

Enlaces' In-service Teacher Training Strategies: A Review of Critical Features

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Abstract

This paper presents a concise overview of the major landmarks in the teacher-training strategies and goals that have been implemented in the *Enlaces* program, how these evolved over its first decade of operation, and the lessons that we believe could be learned from that experience. Greater emphasis will be given to the early years since, in the author's view, what was done then, and how it was done, illustrated the zeal which to a great extent, facilitated the subsequent growth and success of the program.

Keywords

Staff development, computer literacy, ICT training, ICT policies, education, Chilean educational reform

1- Introductory Remarks

Chile is presently completing the implementation of a major educational reform that was started in 1990. A new curriculum for both primary and secondary education has been approved, and new teaching and learning methodologies are being introduced in order to achieve better quality in the system's outcome. Similarly, an unprecedented amount of resources has been steadily allotted to education over the past number of years (nearly 7% of GNP), aimed at the provision of textbooks and other teaching and learning materials (computers amongst them), the renewal and expansion of schools' infrastructure, the extension of school hours, staff development, and the improvement of teachers' salaries. These were all part of a comprehensive effort to improve the quality and increase equality in the educational system. In fact, education has become the nation's number one priority for the public budget over the last decade, in an

unprecedented effort to overcome poverty and to place Chile as a stable and modern country as it enters the present millennium.

The information and communication technology (ICT) initiative for education put forward by the Chilean government, better known as the "*Enlaces* Program", or simply *Enlaces* (links), is also an important component of the reform. Its goal has been to integrate these technologies as a learning and teaching resource for all students and teachers in Chilean state schools¹. Since its inception in 1992, with the first few schools, *Enlaces* has been rapidly growing and gradually nurturing and empowering the work of the national educational community. By doing so, it has been contributing to an important degree to the objectives of educational innovation, put forward by the different components of the Chilean Educational Reform [García-Huidobro, 1999].

In the following sections the reader will find a brief description of the main points we believe were responsible for the interest and enthusiasm that characterized *Enlaces'* teachers-training strategies, how these evolved over its first decade of implementation, and the lessons that we believe could be learned from that experience. In the authors' opinion, there were some early critical features of the program which played a fundamental role, and became the basis for most of its later success. These early features will be given greater emphasis in this review. The readers who want to get a more thorough description of *Enlaces*, can read [Hepp, 1995; 1999; Potashnick, 1996; Potashnik, M., Rawlings, L., Means, B., Alvarez, M. I., Roman, F., Dobles, M. C., Umaña, J., Zúñiga, M., and García, J. 1998; Rusten, E., Contreras-Budge, E., and Tolentino, D., 1999; Laval and Hinostroza, 2000]. For an international, comparative view of *Enlaces'* achievements, you may wish to consult the paper by Hinostroza, Jara and Guzmán [2003] also in this issue.

2- *Teachers as pivotal actors for innovation*

The fundamental belief that inspired and guided the very beginning of teachers' ICT training activities in *Enlaces* during the early nineties was that teachers are the crucial actors for innovation. We were convinced that teachers are at the very heart of all educational processes; and therefore, it was obvious that, when it came to integrating new technological tools into teaching and learning in the schools, it would be the professional competence and the personal commitments of the teachers, which would determine its success. Hence, either we did it with them, or it simply it could not be done.

The founders of the program were careful enough to study the available evidence from other programs around the world, and it became evident to them that teachers are key players in any attempt aimed at improving the teaching and learning processes [Dwyer, Ringstaff and Sandholtz, 1991, Dwyer, 1994]. There were too many instances where great amounts of money were spent each year on computers and software, but they had brought about little benefit to classroom instruction because little effort had been made to help teachers use such tools effectively.

Moreover, ICTs at schools will have little impact if teachers are not actively involved in all phases of their integration into the curriculum [OTA, 1995]. With this idea in mind, our staff development programs and activities were always aimed at achieving a critical mass of teachers who could feel comfortable in using technology and who could

provide support and exemplary instances of good practice to their colleagues who are still not fluent with technology.

Moreover, all the available evidence indicates that these programs must be **long-standing**. Studies of the Apple Classrooms of Tomorrow (ACOT) experimental schools project [Sandholtz, Ringstaff and Dwyer, 1997] as well as the OTA Report to the U.S.A Congress on 21st Century Teachers [OTA, 1995], and the *Enlaces*' experience after ten years of teacher training, indicates that no matter how many computers are put in the schools, these tools are essentially useless if teachers are unprepared or unwilling to use them. Only after completing extended training for three or more years and with steady access to computers will they feel sufficiently comfortable with computers to start innovating in their teaching.

Fortunately, and unlike what seemed to have happened with some other programs with similar aims around the world, the multi-discipline team that planned and initiated the implementation of *Enlaces* was able to convince the Ministry of Education's higher officials to secure sufficient budgetary resources for an extended teacher training and support strategy. This vast training and support ran alongside (and partly in detriment of) a similarly ambitious hardware, software and network implementation program. Thus, historically, about one third of the *Enlaces*' yearly budget has been allocated to staff development programs and activities.

3- *Teacher training strategies during the early years*

As it was just stated, teacher training was (and still is) at the core of *Enlaces*. At the beginning of the program, in the early 90's, from the first 207 teachers who began training, less than 1% had prior experience with computers, and only 7% could find their way around a keyboard and type at a reasonable speed. Knowing this in advance, training began with easy-to-learn devices such as portable keyboards and learning how to use simple applications for everyday administrative tasks, before dealing with pedagogical issues. At this stage, it was considered very important that teachers would perceive, as early as possible, ICT as an ally and as a support tool for their day-to-day duties, and not as a burden.

A second tenet was that teachers were not trained on computer technology, but on practical educational applications of the technological tools provided, through classroom and project related activities. When each teacher began feeling confident enough in handling the computers and had gained an understanding of its potential and limitations, as well as ways the students might be organized and benefit from their work with the computers, (s)he was expected and encouraged to work more often with students. This could be done, at first, assisted by more experienced teachers or by the school's technology coordinator, who has played a crucial part in *Enlaces* and whose role will be addressed to a fuller extent in a later section.

The training strategy consisted of workshops given at each of the schools in which the teachers practice first using the *La Plaza* software [Hepp, 1995; Hinostroza, Laval, Hepp, Iost and Rivera, 1995] in groups to familiarize themselves with its options for using the educational software and word processing as well as communication tools that were offered through it. The second phase of training consisted of teachers in the different schools becoming preferentially involved in either one of the following in-depth extended workshops: "Using educational software in the classroom";

“Collaborative learning projects via e-mail”; “Use of software tools to improve administrative tasks and processes in the school”; “How to integrate the computer into project based learning”. Project based learning was a major educational novelty introduced by *Enlaces* to its early participating schools. In parallel, teachers trained their students in the use of *La Plaza* and related tools [Rehbein, Hepp and Moëne, 1994].

3.1 Competitive application secured motivation and results.

A different aspect of the ICT integration strategy referred to the notion that no school should be included in the program by default; but rather, that schools should be selected as the result of an active and competitive application process. This application included an explicit statement from the teachers, the principal, and district educational officials (or private, subsidized owners) about why they wanted ICT tools to be put into their school, what they planned to do with them during the first year, and an explicit commitment to attend the training sessions and to carry on with their projects, as planned. Schools ranked higher were admitted first, until all vacancies permitted by that year’s budget were filled.

We are convinced that this active application process was of crucial importance for preventing many potential shortcomings during the first few years after a school became part of the program. First, it helped make explicit for all parties involved, what receiving computers and a connection to Internet exactly entailed. Second, by having to state why they wanted to have computers, teachers usually ended up writing a project (collaborative, or not), which helped to give meaning and orientation to an otherwise cold insertion of alien equipment in the school. Also, the very fact that computers were granted as a result of an effort made by teachers, it had a rewarding effect which boosted teachers’ motivation and provided them with a sense of ownership which was a prelude to their later legitimate appropriation through their praxis.

Of a different nature, but also of utmost importance was the explicit commitment from the schools’ authorities (principals and sustainersⁱⁱ) driven by this application process. The latter was to provide the budgetary means for maintenance of the hardware, upgrading and buying new software, keeping a stock of printing supplies, paying the telephone bill (Internet connection), etc. The administrators did not readily see this and it was easily overlooked in the face of the excitement caused by the prospect of bringing in such interesting and attractive equipment for free. Hence, the importance of making it clear and securing their commitment from the start.

Given the presence of computers in the school, all sorts of different new activities and demands from the staff had to be accommodated, additional bills had to be paid for, etc. Hence it was very important that the people in leadership roles in the school became involved in the training, the same way as everybody else. This had two or three advantages that affected the program both, immediately and in the long run. First, by gaining familiarity with, and understanding the use of the ICT tools, the principal was able to understand better the needs and concerns of the teachers. Second, it enabled him to relate in more precise and realistic terms the school’s achievements and needs to other critical agents in the community, be it parents, educational authorities, or fellow educators. Finally, we very soon discovered that it also helped principals to better decide on matters of planning, budgeting and investing for the future development of the school.

3.2 The use of *La Plaza* as a non-intimidating computer-user interface

Consistent with its emphasis on empowering teachers and students through the use of computers and telecommunication, the professional team in charge of *Enlaces* developed "*La Plaza*" (Town Square), a user friendly application which enabled easy access to the computer, be it to navigate educational software (mostly multimedia based applications), to take advantage of electronic mailing facilities (to participate in regional, national and international educational projects); or simply, to deliver and receive information of personal interest over the network. As its name suggests, this application consists of a graphic depiction of a town's main square. Through icons which are buildings which are a familiar sight in most Chilean cities and towns, the software provided four different work environments: a Post Office, a Kiosk, a Museum and a Cultural Center (Hinostriza *et al.*, 1995). A brief description and illustration of these environments is as follows.



Figure 1: *La Plaza* occupied the full screen and it appeared automatically when a computer in any school was switched on. Each major icon was an active button that allowed entrance to a specific work environment by just clicking on it.

3.2.1 The Post Office. The post office is a friendly e-mail system, specially designed for use by students and teachers. The goal was to have an informal mechanism for them to first establish contact, and later on, to form discussion groups around topics of common interest, in the Cultural Center; or simply, to exchange ideas and opinions on subjects of professional or personal interest. Children and teachers began using this tool within a few minutes from the moment they first saw it, and they successfully wrote and received letters to and from other individuals and groups within the school network. At first, messages had to be addressed by typing. This turned out to be a source of major frustration because, at the beginning and due to inexperience, typing speed was extremely slow; and because too often, typing errors resulted in an enormous amount of messages not reaching their destination, and hence not being responded to. This was soon resolved by introducing a "Directory" linked to the envelope address writing tool,

in the out-box of every active school in the *Enlaces* network. Once the desired address was found by scrolling down the list, one click of the mouse would transfer it to the envelope and another click would place the envelope into the outgoing mailbox.



Figure 2: Clicking on any mailbox would bring up a listing of all messages received in that collective inbox. Individual recipients could be identified in the “subject” field. Clicking on the writing stand would open-up a sheet of stationary, along with an airmail envelope to be filled out.

3.2.2 *The Kiosk.* This environment consisted of a dynamic bulletin board. Electronic newspapers were constantly produced and distributed by teachers and students through



Figure 3: At the kiosk, contributions were written in a similar way as in the Post Office, but here, the messages were broadcasted simultaneously to kiosks in all schools.

this newsstand. It also offered multimedia based educational short stories and vignettes. Through the Kiosk, children could write stories, participate in literary or news reporting projects, among many other self-directed or teacher-led activities.

3.2.3 *The Museum.* The Museum was a tool and resource center with greater stability in its content. Essentially, it worked as a resource base through which users could access regular applications, educational software and accessories. Thus, teachers and students

could start using software without having to deal with the machine's operating system. Some of the preferred software packages during the early years of *Enlaces* were “Kid Pix” (by Broderbund), “ClarisWorks” (by Claris), “The Living Books” (by Broderbund), “Grolier Encyclopedia, Decisions” (by Tom Snyder), “The Human Body” (by *Enlaces*), amongst others.



Figure 4: Clicking on an icon on the display panel would start/open the corresponding application, leaving it ready to use or to navigate across it. Once the user was finished, closing the application would return the “museum” interface. To exit the “museum”, or any of the other work environments, the users had to click on the water fountain from *La Plaza*

3.2.4 The Cultural Center. This was a meeting place, a sort of civic center, where collaborative projects among the students and teachers from different schools could be developed and run. It was also a place to provide a directory of ideas, work materials and



Figure 5: The inboxes at the Cultural Center were activated and replaced every school year, depending on the projects and discussion groups that were to be initiated.

experiences, among teachers with common concerns (e.g., groups with a common interest in physical education, mathematics, English, literature, etc). It basically worked as a bulletin board system for interest groups.

La Plaza was particularly successful in helping to reduce teachers' anxiety towards a technology which was perceived as difficult, meant for experts only, and that presumably required long hours of technical training in order to start using it. With *La Plaza*, teachers could avoid the burden of learning how to use the operating system from the beginning, and they could begin exploring software and e-mailing in just a few minutes. Also, given its simplicity, they would soon feel encouraged to try it with their own students.

The innovating and energizing impact that *La Plaza* has had on Chilean schools, and in their breaking away from their endemic and stifling self-reference and anachronism might never be fully appreciated. Even though the beneficial role played by this software during the growth and consolidation of *Enlaces* has been widely reported elsewhere, we considered it important to include a brief description of it here.

3.3 The use of computer networks and communication

Another fundamental factor was the inclusion, from the very beginning of training, the use of electronic communication strategies by using e-mail, discussion groups, and participation in collaborative projects. These and several other means of communication are so commonly used today that it may seem ludicrous to even mention them as a great asset for a school to have. However, during the early 90's these were scarce and unknown resources in the Chilean education system, and they turned training into a particularly attractive event for schoolteachers at that time.

Every school admitted into *Enlaces* got, in addition to computers, software and peripherals, both a local and a wide area network. The local area network permitted some convenient features such as the sharing of peripherals (i.e. printers, CD-Rom drives, etc.), and exchanging files or sharing applications from the computer hosted in the teachers' room. In later years, software was purchased along with books and other teaching resources. Collaborative projects became a major component of our early years' work in the schools, as they were entering into the *Enlaces* network.

The wide area network was not accessed through an on-line connection; but rather, teachers and students wrote e-mails, and they were put in the school server's outbox. At some time during the night, computers were set to dial up a local (or long distance) telephone number to reach the nearest university server and thus delivered (and also received) the accumulated messages. From 1995 on, schools began to progressively hire dedicated telephone lines and using more and more web-based technology and resources.

In 1996 we began using a web-based version of *La Plaza* for all new schools coming into the program. Also that year an electronic educational resource center was implemented to provide free access to electronically packaged teaching materials, classified according to subject area and school level. During the last two years, nearly all schools (old and new) have free full access to Internet as the result of a donation from a telephone company (Telefónica CTC) to the Chilean Ministry of Education

It is expected that by the end of the first decade, all schools participating in *Enlaces* will have a dedicated telephone line in place, with free access to online network services, in order for them to take greater advantage of Internet's educational opportunities. Some

of the rural schools are currently using radio links, but the initial investment is high and the links have a short range. Many rural schools were admitted into the program, despite the fact that they don't have Internet access, and that it is still uncertain whether they will have it, within the next few years.

3.4 Building a competent and motivated community of teacher trainers

At the point when we began introducing computers into the first hundred schools (in the early nineties), the very few teachers who were familiar with technology, had been primarily self-taught and they typically advocated (and expected) separate classes in programming languages, databases, spreadsheets, and word processing. Although these teachers maintained a narrow and different approach to the use of computers in education, relative to that embraced by the program, they were usually looked up to by their colleagues and enjoyed a sort of leadership status. It soon became apparent that it was more important to gain these teachers as allies, by banking on some of their competencies, but reorienting them to abandon their cryptic, command language approach to the use of computers. Some of them became excellent technology coordinators of their schools.

3.4.1 Technology Coordinators. As part of the application process, each school had to present at least one teacher (ideally two) to receive additional and more in depth training. They had the responsibility of administering the computer lab, solving the most common, hardware software and network configuration failures, and assisting their colleagues in the planning and preparing of their teaching activities with the help of ICT resources. These teachers have played an extremely important role in the history of *Enlaces*. As often as possible, they were called upon from the zone centers for special training meetings, and special efforts were always made to keep them abreast of the upgrades to and the latest releases of the implementation of the program. Since this was a new role within the schools, it took a great struggle over many years for a more formal recognition to be given to this post and a more reasonable time allocation. In the program's experience, some of the most important functions of the technology coordinator are:

- Providing preventive maintenance of the hardware, software and network configuration.
- Running Internet connectivity checks.
- Acting as the school's interface with local or national hardware and software providers.
- Coordinating technology lab and software uses according to teacher demand. Purchasing hardware supplies.
- Selecting and purchasing hardware and operating system expansions and upgrades, administrative and educational software, virus protection and Internet content filters, according to teacher demands.
- Assisting the teacher training processes, facilitating and preparing resources and supplies and also helping out with some of the training.
- Helping to identify new uses of ICT inside the school and assisting teachers in implementing them.

3.4.2 Teacher Trainers. These people were regarded as decisive for making it all possible. Hence, very special care was taken in selecting and preparing them.

At the beginning of *Enlaces* there were no ICT trainers at hand, ready to start training following plans. The core multi-discipline team who had designed and started the pilot phase did the job. The first generation of trainers was a handful of outstanding *coordinators*, who also happened to be experienced classroom teachers. For the most part, they were first hired part-time to help out with the training sessions in two or three neighboring schools.

From the second year on, several of these technology coordinators were brought in as full-time staff, and would take charge of training teachers in anywhere from 12 to 17 schools, depending on their geographical spread. From then on, especially after the university-based national support network was established, a rapidly growing community of teacher trainers came into existence. By the year 2000, they had become a special task force of about 1000 trainers.

The size of the operation soon prompted the need for the management of the program to design and implement a permanent coordinating strategy for these trainers. Some of the actions taken in that direction were:

- They used a web site as a bulletin-board to keep up to date with the activities and resources that were available to them at any given time. This resource worked very well for them and it served to gradually build up as a reference for the community of trainers
- They received personalized messages from the managing team of the corresponding zone center, with news about the program in general and about the specific area the schools were responsible for.
- Teacher trainers received a copy of the same educational software and manuals that were distributed to the schools, so they could prepare their training sessions.
- Trainers participated on a regular basis in meetings with the educational authorities from the district, the province and the region, in order to give a progress report of what was happening in the schools and to request their support.

In addition to their role in training and guiding the teachers, trainers also performed some important complementary functions:

- They were the face of the program in the schools and therefore, had to learn to deal with additional political and strategic issues that were crucial for the success of the program.
- They provided feedback to the program management in many relevant areas. Trainers gathered useful data about the school's progress and difficulties. This data was used to fine-tune staff development in each geographical zone.
- Some carefully selected trainers occasionally helped to field test some new software or technological gadget, which was under consideration for the following year's bidding and purchasing process.
- Trainers were responsible for organizing a yearly "technology in education" fair with all the schools from a given district, or province. This fair was organized along with the teachers and students they had been involved with, in order to show parents, educational authorities and the general public, the school's

achievements that year with ICT. It also served as a demonstration and incentive to other teachers on different ways of using ICT in teaching practice.

3.4.3 Schools as training sites. We found that the school was the perfect place for teachers to learn how to integrate ICT into their praxis and to explore new ways of teaching. This was so because it was their actual workplace and the very same setting they faced when attempting to transfer their skills to their students. Just as in the classroom we constantly see that one approach wouldn't meet the needs of all, that different students learn at different rates, and that their abilities are likely to be spread across a broad spectrum. We soon learned that teachers were no different. Training had to provide opportunities and methods that would enable staff to grow in ways that benefited both, them and their students. This facility could be more readily achieved when training sessions occurred in a real and familiar setting, with other teachers playing student roles or actually practicing with their students. Seminars and training sessions provided elsewhere will not have this beneficial aspect.

3.4.4 Training support materials. The important role played by all the training support materials: *Enlaces'* Teacher-training Manuals and leaflets (several generations of them), several CD Roms with educational resources, didactic posters, wall calendars etc., should not be underrated. Special mention should be made of *Enlaces* magazine, which was published 10 months a year, bringing network news and teaching experiences and technological curiosities to teachers and students in every school.

3.4.5 Harnessing help from the system's educational supervisors. Soon after *Enlaces* began inducing changes in the teaching practices and other school activities, some resistance towards these changes came from a different agent of the system, until then unknown to us. Specifically, we had drafted our ICT insertion strategy without considering the roles of the educational supervisors from the Department of Education in every province. These were teachers specially trained to advise and oversee all state-supported programs being implemented in a given group of schools; each advisor has several schools assigned for supervision. Headmasters and teachers perceived them as very powerful authorities (the Ministry's interface with the schools). Actually, a negative report from a supervisor could mean an eventual reduction of the state subsidy for a given school. Some supervisors became intrigued and questioned the changes they began to see in the schools due to the presence of *Enlaces*. This, in turn caused the headmasters to retract some of the enthusiasm and support they had been giving to the teachers and the program began to stall.

This scenario was in the most part sorted out during the second and third year of operation of the program, by means of providing the supervisors with intensive training workshops at the university and by installing a node of *Enlaces* (basic workstation and connection to the network) in their workplaces. Thus, supervisors now also had access to computers and the network and were being specially trained to incorporate ICT into their own duties, as well as to understand the goals of *Enlaces* in the schools.

3.5 Engaging universities as the backbone for teacher-training and technical support to schools in *Enlaces*

Clearly, this program has always entailed much more than just placing computers in Chilean schools. Its long-term success and sustainability depended on providing clear, professional leadership to the schools; the setting of clear, unambiguous, and well founded policies; and the capacity to provide educational and professional as well as technical guidance and support to schools and other educational institutions (i.e., municipalities and the different levels of the Ministry of Education itself) in their efforts to integrate information technology into educational practice.

Thus, the Ministry of Education's strategy for implementing *Enlaces* was based on several support systems. Of primary importance among them are the universities. It seemed reasonable to think that, for all the training and associated services that schools needed in order to become successful, their best allies could be the universities. Universities could provide well-qualified academic leadership. They also were the sites where future teachers are trained, and supposedly, where the use of computers in education was ground-tested and implemented. (Unfortunately, the latter assumption proved to be wrong). Additionally, and up to recent years, universities were practically the only institutions distributed around the country through which connection to Internet was possible and reliable. This support network could ensure high quality support to all schools, regardless of their location, and over a period long enough for schools to gain maturity and autonomy in their use of technology. In hindsight, this direct and relatively permanent relation between in-service teachers, university professors, graduate students and pre-service teachers has worked wonders for all parties involved.

In 1995, convinced of the strategic value of an allegiance between schools and universities, the Ministry of Education, through a bidding process, selected and contracted seven major universities, distributed throughout the country. These zone centers in turn, contracted several other regional universities and institutions with the capacity for delivering high quality training and support, which became *Enlaces* operative units. Each operative unit had under its responsibility the schools from a specific territorial sector, thus comprising a support network of about twenty-five universities where the faculties and colleges of education and engineering provided the necessary expertise to the task. Each university team of educators and engineers were equipped with computers, network and training materials for their duties [see Potashnik, 1996].

The formation of this national technical support network for *Enlaces* came into play at a time when the political decision of extending the program nationwide was also taken. Today, we can assert that without this network of 25 universities, the coverage and the quality of results obtained by the program could not have been achieved –at least not in the timeframe that it did. Shortly after this network was formed, the zone centers, through a collegiate effort, devised and came to share a common set of objectives, procedures and resources for teacher training in ICT uses for education, all over the country. However, they also kept flexibility in order to adapt and enrich the teacher-training scheme according to the particular school reality they had to face. For instance, in the southern region, near the city of Temuco, some schools can have as high as 95% student enrollment of native descent. These are students whose first language is typically not Spanish but Mapudungun. Hence teachers and students are encouraged to use the network to communicate with similar schools in Mapudungun, and to share their projects and their views with other schools, from their own culture's perspective.

Landmarks in the history of Enlaces

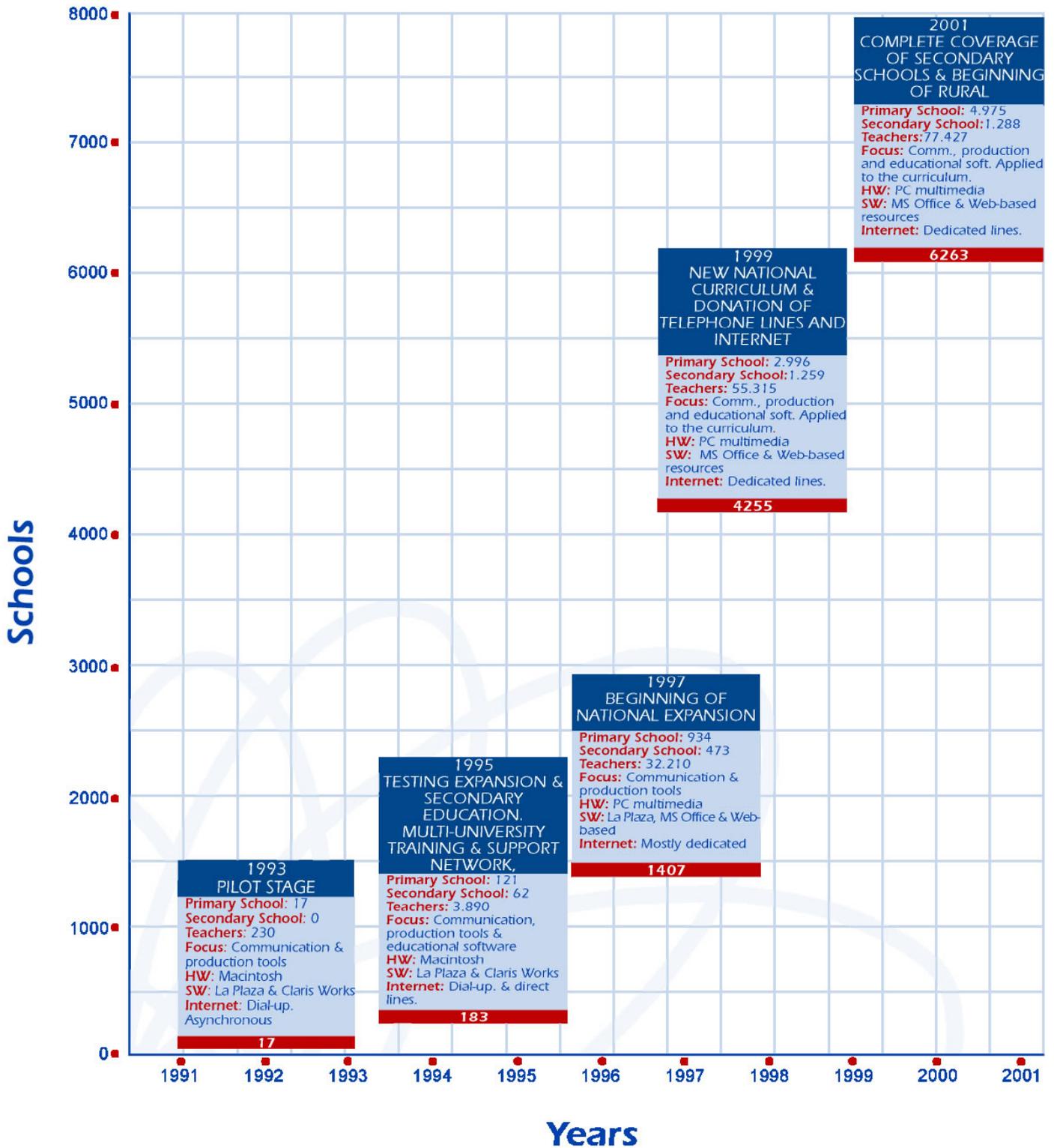


Figure 6: This diagram shows the major landmarks in the history of *Enlaces*, and their description in terms of the same basic set of indicators: schools, teachers, focus of training, and resources.

4- *Concluding remarks*

In Figure 6 we have attempted to portray the evolution of *Enlaces* over its ten years of existence. The reader may follow the major landmarks of this evolution, as well as the cumulative figures of schools progressively introduced into the program and the number of teachers trained. Up to today, *Enlaces* has put about 50,700 computers in over 7,000 schools, about 4,000 of them connected to the Internet. It has provided two-year training to 83,401 teachers and maintains an active community of 680 teacher trainers. There were 1,000 two years ago, at the peak expansion of the program.

An important conclusion that we are confident to state here and which derives from multiple observations of what happened in the schools that became part of the program, is that innovation only arises from current pedagogical practices. No one can be taught to be innovative, we can only deliver the conditions which encourage it to happen, but it must emerge from a person's own practice and her motivation to keep running with it. Huberman [1992] described it as a process of grafting the new onto the old, and he comments that every 'old' is a distinctive, local context with its own history and configuration. Olson [1988] also defined the process of change not as one of substituting one practice for another, but one of subjecting existing practices to the challenge posed by another well-conceived practice. Both definitions have an evolutionary approach to change, rather than a revolutionary one. In other words, teachers are more inclined to use technology if they can relate it simply and directly to their class work, that is, with the materials and the teaching model they themselves use. Innovation, if it occurs, can only occur after that.

To this end, the first years in the history of *Enlaces* sought to show teachers more clearly the multiple ways in which technology could be used both, in the classroom, as well as in extracurricular activities. Even though this could have been seen as conveying the message of "keep doing the same thing, but only now do it with computers," teachers invariably perceived changes in their classes, at the very least, in the organization and the motivation of their students. And on the basis of these small initial changes and on the clear evidence of the students' enthusiasm, teachers would normally try out more effective strategies or adapt those from other teachers from the same, or other schools.

A different observation is that, given the over-encompassing reach from the different initiatives of the Chilean Educational Reform, computers appear to act as catalysts for other initiatives that were not directly related to ICT. In other words, often, in the midst of many other programs intervening to induce changes in a given school, it is the introduction of computers and communication into the classrooms that ends up producing a change. This is not to say that computers by themselves are capable of causing innovation and change; but they certainly contribute in a substantial way to make many of the changes other programs proclaim, possible. This observation is also consistent with Hawkrige, Joworosky and McMohan [1990], who had found that the catalytic rationale was one of the four most used rationales for introducing information technology into schools.

As you were reading this article, you probably expected to find the specifics (contents) of *Enlaces'* technology training program. However educational restructuring is not about technology. It is about changing the way we deliver instruction and assess the

results. During the early years our efforts were aimed at installing the basic skills and capabilities to use technology in ways that were instrumental for teaching and learning. In other words, the weight was put on achieving ICT literacy. Our view was pretty much on the side of considering these new technologies as catalysts for the educational processes.

Over the last four to five years, training has made a qualitative turn, from a generalist use of ICT, to a much more specific, pedagogical one. Every sector on the curriculum has now its particular training program, enriched and illustrated with a plethora of instances of exemplary practice, gathered from teachers' actual school experience. Thus, it is no longer just a matter of using technology as a catalyst but it was also a matter of viewing how to integrate innovative pedagogical uses of technology into the curriculum [see for instance, Blumenfeld et al. 2000]. More specifically, our current technology program could not be fully understood without understanding the nature of the curriculum that is driving the technology. This is to say, we have moved from an emphasis on literacy to an emphasis on the curriculum. The reader may get an appraisal of this new curriculum-driven use of technology by browsing <http://www.educarchile.cl>

Acknowledgements

This paper was written while the first author was on a Leave of Study, with partial support from Universidad de La Frontera, Temuco, Chile. We want to thank Victoria Neriz for her help with the art work.

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ⁱ The Chilean public school system encompasses close to 60% of all primary and secondary schools which are under municipal administration, about 30% are administered by private independent bodies; all of them are subsidized equally by the State on a student-per-diem attendance basis. The remaining 10% correspond to private, fee-paying schools.

ⁱⁱ In the Chilean education system, individuals, or organizations (public or private) may assume the responsibility of keeping a school working, under the forms and conditions regulated by law. The entity that does it, be it the mayor of the city or a private citizen, is called the "sustainer".