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Collaborative Learning Environments. A Response to the New Challenges of Colombian Education

Claudia María Zea Restrepo

czea@eafit.edu.co

María del Rosario Atuesta Venegas

matuesta@eafvit.edu.co

Miguel Ángel González Castañón

mgonza@eafit.edu.co

Jorge Ignacio Montoya Restrepo

jmontoya@conexiones.eafit.edu.co

Irma Urrego Londoño

iurrego@conexiones.eafit.edu.co

Línea I+D en Informática Educativa- Universidad EAFIT
<http://www.conexiones.eafit.edu.co>

Abstract

EAFIT, a Colombian University, with financial support from *Colciencias*, the Infodev Program and other organizations, has been working on the *Conexiones* project since 1992. *Conexiones* developed an innovative model (now used in the classrooms of more than one hundred urban and rural schools), integrating pedagogical methodology, a computer literacy program (for teachers, students and community leaders), a technical support methodology (involving university students and more advanced trainees), a low-tech networking technology (using dial-up solutions to interconnect remote schools), computer interfaces and locally developed educational contents.

Keywords

Learning environment and ICT, technological learning environments, school networks, collaborative environments, collaborative school activities.

1. Introduction

It can be said that nowadays, that to carry out the majority of human activities depends to a large extent on the effectiveness of technologies, the means of communication used, their organizational systems and access to information. For this reason, it is of vital importance to understand the merits and possibilities of information and communication technologies (ICT) and, through this to seek the development of cognitive and evaluative abilities in children, so that they can effectively carry out social processes in all their daily activities.

The reader can confirm that all the articles on this subject start with a series of statements similar to those in the previous paragraph. In *Conexiones*, as a research group, we consider such ideas as only a working hypotheses. Will all human activities really depend substantially upon access to new technologies and their use? Do the technologies help collaborative working? Is it true that computing helps to improve cognitive development at school? Is it really a pedagogical advantage to have access to a lot of information? This position radically changes the strategy for approaching the subject. Without accepting such statements as true, we proposed to submit them to systematic evaluation. To this end we designed a project of a global nature, the core of which is a proposal for integrating information technology into the classroom, curriculums and institutional educational projects. The conclusions and lessons learned are many, but we can definitively affirm that there are no magic effects in the use of technologies, that the contextual conditions of each educational institution vary greatly and that it is therefore risky to give a general recipe for convenient pedagogical practices. As in all educational innovation, we confront a complex process that goes beyond some didactic abilities that the teacher learns during training and that can be reproduced during practice. This study attempts to highlight some critical aspects and alternative ways of confronting them so that at least some of the visionary prophesies about the world of telematics and globality manage to take root in the minds of our children and teachers.

Faced with this challenge, *CONEXIONES* proposes the restructuring of learning environments. *CONEXIONES* is a research project of a regional nature in Colombia, based at EAFIT University and the Universidad Pontificia Bolivariana, with the financial support of *Colciencias*, InfoDev – World Bank, UNESCO and other national and international organizations. On the basis of an education for a sustainable future, it seeks to integrate information and communication technologies into the basic education curriculum, as a contribution to the improvement of the quality and the equality of Colombian education.

This proposal has been put into operation based on school technological activities developed to make an inter-school network more dynamic. Applying the didactic form known as “collaborative projects” (Hernández and Ventura 1994), strategies are brought together, such as: working through projects, collaborative learning, curriculum integration, multimedia environments, productivity tools, and educational software. The evaluation processes give the opportunity of analysing their effect on the education of children at a basic level. In particular, *Conexiones* seeks to evaluate their impact on the development of: (1) human, cultural and ecological values; and (2) practical intellectual abilities for school such as: communication, systematization of information, adapting to change, team working and a conscious construction by the student of their own style of learning.

Eighty educational institutions, both public and private, currently participate in the *Conexiones* experience at a national level. These are located in the departments of Antioquia (50), Santander (12), Bolívar (3), Atlántico (5) and Valle del Cauca (10). These institutions are interconnected by three regional branches, coordinated by the EAFIT University (Antioquia, Valle del Cauca and Bolívar), the Autónoma University of Bucaramanga (Santander) and the Norte University (Barranquilla), and are composed of the following local, regional and national participants:

- ✚ Boys and girls in grades 2 to 9 in basic education
- ✚ The teachers for these same grades
- ✚ Teaching Directors
- ✚ Educational agents – university students linked to the program of social educational service
- ✚ Parents
- ✚ Municipal and Departmental Secretaries for Education
- ✚ Researchers and Institutions of Higher Education.

2. Connections: the infrastructure

The project is supported by a technological infrastructure consisting of four platforms (components): namely: telematics, computing, school activity and monitoring/evaluation.

Telematics Platform

The telematics platform is based upon a network of communications called interschool *CONEXRED* (Carvajal and Gómez, 2000), to which the 80 educational institutions are connected electronically. The objectives of this network are to provide the necessary means for facilitating communication between students, teachers and educational institutions, and to provide them with access to a large volume of information. Figure 1 shows the architecture of the basic pilot network.

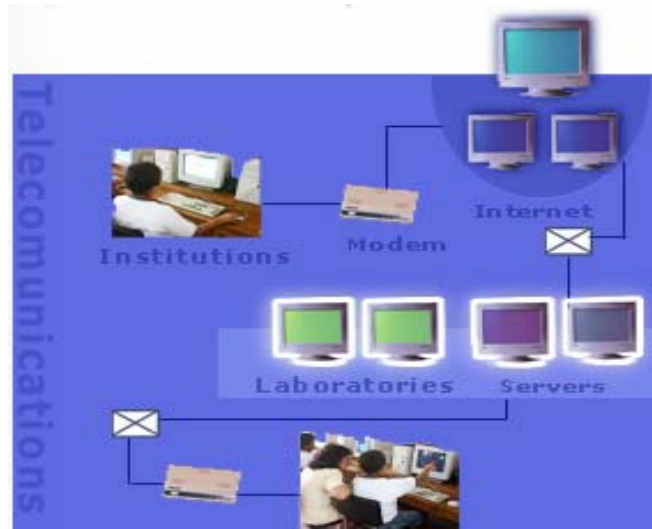


Figure 1: Architecture of the basic pilot network, designed by CONEXIONES

Informatics Platform

A multimedia graphic interface called *La PachaMama* (Mother Earth) has been developed as part of the computing platform. This helps to bring children closer to information and communication technologies and fulfills the function of articulating, in a significant way, applicable communication services in an environment close to the user.



Figure 2. *La PachaMama* graphic interface

The interface is the product of a combination of communication, education, learning psychology, design and informatics theories (Atuesta et al., 2000). It successfully interweaves a combination of elements (graphic art, sound, animation, video and text) with the capacity to interact with the student. In this sense the interface responds to the needs of the final user (Lewis & Rieman, 1993). The interface is based around the provision of the task or activity to be undertaken by the user. Teachers and students can access productivity tools and educational software through *La PachaMama*. This helps consolidate the function of the interface.

La PachaMama was designed taking into account factors of a human, practical and efficiency-related nature. With respect to the human factors, the knowledge that the teacher could attempt use it with the students in the realization of various activities, conceived from teaching practices, was considered to be important (Mellar, 1997). The factors of a practical nature such as the availability of equipment in the educational institutions and access to telematic tools of pedagogical or instrumental use by teachers and students was revised. With respect to factors of efficiency, the following were considered: the level of interactivity in searching for information, taking decisions and responding to different alternatives; ramification, offering a large number of possible activities; transparency of use in a simple and rapid fashion; the possibility of navigating as an adventure or as a free and pleasant journey (Ramirez 2000).

La PachaMama makes use of multiple spaces, is rich in materials and experiences, which capture the interest of children and young people. These spaces allow them to explore, observe, analyze and build their own knowledge.

In the inter-school network, *La PachaMama* is a meeting place for users of different ages, economic and cultural levels. This environment of interaction and learning also aims to help in the development of constructive thinking. It is more than a product, it is a system for evaluating the teaching and learning processes.

The computing platform allows students and teachers to access a series of software tools, provide data and information, and build knowledge. It opens up to the child, the teacher and the educational community, a wide range of valid alternatives for education, such as: creation of new environments, transformation of perception, integration of different areas of the curriculum, research activities and direct contact with technology.

It is important to consider that a network, communications interface and software in themselves do not provide the capacity to connect elements for cooperation, and only allow the flow of information from one element to another. This is where the importance of the teacher as director and guide comes into play. He is, therefore, an essential part of the learning process and is the person that makes the whole technological school activity dynamic, so that it can be undertaken on the two platforms described previously.

School technological activity platform

CONEXIONES proposes the restructuring of the learning environment into which student, teacher, technologies, subject areas, projects and collaborative school activity are integrated into the classroom, and where each one of these components acquires a new role and a new form of interaction.

The student becomes the active and central element of the educational process. It is for the student that the learning environments are structured, allowing freer styles of learning, especially the praxis of the cognitive strategy of learning to learn.

The teacher becomes the learning facilitator because he acts as an element that stimulates, orientates, animates and facilitates the process according to the characteristics, needs and interests of each evolutionary period.

Technologies, especially those of information and communication, should be an integral part of modern education (Gutiérrez 1997). Their effective use allows educational institutions to carry out their mission of dissemination and research. The computer exceeds its traditional roles as a simple tool for word-processing and individual computing and becomes a tool for community use that facilitates the undertaking and coordination of cooperative, information based tasks. As a tool for communication, computers minimize the barriers of time and place by making use of their own means of telecommunications.



Figure 3. The school technological environment

Collaborative school activities, from the perspective of any of the subject areas of the curriculum, in particular technology and computing, are the crux for innovation in socio-cultural aspects pertaining to the pedagogical environment. This type of technological

activity involves the development and growth of human talent as a spontaneous, effective and cooperative process, in contrast to current western culture based on competition and copyright (Johnson and Johnson, 1987). These cooperative activities permit communication of both internal and external information in such a way that the group working on a given project can exchange information with other groups. During this process the groups can consult different aspects of the design, receive relevant data, consult directly with national and international experts and, in general, develop the abilities of communication and systematization of information that are central to the scientific and technological process.

It is, therefore, the objective of *CONEXIONES* to promote, through activities inside and outside the classroom, a favorable atmosphere for the development of communication infrastructures. It seeks to assist the training of teachers and students in participation, leadership, team working and the appropriate use of the aforementioned technology, until geographical barriers are broken down, enabling the creation and sharing of visions of a flexible and more natural future. In a society that is ever more interdependent, it is necessary to educate citizens that are capable of communication and collaboration with colleagues in other countries, thanks to a better knowledge of the economic and social structures of their neighbors.

3. Activity with the teacher

This type of innovation, centered on the introduction of a new resource or method, takes on a pedagogical meaning by becoming integrated into a certain pedagogical vision. What are the relevant subjects in this case, so that teacher training might be the motor for an improvement in quality via the proposed innovation? *Conexiones* has defined three subject areas based on its own experience, parallel experiences and specialized literature. These are taken in four complementary cycles of 45 hours each, making a total of 180 hours of instruction (González et al. 2000). The areas that make up each cycle are:

- ✚ **Pedagogical area:** learning about principles and concepts is the fruit of theoretical reflection on education. These make it possible to lay the foundations, justify, comprehend, and give direction to innovation with new technologies, their integration into the curriculum and into the institutional educational project.
- ✚ **General didactic area:** methodological concepts and procedures that enable the incorporation of the best potentialities of information and communications technology into teaching work. They improve the quality of the learning environment and the results.
- ✚ **Technological area:** concepts, procedures, abilities and evaluations relating to information and communication technologies which allow sufficient management of information and communication resources. The capacity to find the didactic

meaning in these technologies and to incorporate them with meaning into classroom work.

As a complement to the process, a fourth training component is inserted which is aimed at the institutional directors of teaching. This component seeks to guarantee that the project is implemented at an institutional level and that its development has the appropriate organizational and logistical support. This is the **Institutional** component in which models and practices for strategic planning and management of educational projects are worked upon.

4. Classroom activity

To reach the pedagogical goal guided by Model Connections, the work is undertaken from the perspective of collaborative/cooperative learning. This can be defined as a teaching strategy in which small groups, each one of the students with different levels of ability, use a variety of activities to improve their understanding of a specific topic. Each member of the group is responsible not only for learning what is taught or studied, but also for helping and securing the learning process of their colleagues, so creating an atmosphere of achievement.

Conexiones combines the objective of work through projects with the strategies of collaborative/cooperative working. This gives rise to a method of instruction that has as its purpose the modification of the relations that are established between the teacher and his student, and between the students themselves. It provides guidance on the development of an organization inside and outside of the class which is more meaningful and planned for the development of student learning activities and the operation of a shared responsibility towards learning. Students work in groups where they not only carry out the given task, but where they also learn the process of learning.

In this sense, *CONEXIONES* creates a more favorable classroom atmosphere through the realization of Collaborative Projects (Hernández and Ventura 1994), that allow for teamwork and curricular integration through Integrated Learning Units and the use of information and communication technologies. The units and the projects carried out during the first phase of the incorporation of *Conexiones* establish a relationship with the different environments of the graphic interface, *La PachaMama*.

The incorporation of the Model Connections proposal is supported in each educational institution by a permanent program of advice called Support and Accompaniment. This has the objective of supporting all the technical and pedagogical processes, identifying teacher training needs and promoting self-management processes in educational innovation. This process is supported in a virtual way through the regional branches of the *Conexiones* educational network.

5. Activity outside the classroom

The activities that are undertaken outside the formal classroom, aim to strengthen the process of bringing students of all school grades closer to information and communication technologies within the educational institution. They support the processes of individual and collective knowledge building, securing through social actions the active participation of the students. In this way the learning, building and development that result from the activity do not remain restricted to the individual experiences of a teacher.

In order to be able to undertake activities outside the classroom, *CONEXIONES* employs the strategy of forming informatics clubs called “Clubs for Friends of Inter-institutional Information and Communication Technologies – CATICI” (López et al. 2000), in each one of the educational institutions.

The students and teachers that form the CATICI in an educational center organize it giving it a name, slogan, rules and a login. They carry out activities that include, for example: creation of web pages with information about their institution and the municipality in which it is situated; the production of electronic newspapers and participation in collaborative projects with an international character.

The CATICI are supported by Educational Agents (López and Vélez 2000), university students that belong to the educational social service program. They are selected, trained and orientated to support the incorporation processes of Model Connections into the school environment.

6. Monitoring/Evaluation Platform

One of the objectives taken on by the project has been the search for and design of evaluative research models that take into account a complex phenomenon, as is the school learning environment, that cannot be manipulated by the researcher. The proposed evaluation model (González 2000) follows the recent proposals of holistic evaluation, associated with the currents of “quality improvement” (Stake 1998, Santos Guerra 1997, Medina Rivilla 1997) and of “evaluation centered on the school institution” (De Miguel 1996, Nevo 1996).

The actions of monitoring/evaluation take place permanently during the development of the project and during the process of adoption of the model for incorporation of information and communication technologies into the educational institutions. They are carried out in the two periods over which the project is developed: the period of research and development, and the period of pilot application in the educational institutions.

The actions of evaluation during the period of research and development are purely self-regulating. That is to say, the aim is that the members of the research team themselves have the instruments and spaces for self-reflection, so that they can record and document the information necessary for regulating their own actions.

The evaluation of the pilot application in the institutions seeks to understand and appraise what happens in the learning environment when incorporating a pedagogical proposal such as *CONEXIONES* into it. The aim is not only to carry out an external investigative evaluation, but also to incorporate a component of internal regulation as an essential part of the project. This should be managed by the teachers and students themselves and will guarantee its sustainability once the support of the central team disappears.

The central subject of the evaluation is the “learning environment with new information and communication technologies.” This subject has been conceptualized under the systematic watch of the CIPP model proposed by Daniel Stufflebeam (1987), and a holistic evaluative strategy has been opted for. The central methodology of this is the Case Study (Stake 1998, Yin 1984), which groups different sources and methods of evaluation, overcoming the conflicts between quantitative and qualitative methods. On the one hand are those methodologies that have been designed using the available technology. One is the monitoring of the graphic interface *La PachaMama* itself. The use of *La PachaMama* and tools accessed through *La PachaMama* such as email, productivity and educational software tools are registered. Monitoring the effective use of telecommunication tools can be done from the central branch of the *Conexred* network. A second group of methods and techniques are of a qualitative nature, some characteristically ethnographic (Woods 1995, Delgado and Gutiérrez 1995), such as: direct and participative observation processes, document analysis [diaries of processes (Porlan 1996), the textual products of students, reports, school newspaper etc.], analysis of life stories and focused narration (Briones 1996), video recordings of classroom work, non-structured interviews and evaluation questionnaires. A third group of methods follows the empirical models of measurement of variables in a controlled situation and comparison with control groups (Campbell and Stanley 1966). The triangulation (Santos Guerra 1997) of these differing sources becomes an obligatory tool of analysis.

7. Results to date

The *CONEXIONES* model has differentiated between two types of results: those that are directly related with the objectives and hypothesis of the project, called **achievements**, and those that come about through the presence of the project and that affect the institutions, the parents and the educational community in general, called **impacts**.

Achievements

In the Teachers:

- ✚ Improvements in their teaching capacity, observed in the incorporation of the praxis of the knowledge and abilities that form part of the training program
- ✚ A clear change from the role of “teacher” to that of “facilitator and guide” in learning

- ✚ Application of collaborative learning methodologies
- ✚ Way of planning and curricular integration
- ✚ Knowledge and management of new technologies
- ✚ Incorporation with meaning of information and communication technologies into classroom work

In the Students:

- ✚ Stimulation of better cognitive processes. This has resulted in a concrete and significant improvement in Practical School Intelligence. The aforementioned has led to better management of their learning environments by the students and in better comprehension and permanent assimilation of the learning objectives
- ✚ Better social interaction with peers and teachers
- ✚ Development of communicative abilities and team working skills
- ✚ Improvement in self-esteem and motivation
- ✚ Improvements in attitudes of tolerance and cooperation

Impacts

At an institutional level, amongst the teachers and the educational community, the following stand out:

- ✚ The creation of environments of joint curricular building
- ✚ Interest and expectation throughout the teaching team
- ✚ Introduction to the use of new technologies as an institutional policy and the emergence of an awareness of innovation with new technologies
- ✚ Ways of conceiving institutional management and administration
- ✚ The parents are better informed about the activities of their children, in particular about what they learn with, and how they are using information and communication technologies
- ✚ Greater participation of parents in school life and in their children's educational process

There are also indicators that show an impact on the community in general. This is evident in the growing volume of consultations about the project, official requests for its expansion, invitations to events, requests for assistance etc.

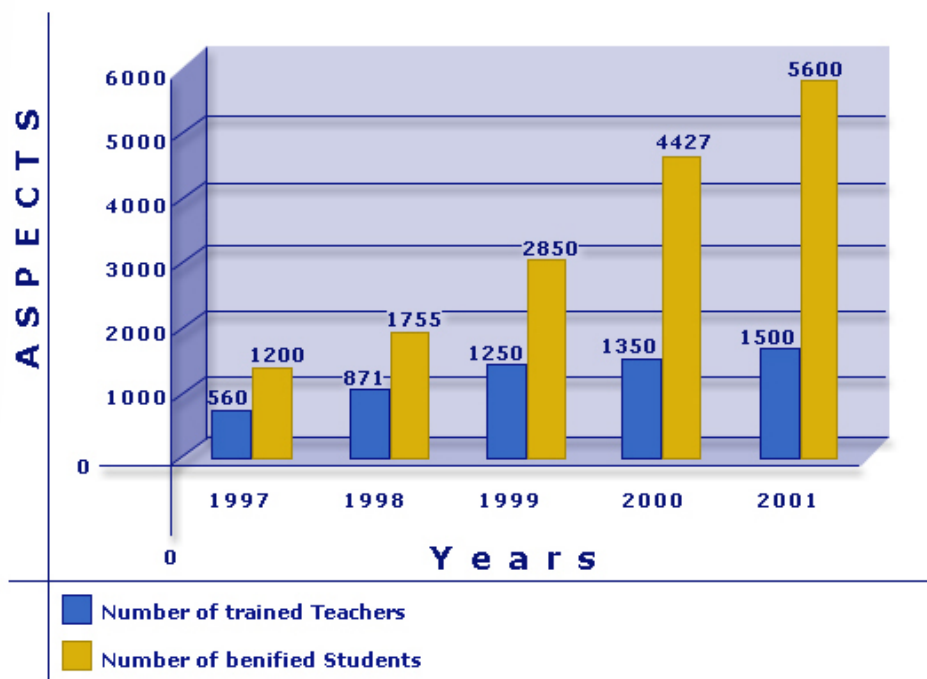
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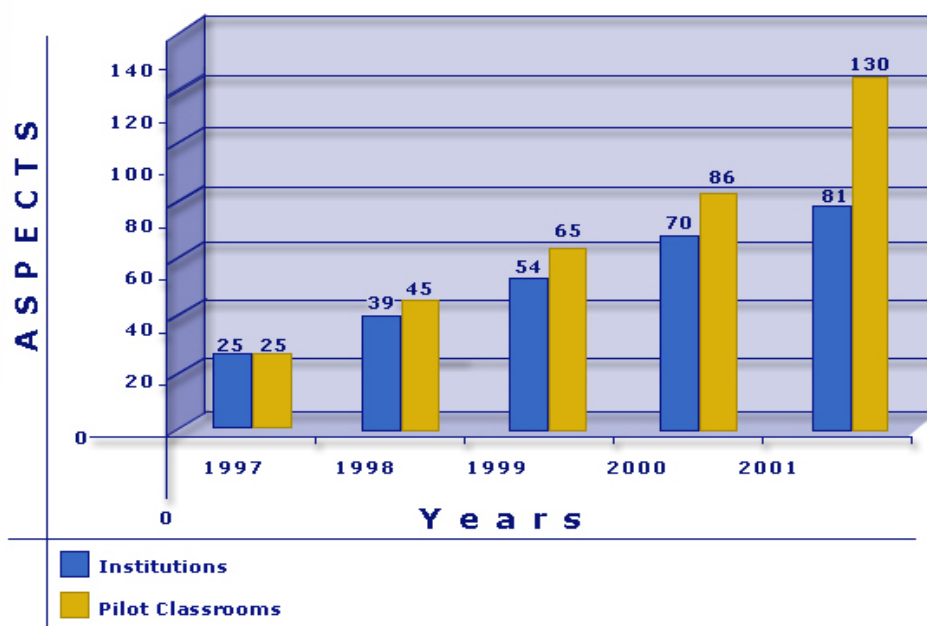
- ✚ Integration of the different educational bodies in order to act in an efficient manner with respect to educational issues within the country
- ✚ Acquisition of experience concerning educational issues in general
- ✚ Linking of international universities and research centers to the *Connections* proposal

- ✚ Definition of the basic and priority elements of teacher training in the sphere of information and communication technologies in learning environments
- ✚ Strategies for the incorporation of information and communication technologies into school educational processes
- ✚ Knowledge of the critical factors for educational innovation with technologies
- ✚ Development of evaluation models adequate for the complexity of school learning environments

The achievements of the educational institutions are placed in the context of what the opportunity for innovation in academic programs means, giving purpose to the use of technologies. In this aspect the assistance given by the regional branches was vital in achieving the dynamic of the Connections Model.

The following demonstrates how the expansion of coverage within the educational institutions, and the incorporation of new teachers and students into the national *Conexiones* network, has taken place.





Conexiones coverage

8. Conclusions: Lessons Learned

CONEXIONES faces the future with optimism. We think this way because of the positive climate that nowadays is the norm in the educational communities that move the project forward. As a conclusion we include the voice of the direct actors in the educational institution, who shared the lessons learnt from their experiences and their thoughts on how to improve the quality of the processes. (The following quotations are taken from the reports of the *Jornadas de Reflexión* (reflection sessions), written by rectors, teachers and students).

a) The first lesson learned, and an important one, is to make sure that there is improvement in the quality of the education in the institution as a whole. This covers all the members that make up the community. *CONEXIONES* has met the needs and expectations of the group. Were it not so it would remain as an initiative of one teacher or of a small group, thus reducing its reach and its chances of continuing.

"We are creating a community: opening the classroom to other learning and exchange environments. We bring the subjects and worries of the community to the curriculum; even to the parents, with the direct collaboration of the students and teachers". (Principal)

b) The innovation brought by *CONEXIONES* using ICT's tends to alter the organizational structures of the school: space distribution, schedules, grouping, functions, time given to school work, etc. Therefore the commitment and support of the school principals becomes essential; it is desirable to start with awareness raising, information giving and training with the principals or directors of the institutions. This should lead to the development of a midterm institutional action plan (2 to 4 years).

"It is necessary to relieve the academic work load to develop the project. In some institutions, the number of assigned hours of one or more participants is increased in order to strengthen the project". "It has been necessary to reschedule traditional timetables due to the work on projects and because of the use of computer rooms". "Research done by teachers has increased and not as a consequence of a demand on the part of the administration, but by their own initiative". "There have been limiting factors like facilities, space distribution, furniture, decoration, and work material distribution, to the use the computer room". (Principals).

c) There is a remarkable change from the initial concepts and interests that students, teachers, and parents had to ICT at the beginning. This has to do with:

"Computers are the future; there is a need to know how to handle them to enter the XXI century".

"I want my children to learn computer science, otherwise they will not get a good job in tomorrow's world". "It is necessary to be up-to-date: it is necessary to learn information technology".

Now, after four years of work, all the actors involved agree on the importance of the changes and improvements in the atmosphere or climate in the classroom and institution, of the improvement of the capacities of participation and autonomy when using ICT, and of the capacity to jointly share and to construct knowledge. This in aspects related directly to the use of the technologies. The general principle is confirmed once again: "the technologies by themselves do not add anything to education; therefore they must be linked with pedagogical objectives that increase their advantages and lessen their disadvantages".

"There has been a revolution: we have better facilities to engage in dialogues and to solve problems that appear in the classroom " (Student)

"There is greater empathy between teachers and students, because it enables a wider participation in the learning process. We consider their interests and necessities " (Principal).

"The atmosphere is more pleasant; they improve their relations when they have to share knowledge ". (Teacher)

d) The integration of the technologies with pedagogical meaning into the learning environment does not demand complex or expensive facilities. *CONEXIONES* has achieved the proposed objectives with equal effectiveness in schools with very limited resources, with a single computer installed in a classroom, as in schools with many resources, with several well equipped computer labs. This lesson is fundamental in our country, because it makes possible the concept of qualitative equality: it is possible to improve the quality of the education for everybody, independently of the economic level and the available resources and technological facilities. We have verified that when the project reaches its third phase of Institutionalization, the participants mention the need to increase the amount of equipment (computers and devices); but it always appears as a final observation and with expressions like: "It would be very desirable... We hope to have with..... "and such like. Thus it could be assumed that even though it is seen as having some importance, it is not perceived as being essential .

e) The active integration of the ICT for the teacher is achieved by combining several strategies:

- ✚ A plan of initial training staggered over time. *CONEXIONES* offers a plan of 180 hours of training, organized into four intervals spread over 18 months, with each one followed by a period of application in the classroom.
- ✚ A support plan and a permanent consultants group during the first year of application in the classroom; for this work *CONEXIONES* has groups of university students, with 120 hours of training. The system of consultations using electronic mail has been extremely agile and effective.
- ✚ Group work by several teachers from different subject areas with the interchange of experiences with teachers from other centers and regions.

Two years of training and permanent support seems to be the minimum time for a teacher to acquire the capacity to initiate a formal process of improving the quality of his teaching by integrating ICT.

f) The methodology of work by projects and the collaborative work turn out to be suitable for exploiting the advantages that the technologies offer to the learning process. This is because they facilitate the active participation of the student, make the student responsible for the learning of the entire group, facilitate the creation of virtual places for joint work, open the classroom to other educational spaces, incorporate the interests of the student, facilitate the independent search for additional information, diminish the directive role, and are a "unique source of the knowledge" of the teacher.

"It has permitted the development of abilities, the effective performance of roles within the collaborative group, assuming individual and collective responsibilities that create common points between the diverse areas of study" (Teachers).

"In addition, the collaborative work reinforces the formation of values of tolerance, acceptance of others, self-esteem, cooperation, coexistence, listening and mutual

aid, as well as enhancing the interpersonal relations student/student, student/teacher, and teacher/teacher " (Teachers).

"The classes were tedious, cluttered with books and notebooks, working individually without integration of materials. Now we work in groups, everyone values the work of all members of the class, there is communication with counterparts in other schools, the teachers are more dynamic, there is more creativity in the learning " (Students).

g) It is necessary to go beyond the criterion of "learning results" as the main indicator of success for this type of project. All participants coincide in emphasizing that the most important lessons learned are the improvement of the atmosphere in the institute, the change of attitudes and evaluations, the participation and recognition of the work of by all students, and the consequent improvement in self-esteem.

"The atmosphere in the class is more familiar and pleasant, there is more practice and less theory, more research, an easier familiarization with the different technological devices and use of new technologies of communication and information, mutual support, understanding and creativity " (Students).

"We deepened our knowledge in such a way that the teacher also learns with us, we are more communicative " (Students).

h) It is not necessary to associate the use of technology with specific learning or areas of content (language, mathematics, biology, etc.). The change of culture that generates a real improvement in the quality of education is better approached by aiming to create general abilities of learning, changes in attitudes, and improvement in the conditions that facilitate learning.

i) It is essential that teachers and students incorporate methods of regulation and self-regulation of the process. Techniques such as personal diaries, instruments of self-evaluation, dialogue and joint solution of problems, enable a comparison to be made with specific pedagogical concepts. These can thus be reformulated or differences accepted.

"The Diary has served to help us evaluate our own process of learning " (Students)

"Important changes have been generated in the assessment criteria and the has given rise to constructive criticism" (Teachers)

"The diary has allowed us to reflect on our pedagogical practice and to make explicit our pedagogical conceptions; this favors the changing or clarification of such concepts." (Teachers)

"Before, the assessment was practically the same for all members of the class, but it was carried out in an individual manner. The evaluation of group work demands

another method to see the improvement and yet another method to evaluate the work of each member, in relation to the group". (Teachers)

j) An effective integration of ICT into the learning environment must be incorporated into the curricular plans and the Institutional Educational Project - IEP. A good strategy has been to choose a core area that allows work on real problems or subjects, close to the everyday experience of the student.

"CONEXIONES had made possible the reframing of the curriculum and adjustments to the IEP" (Teachers)

k) It is important to remember that the educational community is also made up of the families and the students' and teachers' own cultural surroundings. Computers offer a good opportunity to relate school and daily life, favoring the participation of the parents and finding subjects for the collaborative projects in the educational community's surroundings. Children are very sensitive to their cultural surroundings, in our case the conditions of violence, insecurity, and corruption, affect them deeply. The conviction that telecommunications and the sharing of knowledge and ideas, are a means to face such problems turns this into an important opportunity to integrate school and life, theory and practice.

"CONEXIONES has facilitated the interest of the parents in their children's learning, narrowing the relation between their children and the teachers" (Teachers)

"In some institutions the parents have created formal groups, as a mechanism to support their children, looking for resources from local government and private corporations; others have created support groups in specific areas, with older students, who are in charge helping the students who need it" (Principals)

"It is clear that we must seek an active participation of parents in the innovation process" (Principals)

"Some mothers have participated actively, supporting the teachers when they have training or small group activities" (Principals).

l) It is essential that the introduction of ICT into the learning environment is socialized. There needs to be a person or group who sustain the informal interaction and information channels that are able to generate interest and to maintain participation levels. These agents must be "local", that means, members of the educational community or from nearby. In our case this role had been played by Educational Agents, university students from the zone, whose proximity in age, in interests and handling of the linguistic and cultural means, makes them easily accepted in the institutional surroundings; on the other hand, the It's clubs serve as a permanent catalyst for all members of the community.

"The raising of awareness, motivation and support of the teachers from the Educational Agents are fundamental. They enhance the dynamic of innovation, and they facilitate the incorporation of the new technologies and the development of the collaborative projects". (Educational Agent)

m) The expansion of *CONEXIONES*, or similar projects, requires the formation of local groups who are able to adapt the proposal to their particular conditions and surroundings and to provide the initial support. It is very important that this adaptation is based on processes of evaluative research, that contribute to new strategies of development and new knowledge on the technologies and their integration into the learning environment.

n) The changes and innovations with ICT have their timescales and stages of development. It is not possible to modify too many things simultaneously.

There is a proven need to give continuity in time to the teacher's support processes and training. On the other hand, research groups and the management of this sort of project usually does not have the capacity to follow through the whole incorporation process, once the period of development and evaluation is finished. These facts illustrate a general corollary.

Corollary. We frequently see that during a period of educational reform (and sometimes it seems that the education system is in permanent reform) or when a proposal or pedagogical innovation becomes generalized, until it almost becomes a fashion (as we think is the case with the use of ICT in education), usually in the same educational institution an excessive number of proposals, projects, and innovations appear. These originate from the initiative of different institutions which can be universities, multinational research centers, regional and local offices of the Ministry of Education, and others. In general, it seems that a promising set of efforts together can generate desirable changes. But actually we have verified that if there is not some kind of coordination between the different projects, a considerable amount of confusion is generated. The capacity does not exist to advance all the projects properly; they are simplified and added together without proper criteria and enough time. In some of our schools we have found up to nine similar projects, with the problem that the responsibility is concentrated with the same teachers and groups, "because they already know something about the subject". Really, great damage is caused to the educational community that in the future may reject similar initiatives or accept them only by obligation.

To face this situation it is necessary, of course, that "somebody" demands that there is coordination between all the agents who propose similar projects or initiatives. But also we verified that the *CONEXIONES* proposal, by its open character and its global approach, has shown the capacity to bring together some of these initiatives. Some of the lessons learned that we had described earlier allow this strength:

- ✚ The effort to get that the proposal is incorporated into the IEP, so that it is perceived as being its own;

- ✚ Promoting local agents to support the sustainability of the projects;
- ✚ Incorporating methods and techniques of self-regulation and independent management from the beginning;
- ✚ The grouping and integrating character of the proposal, that eliminates the individuality and privacy of the classroom work;
- ✚ Maintaining informal groups, that freely develop non-curricular activities which generate problems and expectations of students, teachers, parents and community.

We are convinced that these lessons constitute a collection of key points that can help others to orientate their actions to accomplish similar achievements.

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