tool to increase the students' commitment and to deepen their knowledge

across several content areas. One item in the survey asked teachers to choose the three most important objectives for the use of technology out of a list of nine options. These went from assigning technology to achieve an advanced knowledge of technology, up to assigning technology to support the learning of other subjects. The results showed a certain variety of responses, but there was a clear preference for objectives that used technology to deepen and expand the student's learning in the other areas. A majority of teachers use the technology to look for information (57%) and to reinforce knowledge the students have learned (52%). After that, the technology is an analytical tool (43%) and it facilitates collaborative work (48%). Only 29% of teachers consider computing as the main objective for the use of the technology.

**Figure 6 - Most cited objectives by the teachers to make their students use computers?**

To look for ideas and information.	57%
To reinforce knowledge / skills	52%
To learn to work collaboratively.	48%
To analyse information.	43%
To communicate electronically with other people.	33%
To improve their knowledge on computing.	29%
To express oneself through writing.	19%
To present information to an audience	5%

The projects carried out in each one of the institutions, the interviews and the results of the survey on the benefits observed amongst the students, evidence an active and constructivist learning. Furthermore, 100% of the teachers who used the technology declare that they have learned to teach in other ways thanks to it, and 63% of them define their role as a teacher mainly as a "facilitator".

## **8. Conclusion**

The successful experience of the two schools studied, fits into the theoretical framework on which the study is based. In different ways, the educational community in both institutions managed to overcome the difficulties for which many other schools did not manage to implement the program and integrate ICT into school life.

### **8.1 Objective**

iEARN international and the Argentinean Ministry for Education had their own objectives in order to implement their program, to improve the quality of life of the planet and its inhabitants and of secondary education, respectively. Apart from these objectives, the project succeeded in each school because the school community adapted it to its own needs (to break the isolation and exclusion, to provide basic contents on information technology and English; to promote professional development, pedagogical reform and social equality).

### **8.2 Leadership**

The constant support of the directors of both schools made it possible for the institutional changes required by the integration of technology into the school on participating in the TELAR-iEARN project to be made. The extension of the project in every school was achieved thanks to the efforts of the coordinators, their clear vision of the potential offered by ICT as a means for the professional and educational development of the whole school community, and their effort to generate small actions with this goal.

### **8.3 Professional Development**

The interviews in both schools showed the difficulties faced by the teachers to overcome the deficiencies of the program described by Lafontaine (1999) and to create their own professional training. Given the lack of resources, the network became for them a source for professional development in itself. Furthermore, both schools were able to overcome the obstacles because they had an information technology teacher, whose technical ability allowed them to enter into the world of telematics. In the case of C.P.E.M No. 3, they had a teacher of English whose knowledge of the language enabled them to participate in iEARN at a time when very few projects were in Spanish.

### **8.4 Reflection and experimentation**

The flexibility to experiment and adapt the programme to suit every school was very important. In both cases, they started simple interchanges and experimented with specific actions. These enabled them to reorganise the institution, to try out the equipment and to encourage the enthusiasm of teachers and students to obtain a massive participation of the educational community.

### **8.5 Time**

In both schools the two coordinators could have hours outside of their teaching timetable to dedicate to the project. This time was generated by the same school institutions. However, most of the time the coordinators dedicated, they did so as volunteers.

### **8.6 Infrastructure**

The experiences and strategies used in both schools confirm that computers are not the only necessary infrastructure needed for such projects to succeed. To have access, if possible, to a dedicated telephone line; to get a stable Internet connection, to have appropriate technical and pedagogical support, and the space for students to have equipment available are equally important.

### **8.7 Finance**

The interviews in both schools show the difficulties faced by the teachers in overcoming the lack of finance, a crucial aspect for the sustainability of the integration of ICT. Both schools, with no support whatsoever, had to develop their own strategies. The project was sustained thanks to the support and bureaucratic skill of the directors and coordinators; the support and creativity of the teachers and students; and of the community in general.

Finally, the study also shows that the teachers in a school can have a decisive role in overcoming the digital divide. Many teachers expressed their strong social compromise to attain equality and to get more resources for their students in an impoverished environment.

“I want my boys and girls to have access to what others have, they are the same as all the others and they have to have the same possibilities. Today my school has access, but I am worried for all the others too”. (Coordinator TELAR-iEARN Tanti)

## ***9- Recommendations***

During this study we have learnt about the difficulties of integrating technology into schools in Argentina. This is probably applicable to schools in similar contexts throughout Latin America. The two case studies show the individual challenges that every school and its educational community faced and the way they overcame the barriers in order to improve the education of their students.

Based on this study, we have written a series of recommendations to guide future attempts to create and develop other projects for the integration of educational technology:

- To develop the programme based on clear objectives based on real life. These will have to have a flexibility which will enable schools to adapt them to their own institutional project, to their needs, to those of their educational community, and to the interests of their students.
- To plan to start on a small scale, extending the program through time, monitoring closely in order to make changes and improvements based on concrete experience.
- To select the schools through a competition or a call for proposals in which the schools show a commitment to an institutional project for the use of ICT. Thus one can be sure that the school is committed to work.
- To plan for continuous and sufficient technical and pedagogical training, either with real teachers and/or through Internet. This training should include training of staff in the maintenance of the computers.
- To create the programme based on the native languages (or most common) of the students.
- To insure that every school has the minimal resources necessary to start working on the project and, if possible, a telephone line dedicated to the program.
- To look for the support of the directors of the school.
- At the school level, to promote the selection of those teachers with leadership skills to coordinate the program and to be trained first. These leaders should be trained to have a clear view of the educational potential of the technology in their schools, a general view of the process of integration of ICT and of the changes that favour their integration into a school. Thus they can find appropriate strategies in every case.
- To develop strategies to create sufficient time for teachers and students. For teachers, time must be within their working day, and for students there are mod-

els for implementing within the courses or as an extension to their extra-curricular learning time.

- To allow flexibility for teachers participating in the programme to adopt and experiment with the curriculum.
- To incorporate activities and support to encourage connections between the school and the community.
- To provide sufficient finance at the start for the initial phase and to help the school or any other local education organisation generate strategies for self-financing and to develop public policies that promote the collaboration of the private sector.
- To keep continuous track of the schools that participate in the project to learn from their experience and to question aspects on the programme, if necessary.

Finally, an interesting fact about these two schools is that in August 2000 they both applied to be integrated into the GEMS Program (Global Education Model Schools - [www.schoolsonline.org](http://www.schoolsonline.org)), an alliance between iEARN and the organisation Schools Online, whose mission is to provide equipment to schools who lack resources. The two schools on which we based our study were awarded a computer lab with 10 of the latest generation computers with Internet access. The labs were installed in March 2001.

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<sup>i</sup> Social Education Plan: In 1993 the Federal Education Law was implemented in Argentina. This had the objective of generating educational reform, which would minimise bureaucracy, decentralise the management of the educational system to the provinces, and improve the quality, equality and efficiency of Argentinean education. A central aspect of this reform was dedicated to improve education in poor and rural areas, which suffered from a lack of furnishings, precarious infrastructure, teachers lacking motivation, and high indices of repetition and school drop out. This part of the law was designated the Social Plan. In 1998, the social plan had already been extended to 12,000 schools and 3.5 million students of initial, primary and secondary levels.

<sup>ii</sup> iEARN ([www.iearn.org](http://www.iearn.org))

(International Education and Resource Network): Was founded in 1990 in the United States by Peter Copen, and is based on a pilot exchange project, which linked schools in Russia and the United States. The main objective of iEARN is to contribute significantly to the intellectual, human and spiritual development, and to the welfare of the Region, Country and the Planet through telecommunications. iEARN currently connects schools, teachers and students in more than 90 countries. The participation in this network enables students and teachers to be involved in collaborative projects in almost every discipline. These projects, which are proposed by teachers and students from around the world, are easily integrated into the school curriculum.

<sup>iii</sup> *Fundación Evolución*. Was created in 1991, with the aim of providing a legal framework for the activities of the TELAR-iEARN network and the educational programs derived from their activities. Since then *Fundación Evolución* coordinates, supports and promotes the participation of Argentinean schools in the TELAR-iEARN network. It also coordinates educational programs with presential events generated from the interaction of the schools in the network.

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<sup>iv</sup> The field-work in these two schools was carried out in august 2000.