Case Study

# Chile

## Chile: Building the National Learning Network "Enlaces"

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Growing from a handful of primary schools in 1993 to 1,500 schools by the end of 1997, the *Enlaces* Project in Chile is a model in how to take a "computers in school" initiative to scale. The Project provided important planning and implementation lessons based on the experiences of teachers and students using computers as an additional learning device. Though Internet connectivity was extremely limited at startup time, the project began with the vision of "linkages" or *"Enlaces"* in Spanish.

Much has happened to the world, the country, and the program since then. Yet, the original lessons are relevant today. They are at the heart of how to integrate ICTs into learning environments.

What follows is the story of the early years of *Enlaces*—a picture in time, mid-1998, but enhanced, with updates summarizing recent events. It traces the evolution of the project from pilot to scale. The project was based on sound pedagogical criteria, responsive and responsible expansion strategies and initiatives, and the judicious application of past lessons learned worldwide. The story is a valuable case study for other developing countries, particularly those initiating or expanding their own ICT programs into schools and teachers' professional development. Local solutions will vary, of course, but similarities with current projects worldwide are striking.

## The Vision

The vision of *Enlaces* was to create a national learning network of Chilean schools to improve education and meet the future needs of society. *Enlaces'* focus on modernizing education and its visible achievements have enabled the program to generate broad public and government support. The high level of support from schools, parents, businesses, and politicians makes it easier for the program to obtain practical assistance from all sectors of society, achieve objectives, and solve problems.

*Enlaces* enabled teachers and students to communicate easily with others within the network and with people around the world via the Internet. Teachers and students frequently attend meetings, events, and exhibits of locally-produced software applications and computer-assisted educational projects. Simple and creative school projects, such as "Wordarium," "Guessing the Character," and the "Poetic Dictionary," were used to increase and enrich collaboration among participants, enhance creativity, and build vocabulary and information processing skills. The network also enabled teachers to share their experiences and engage in collaborative problem solving and learning.

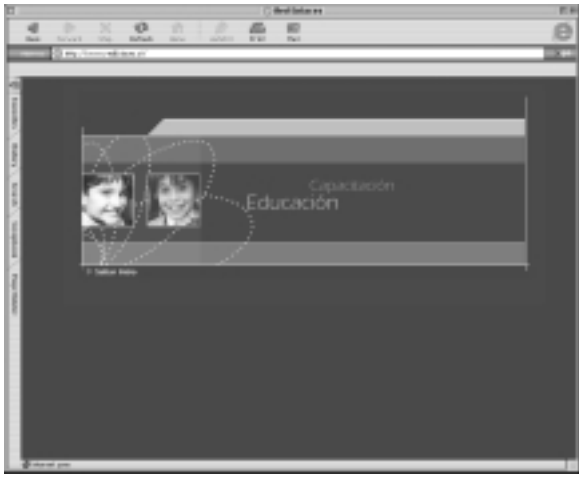
Studies carried out by *Enlaces* researchers and UNESCO consultants showed a positive change in teachers' attitudes toward teaching, computers, and the benefits of the network after being involved in *Enlaces*. These studies found that student dropout rates had fallen and achievement among slow learners had increased in *Enlaces* schools. Interviews with teachers and students also showed an increase in student motivation and creativity.

The World Bank, SRI International, the Universidad de La Frontera, and Fundación Omar Dengo (Costa Rica) conducted a major qualitative study of computers in schools serving middle- to low-income students. Six successful *Enlaces* schools in Chile were selected for an in-depth study from June to November 1996. Researchers found that student-teacher relationships within computer labs were more personal than in traditional classrooms and that students showed greater ability to work and learn independently. Computers also have increased the likelihood of cooperative learning situations. Positive impacts on behavior and self-esteem were also reported among slow learners and special education students. Teachers were positive about the impacts on their own behaviors and self-esteem and believed that computers increased collaboration and strengthened relationships among teachers in the network. Parent and community involvement and interest in computers in schools increased as well.

Although the World Bank/SRI report did not draw specific conclusions about student learning, interviews with teachers reflected their belief that computers did enhance thinking skills and the quality of work of their students. The changes in behaviors and relationships among students and teachers may indicate improved learning. However, more focused research on the effect that computers and learning networks is needed to verify and quantify this effect.

The *Enlaces* program, then and now, is an excellent example of a successful education and technology project in the developing world. Chile's experience represents one possible approach to bringing computers into schools to enhance education. It provides useful lessons and information for understanding the risks and potential benefits of experimental pilot projects that eventually become national programs.

*Enlaces* Interface: La Plaza

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## Project Summary

*Enlaces* is a bold and forward-looking initiative that has radically expanded and enhanced learning environments and educational opportunities for Chile's students and teachers. Using a creative mix of computers and communication tools, *Enlaces* has created a virtual community of teachers and students across Chile and has linked this network to the rest of the world via the Internet.

*Enlaces* is part of a nation-wide education reform effort that seeks to improve the equity, quality, and efficiency of primary and secondary education. *Enlaces* began in 1992 as a pilot effort run by a small group of people at the Catholic University of Chile in Santiago. Initially, the project's goal was to see if a combination of computer and communications technologies could be used to connect schools to form a small learning network. Project planners believed that a network linking schools could contribute to better teaching and learning, help teachers and students develop new skills, and initiate new ways of learning and applying knowledge.

After demonstrating a high degree of success, the *Enlaces* prototype was adopted by the Ministry of Education in late 1993. It was to become a nation-wide initiative and was part of the national education reform program, MECE (Improvement of Equity and Quality of Education).

*Enlaces* and the larger reform effort share important, mutually-reinforcing goals that are critical to overall success. By modernizing the education system, government officials believe that Chile will sustain economic growth and social development and play a more active role in the global information economy of the 21st century. By the end of the 1998 academic year, more than 3,000 primary and secondary schools and half of all primary and secondary students (1.4 million) were participating in the *Enlaces* program. The Ministry expected that all secondary schools and half of Chile's primary schools would be linked by the year 2000.[1]

The remaining primary schools, covering 11% of all students, are in remote rural areas not served by the telecommunications infrastructure. Linking these schools to *Enlaces* remained a priority of the Ministry, and a variety of creative approaches to solving the challenge of providing these schools with basic communication services were being tested.

The *Enlaces* project had the following main objectives:

- Establish a virtual education community of teachers and students using a computer-mediated communications network linking all primary and secondary schools in Chile. This network, as explained by Cristian Cox, MECE's Director, is "a communication network that radically expands the schools' learning environments."
- Enable all teachers and students in Chile's primary and secondary schools to have equal access to basic entry-level computer and communications technology and related educational resources, regardless of location or socio-economic status.


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- Improve teaching practices to increase learning.
- Teach students to conduct research, process information, and improve planning skills; stimulate creativity; and build effective communication abilities.
- Improve the administration and maintenance of student records and instructional materials.
- Enable teachers across Chile to share educational resources and engage in collaborative learning.
- Provide teachers across Chile with a forum to share innovative ideas and experiences.
- Prepare students for the modern workplace by teaching them to use computers and related information and communication technologies (ICTs).

In concert with these educational objectives, there were economic and social expectations as well. Students from *Enlaces* schools would likely become agents of change, introducing ICTs in other sectors of Chilean society as tools for learning and development. These skilled graduates would also provide for sustained national economic growth and development.

## The Early Years: to mid-1998

Pedro Hepp, National Coordinator of the Ministry's *Enlaces* program, started and directed the pilot project with a small cadre of committed professionals. Hepp and his team linked some 60 primary schools in 1994, and prepared a proposal for World Bank support to expand the network to secondary schools. At the end of 1996, Ministry and World Bank funding enabled *Enlaces* to link over 300 primary schools and 160 secondary schools. By the end of 1997, over 1,400 schools were already part of *Enlaces*, with 1,700 more schools added by the end of 1998, and another one thousand during 1999. A technical assistance network of 35 universities also was in operation. The program's goal of linking all of Chile's secondary schools (about 1,400) and half of all primary schools (about 4,000) by 2000 was on the verge of being achieved, though additional private-sector and school community support was hoped for to achieve full implementation.

By mid-1998, *Enlaces* was already both a physical and social network linking Chile's educational institutions. The physical network included computers in schools with links to universities for technical support, a telecommunications infrastructure, software, and communication resources. Users accessed the resources and services through a locally developed interface known as La Plaza, meaning "a town square." The La Plaza interface represents a common cultural setting familiar to anyone in Chile. Users would simply "click" on parts of La Plaza to access their email accounts, information and reference materials, a number of educational software packages, a chat room for interactive discussions with others on the network, and a bulletin board for school and community announcements.

Given the earlier connectivity conditions of country and schools, most communication among

*Enlaces* members was carried out along standard telephone lines via a store-and-forward email method where schools dialed out to regional nodes late at night when rates were low and forwarded accumulated messages to their destination. Initially, *Enlaces* did not provide schools with real-time access to the Internet, but some schools established these services on their own. In 1998, due to more favorable connectivity options and Internet growth, *Enlaces* staff started addressing the question of providing schools with full Internet access as an educational tool, even though its own web site, which was overhauled in August 1998, had existed since 1995.

The social network consisted of primary and secondary school administrators, teachers, students, universities, and staff and officials of the Ministry of Education. To date, the Ministry oversees *Enlaces'* policies, guidelines and funding, and a consortium of 35 universities in different regions of Chile provides technical support and teacher training. The *Enlaces* network is headquartered at the Universidad de la Frontera (UFRO) in Temuco, Chile. By mid-1998, a project team of approximately 40 professional and support staff worked in the different regions to manage and support project activities.

*Enlaces* is funded by the Chilean Government, through the Ministry of Education, with additional assistance from World Bank loans. According to Potashnik (1996), Chile expected to spend approximately $80 million on *Enlaces* until the year 2000, including a Word Bank loan for $20 million. Communities, schools and businesses also provided some cash and in-kind contributions for local *Enlaces* schools. About three-quarters of the funds were earmarked for equipment, and the remainder was for training and technical support. Ministry officials realized that long-term sustainability of *Enlaces* would require private sector involvement, and they were actively campaigning for resources from businesses and offering tax benefits to encourage donations to Enlaces schools. Hepp (1998) reports, however, that few businesses had been willing to provide sizable contributions because of the lack of strong incentives and inexperience with this kind of public-private partnership[2].

Apple Computer Corporation donated some initial equipment through its Apple Classrooms of Tomorrow (ACOT) program, and Apple's Chilean distributor won the initial public bid to provide *Enlaces* with equipment. ACOT also provided consulting services, advice and training to teachers and *Enlaces* staff. CISCO Systems provided the remote access servers at the pilot phase for the dial-up access to schools. After becoming a national program, both IBM Corporation and Apple won major contracts to provide *Enlaces* with equipment. The combination of IBM and Apple computers and equipment made it more difficult and costly to manage and maintain *Enlaces'* technology base.

During 1998, one of Chile's major telecommunications companies, CTC, donated 5,650 telephone lines to *Enlaces* schools, including 860 lines designated for rural schools. CTC also provided reduced rates for telephone costs and offered all government-supported *Enlaces* schools up to 88 hours of free Internet access per month. In addition, CTC would train 10,000 teachers on educational uses of the Internet[3].

*Enlaces* is an open learning network, and private schools were encouraged to join if they provided their own equipment. All schools had to pay their own operating and recurrent costs. In the early *Enlaces* network, telecommunication costs were very low but increased when the Internet was used. In the first four years, all schools entering *Enlaces* had to prepare proposals for their own educational projects detailing how the technology and the network would be used to enhance education. Once the Ministry approved the school's plans, *Enlaces* provided the necessary equipment. A network of supporting universities trained the principal and at least twenty teachers from each school. The trained teachers were then required to train additional teachers in their schools. *Enlaces* also provided schools with additional technical support during their first two years in the network.

Primary schools were allocated equipment and services based on numbers of students. Schools with up to 100 students received three computers and one printer; those with up to 300 hundred students were given six computers and two printers; and schools with more than three hundred students received nine computers and two printers. Each school also received one modem, one CD-ROM player, and a selection of educational software. Secondary schools were provided with a multimedia computer lab with eleven computers, three printers, a network server and modem, CD-ROM drives, and other multimedia

tools and software. Individual schools are still responsible for recurrent costs and are encouraged to develop strategies to expand and sustain their new computer and communication systems.

Universities in different regions continue to provide technical assistance and training to schools and teachers participating in *Enlaces*. Along with support, training, and managing the network, the universities also help teachers become self-sufficient in their use of information and communication technologies to enhance education and stimulate creativity and innovation. The *Enlaces* National Coordination Office sets basic standards, and each regional center and cluster of affiliates develops its own plans and activities to meet the specific needs and capabilities of the schools in its area. *Enlaces* also published a quarterly magazine and maintained a web site (www.*Enlaces*.ufro.cl) to provide teachers and others with supplementary educational resources and information about the program.[4]

By 1998, *Enlaces'* biggest achievement was the creation of a computer-mediated communications network of teachers and students at hundreds and then thousands of Chilean schools, universities, other educational institutions, and the Ministry of Education's own programs. At the time, this impressive accomplishment enabled a series of significant and far-reaching benefits, which are outlined below.

*Enlaces contributes to Chile's national education reform effort:* The Ministry of Education's broad educational reform effort includes initiatives to provide students and teachers with access to modern technology. Through the *Enlaces* project, computers and telecommunication capabilities were introduced directly into Chilean schools to support new learning and teaching practices.

*Increases equity among Chile's schools:* The Ministry of Education selected schools for the Enlaces program according to poverty indicators. *Enlaces* was part of the MECE program, which explicitly addressed equity issues and schools at "pedagogical risk." Since *Enlaces* began, it focused on providing economically and socially disadvantaged schools with computer equipment and training. In fact, a majority of the schools in the small pilot program were among the poorest communities in the country, serving mainly indigenous populations in southern Chile and schools in Santiago. Using the La Plaza interface and both locally developed and commercial educational software, *Enlaces* also helped ensure that all teachers and students linked to the network would have access to the same kinds of information, regardless of location. As the program expanded, this equity goal remained a focus of project activities.

## Lessons

*Focus on Teachers and Teaching, not the Technology*

Central to the success of educational technology projects is training and supporting teachers and integrating technology into learning environments. In addition, actively involving teachers in decision-making about using computers and learning networks is critical to the program's continued success. If they are not, long-term educational achievements and changes in pedagogy will be unlikely. Student learning also is accelerated when teachers successfully assimilate education technologies and integrate their new skills—and the technology—into new approaches to teaching and classroom management. Achieving this is dependent on building effective support systems for teachers. This convinced teachers that technology is an ally for improving teaching and learning and reinforced the idea that technology can be a useful means of enabling educational reform.

*Enlaces* provides teachers with a variety of learning opportunities, including formal group training at teachers' schools and in workshops, collaborative projects with teachers from different schools, the sharing of experiences via the project's magazine and web site, and through informal teacher networks. During training, teachers are provided with "teacher only" rooms to learn and practice new skills. *Enlaces* and other similar projects have learned that teachers do not like learning to use computers while their students are present and will avoid training activities if not held in private facilities.

To enhance the rate of adoption in *Enlaces* schools, computers are introduced as general educational tools that all teachers can and should use—not just math or computer science teachers. Training and orientation are aided by the easy-to-use software interface La Plaza. Once the initial fear of the technology was eliminated, teachers learned more advanced skills quickly and began using the

technologies in their classrooms.

Teachers' concerns about quickly adopting new technologies and ways of teaching influenced the program design. Computers were introduced gradually over two years with ongoing support and training. *Enlaces* focused on meeting teachers' needs and linking technology to teaching. Teachers and administrators also appreciated the program's focus on using the technology to improve school and classroom administration. Providing teachers with practical tools for handling mundane management tasks allowed them more time for more enjoyable educational activities. This feature of the program contributed to teachers adopting new pedagogies that included the use of technology.

In a further effort to address teachers' needs, the *Enlaces* learning network provides teachers access to email and discussion groups. Use of the network for communication helped all teachers, even those in poorer schools, feel part of a larger educational community and reduced feelings of isolation so common among teachers in rural areas.

To join *Enlaces*, all schools must propose educational projects using the new technologies. These teacher-designed projects foster self-reliance and demonstrate how innovative teachers across the network are using the new system to enhance teaching and learning. Designing and implementing their own computer education projects has been an important learning and formative process. These projects and experiences are shared with others through local and regional events, as well as through the Internet. Women teachers across all disciplines devised a substantial number of these projects.

A determining factor for teachers' involvement in *Enlaces* is the lack of time that teachers have for extracurricular activities, including computer training, self-instruction, skills practice and intensive collaborative work. The development of required professional skills occurred primarily on a voluntary basis outside the teachers' normal workday. Dependence on teachers' willingness to spend their own time and resources to make technology projects successful should not be the rule. Programs need to provide teachers with sufficient time during their workday for training, practice, and innovative planning.

The *Enlaces* program is evolving and expanding and now seeks to intensify the relationship between technologies and learning processes, both at a broad strategic level—the restructuring of educational and learning practices—and at the micro level through practical day-to-day applications that improve classroom management and enhance teaching and learning.

*Use a pilot project to test theories and strategies before implementing them on a large scale.* New, complex, and technically difficult initiatives are often best started as small, flexible pilot projects designed to test key ideas, refine strategies, and demonstrate potential. *Enlaces* successfully transitioned from a pilot project to a national program due to its long-term vision and its effectiveness at the pilot stage. Although the *Enlaces* project helped complete the technological requirements for introducing computers into schools, the project itself has focused on educational development. It gained the political and financial support necessary for it to become integrated into a national agenda for improving education. If *Enlaces* had not been integrated into the national educational reform effort, it is unlikely that the program could have achieved its current level of success.

*Organize a small, professional, decentralized management team.* Although *Enlaces* is part of the Ministry of Education, a fairly small autonomous team of professionals manages the program. Because of the complexity of the *Enlaces* network and its far-reaching goals and objectives, *Enlaces* requires a highly competent professional team to design, manage, and maintain it. Individuals in direct collaboration with the schools make most of the administrative decisions. The autonomous and decentralized nature of the program has attracted leading education professionals to join *Enlaces* as collaborators and promoters. The *Enlaces* experience demonstrates the importance of creating and maintaining a decentralized management structure comprised of committed professionals so that people closest to actual project activities can make decisions that reflect local realities and needs and not central policies.

*Utilize a preexisting infrastructure.* Projects such as *Enlaces* that seek to create dynamic learning networks will benefit significantly from a well-developed power and telecommunications

infrastructure. The underlying communications and power network in Chile played no small part in the early achievements of *Enlaces*. In poorer, rural parts of Chile that lack these resources, the program has experimented with wireless alternatives to provide basic connectivity to participating schools. This demonstrates that an extant infrastructure can make learning network projects easier and faster to implement. However, the absence of a well-developed infrastructure should not preclude such initiatives. For much of the developing world, it may be too expensive and take too long to establish a conventional power and communications infrastructure to reach all communities, especially the poorest and most remote areas. In such situations, it may be possible to create clusters of linked schools or learning network cells via wireless technologies. Countries considering projects similar to *Enlaces* must carefully evaluate current and planned infrastructures against the demands of technology projects. Such efforts must also assess alternative strategies for meeting these needs since the long-term benefits of enhancing education through computer -mediated communication will likely outweigh short-term costs.

*Gradually introduce computers into schools and integrate the technology into teaching and learning activities.* It takes time for teachers and schools to adjust to using computers and communications tools and integrate these technologies into educational programs. *Enlaces* shows that while computers are useful tools, it is necessary to introduce them in ways that are not threatening, enabling teachers, administrators, and students to learn how to use them to improve education and make their work easier and more enjoyable. Change and innovations in educational practices start with methods that are already being used. *Enlaces'* structure allows changes to be gradual and in many ways self-directed by the teachers themselves.

Schools should have sufficient autonomy to define the ways in which technology will be used to support their own educational needs and activities. At the same time, educational technology programs need to use training and demonstration activities to show the diversity of possible applications and new opportunities for local innovation. *Enlaces* has been an exercise in empowerment for teachers and school administrators by encouraging them to develop their own proposals for using computers in their schools. Teachers are the primary actors and beneficiaries of the program. Their involvement has given them a sense of ownership of the program and fostered a willingness to implement change.

The training *Enlaces* provides familiarizes teachers with the use of technology. However, it is insufficient to allow teachers to fully integrate technology into their curricula. Continuous training is essential to develop skills, confidence, and a desire for innovation. Although schools are provided with the necessary equipment and infrastructure, teachers must be willing and able to use these tools if they want to help their students learn new capabilities effectively. The gradual introduction of technology into schools, the design of a culturally appropriate and an easy-to-use interface, and on going support has been essential for the success of projects like *Enlaces*.

*Decentralize technical assistance and training.* Much of the technical assistance that *Enlaces* provides consists of teacher training and producing training materials and work guides. Universities deliver the assistance, which is advantageous for many reasons. The universities are up-to-date on education and technology trends, and they can provide advice on pedagogical matters. This decentralized arrangement also gives the universities and schools more power to define and direct the program to meet their specific educational goals and implement their own school-based projects. The universities are accountable to the schools and the Ministry for delivering training and technical support, but they are free to apply basic standards set by the Ministry flexibly. In addition, universities have opportunities to conduct research to evaluate the progress of students and teachers in *Enlaces* schools within each zone. Another advantage is that universities must deal with the realities of introducing technological innovations and skills into public primary and secondary education.

Using universities to deliver support services to a complex project also has disadvantages. For example, universities may have limited capabilities in keeping computer systems and communication networks running. When they exist, commercial vendors may be more reliable providers of these types of services.

Universities also tend to have slow administrative procedures, bureaucratic systems, high operating costs, and a lack of discretionary financial resources. Even though universities have research capabilities, there are no guarantees that staff will choose to make educational technology projects a focus of inquiry.

Although universities may not be the best means of providing support, training, and research services to projects such as *Enlaces*, for Chile they were the most reliable and efficient way of reaching the schools and teachers in a decentralized manner. A hybrid arrangement with both private and public agencies providing aspects of technical assistance and training may be an effective approach for complex projects. Such an arrangement also may keep costs down, promote community involvement, and encourage economic development.

*Use robust processes for assessment, monitoring, and evaluation.* Dynamic but not complex monitoring and evaluation strategies and tools to collect both quantitative and qualitative information can help maintain strong local and national support for expensive and long-term projects.

*Enlaces* staff devised a strategy for monitoring and evaluating the use of the network by teachers and students, as well as their progress toward achieving short- and long-term project results and outcomes. These approaches included monitoring the use of La Plaza software, the flow of communications among schools, the number of email contacts made by participants, and assessing student achievement using the national exam and other instruments. The data collected through this system provided *Enlaces* with the raw material to identify and explain early usage patterns and changes in attitudes, behavior, and learning outcomes related to *Enlaces*. Unfortunately, only initial results from 1995 were reported, and no subsequent information was provided in the January 1998 evaluation report.

Project staff carried out a series of small, qualitative studies to improve planning and implementation. These studies focused on assessing the concerns and attitudes of teachers, principals, and students about using computers and communication networks to enhance learning. Early results from teachers showed that they were skeptical about the plans for *Enlaces;* many believed that poorer schools would never receive computers, and that if they did, the equipment would be old, used systems and that teachers would not be trained to use them. As the project progressed, however, focus group meetings and interviews indicated that teachers' attitudes toward using technology in the schools were positive.

Teachers also valued the simplicity of the La Plaza interface. Although limited, the electronic resources made teachers feel that they were indeed part of the larger *Enlaces* program and a networked community of learners. Many teachers also felt that they were part of a "modern wave" of education improvement in Chile. Student assessments showed that they felt much more motivated to learn in innovative, fun, and engaging ways. They also believed that they were learning marketable skills in writing, computer knowledge and teamwork within their schools and across the network.

In 1997, a major, independent, qualitative study examined classroom, school, and national-level implementation strategies, comparing them to a similar project in Costa Rica (Alvarez et al, World Bank, 1998). Six *Enlaces* schools were selected to participate in the study, which stressed a number of specific positive changes in learning and teaching that have occurred as a result of using computers for education and of linking schools together electronically.

The results from these studies did not provide definitive conclusions about the effect of *Enlaces* on learning performance. However, they did provide valuable insights into the multitude of effects that this project is having on teaching and learning in Chile. They showed, for example, that *Enlaces* was making a substantive impact on pedagogy and a valuable contribution to the larger education reform effort. They provided examples of real-life, classroom-level experiences and lessons from *Enlaces* that are relevant to other schools and teachers in Chile and other countries.

The *Enlaces* program devised a complex set of quantitative tools that were designed to assess student progress over time and track changes in teachers' and parents' attitudes and perceptions of the program. Unfortunately, the results from this evaluation process, based in part on factorial analysis, are not interpretable. *Enlaces* staff admit that the most serious complicating factor is the number and pervasiveness of different processes that are involved in the national educational reform effort. It is extremely difficult to isolate the impact

that *Enlaces* might be having from the impact of the larger reform program. Additional difficulties derive from the varied way in which schools, teachers, and students use *Enlaces* to enhance different aspects of teaching and learning. Notwithstanding such complexities, some comparisons using national achievement scores of *Enlaces* and non-*Enlaces* schools also were undertaken.

*Sustain and expand technology projects.* Development projects that require significant investments in technology demand sound strategies to cover maintenance, replace outdated equipment, funding for new equipment to meet increased demand, pay recurrent operating expenses, and provide ongoing user training. To address parts of this sustainability challenge, *Enlaces* provides participating schools with the initial equipment and software and two years of technical assistance. During this time, schools are expected to develop plans and mechanisms for sustaining the project. Reports indicated that most schools were successfully meeting part of this responsibility. However, schools had limited success in receiving effective service from equipment vendors and in keeping costs for telephone service and equipment insurance and repair low. The lack of skilled technicians to service both IBM compatible and Apple equipment, especially in remote areas, also proved problematic.

An even greater challenge—the need to replace outdated equipment and buy additional equipment—rapidly became a painful reality. It appeared that few schools had created budgets or funding mechanisms to upgrade equipment and software and buy additional equipment needed to meet the growing demand. This was also at the same time that *Enlaces* was encouraging schools to use the World Wide Web and the monthly access and on-line use costs were significant. For *Enlaces* to be sustained and institutionalized, progress must be made by schools and the ministry to develop an equitable means of funding the purchase and continued use of ICTs in schools over time. School budgets must be changed to reflect these new needs. Through creative partnerships among schools, parent groups, and the business community, supplemental funds could be provided to maintain and buy equipment, provide continuous training, and increase Internet and network usage.

*Enlaces* is an ongoing program that has successfully managed a complex transition from a carefully planned and nurtured pilot project to a nationwide effort. Projects like *Enlaces* that seek to achieve national coverage without sacrificing educational equity and quality need to address a number of important factors, including:

- a focus on teachers as the main pedagogical actors and a commitment to supporting their learning needs;
- support for the establishment of a social network of learners and educators, facilitated by user-friendly technology and decentralized support arrangements;
- respect for schools' autonomy and the decisions they make about using technology to meet local educational needs; and
- creating a balanced mix of project vision, strategic planning, efficiency, and needed flexibility and creativity in the face of emerging educational challenges and rapidly evolving technologies.

Two other aspects of the *Enlaces* experience deserve special attention. First, *Enlaces* staff put the needs of learning and learners before technology. Strategic program decisions reflect this principle, from extensive and well-budgeted teacher training to school-directed local projects for using technology and the inviting interface of La Plaza.

Second, *Enlaces* planners have judiciously applied learning from other efforts to introduce and use computers and telecommunications to improve education. Lessons learned in different cultural settings echo through the *Enlaces* implementation process. One can only hope that *Enlaces* continues to be an innovative and equitable learning network that learns from its own experiences and that of others.

## The Enlaces Project: 1992-2002

Between 1992 and 2002, the *Enlaces* Project underwent significant changes. Some of the key developments are summarized.

### Increased coverage of schools and students

Table 1 summarizes *Enlaces* increased coverage and shows a dramatic increase in the number of schools and students.

Targets were met and substantial additional progress has been achieved in full primary school coverage. The remaining rural school problem is being addressed within the Ministry's "Básica Rural"

program. In 2000, a pilot project was implemented in 14 rural schools, with 62 micro centers covering 340 schools added in 2001, and 600 more in 2002.

While student coverage is now almost universal, the ratio of computers-to-students needs to improve. By 2006, the ratio will be 1:35 instead of 1:65 as it is now. Some school-community initiatives are improving such ratios.

### Access to Internet and WWW resources

The coverage increase masks another critical qualitative change. Full Internet access is now prevalent. This was not the case prior to 1998. Some schools are now jumping into high bandwidth, provided at increasingly affordable costs. Dial-up access to Internet has accelerated enormously because of a decrease in connectivity costs and Internet plans. The substantial increase in access and use of online educational resources is now part of the Enlaces coverage.

Access *per se* means the potential use of any and all educational resource on the Internet (and substantial numbers of them are available in Spanish). Moreover, quality and pertinence of use within a formal schooling environment is enhanced by the new educational portal and several related resources. Teachers continue to be supported, too, in the development of their ICT competencies and skills, online and offline.[5]

### A new portal and more resources for the educational community

The most visible change for *Enlaces* is the new portal, www.educarchile.cl, online since October 2001[6] and segmented into four sub-portals: Students, Teachers, Family, Researchers and Policy-Makers. A successful partnership between the public, private, and philanthropic sectors supports the site.

Digital content on the site includes lesson plans, summary index cards and guides to educational resources, educational data banks, and interactive services for the educational community as a whole, including online training and email accounts. The implied lesson is paramount. *Enlaces* is now not only about schools, teachers, and students: it is the reference site for all those interested in education.

The original *Enlaces* network web site, though, is not defunct and still operates on its own as www.redEnlaces.cl, with a focus on the educational network itself and its accompanying resources. One link leads to the specialized *Enlaces* Trainers' Network[7], which adds unique additional training resources for teachers and educators.

### Improved teacher access to computers and use of e-resources

While the complaint about not enough computers in schools is valid, a program that subsidized teachers' purchase of computers seems to have influenced educators' personal decisions to own one at home. A recent independent poll[8] shows that 64% of teachers in the public education system own a PC (i.e., over 80,000 teachers), and 41% (over 50,000) have Internet access. Virtually all report using these resources to support their professional tasks and development. Teachers are actively engaged in enhancing their professional profile and their e-readiness, a critical component for sustaining

Table 1 ***Enlaces* Expansion 1992-2002**

| Item | | 1992 | 1994 | 1996 | 1998 | 2000 | 2002 |
|---|---|---|---|---|---|---|---|
| Number of schools | primary | 5 | 58 | 311 | 2206 | 4052 | 5942 |
| cumulative | secondary | 0 | 0 | 161 | 952 | 1283 | 1336 |
| % coverage schools | primary | 0 | 1 | 4 | 27 | 50 | 74 |
| | secondary | 0 | 0 | 11 | 66 | 89 | 93 |
| | total | 0 | 1 | 5 | 33 | 56 | 77 |
| % coverage students | primary | na | | | 48 | 85 | 96 |
| | secondary | | | | 81 | 95 | 98 |
| | total | | | | 56 | 87 | 97 |

Source: www.red*Enlaces*.cl ("cobertura"). 2002 est

educational reform and integration of ICTs into the teaching and learning process. The fact is more noteworthy if one compares the teachers' prevalence figures with the country's (17% and 10% respectively for PCs and Internet). In fact, the teachers' rates are equivalent to that of the highest percentile of the population. The value and impact of proactive equity measures cannot be more strongly underscored.

### Computers in schools available for community access

Chile is still not a relevant actor in telecenter development, except for a few noteworthy initiatives. Worldwide, it is not common to see school ICT and Internet facilities open up to the community. After field testing the idea, the Ministry of Education opened up the *Enlaces* network to the community in August 2002, with 590 schools applying for entrance. The plan will encompass 5,000 schools reaching an estimated half a million persons to be trained in ICT uses by 2005.

### Growth pains, new challenges, persistence of educational inequities

Even success stories are not all rosy. The problems of deep persistent social inequities, which tend to permeate educational systems, cannot be solved by ICT infusions alone. Yet evidence highlighted in this case study show that *deliberate, proactive, and well-focused ICT initiatives can be strategic in addressing inequities.* Some problems become non-problems after a while, perhaps due to other economic and social developments such as more affordable connectivity options and more educationally-relevant Internet content and resources.

Sometimes solving old problems creates new, superior challenges, as is the case for increasing the availability of computer time per student and the continuing development of more sophisticated Internet usage and creativity in applying such resources to learning.

The Chilean educational system remains "significantly segregated: where poor students go, middle and upper class students do not go and vice versa." Moreover, the educational culture has internalized a "representation of inequality" in a system operating in "three different bands," i.e., municipalized, subsidized, and private, according to the latest yearly survey of educational actors.[9] Nevertheless, most parents have high trust in their children's teachers and principals. The survey notes that 80% of principals and 74% of teachers, regardless of their school, have a computer at home. In 41% of the students' homes, there is a computer, too, though Internet access at home is available for 46% of paid school families and for only 15% of municipal ones.[10] This is why computers, software applications, and Internet access are important inputs to schools, as partial equalizers. Poorer schools in the study complain about insufficiencies in all three aspects.

Introducing computers in schools may be the single most important factor in preparing developing countries for the challenges of globalization and the coming Information Age. The challenge is not unlike that of extending the reach and quality of education: first, it is about universal access to primary education, followed by equity and quality of learning and successively expanding the agenda to cover all actors and levels of the educational system. Putting computers in schools and providing the very first window to the Internet is but the momentous initial step.

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**Red*Enlaces*.cl:** This web site (www.red*Enlaces*.cl) continues to host the *Enlaces* Network and has links to the other key sites: the educarchile portal, the Ministry of Education Portal (www.mineduc.cl), the *Enlaces* Trainers' Network, the *Enlaces* and Community site.

## Footnotes

[1] Those targets were met.

[2] The new portal is a major public-private-philanthropic partnership.

[3] CTC is now Telefonica. An even better agreement was subsequently concluded between the Government of Chile and Telefonica.

[4] The magazine, essential for teachers in the start-up years, was discontinued in 1999. The supporting web sites were folded into the new portal, though the network's web site is still active.

[5] See www.red*Enlaces*.cl for additional teacher resources for their online work.

[6] The new portal is the confluence of the classic and beloved www.red*Enlaces*.cl and the educational portal www.ie2000.cl developed by Fundación Chile, a public-private entity (see www.fundch.cl/dt/fc_index.htm). Those links now redirect to the new portal.

[7] www.red*Enlaces*.cl/capacitadores/capacitadores/index.html

[8] Collect Investigaciones de Mercado, mid-2002. Reported in red*Enlaces*, mineduc and media, July 2002.

[9] CIDE, 2002. This is noted in its third national survey, 10-11/2001, applied to a representative sample of 231 educational establishments in which almost 15,000 persons were consulted (principals, teachers, students, parents). See Refs and www.cide.cl

[10] The home computer percentages are 32, 40 and 67% according to students' type of school, a notable gain for poorer families whose Internet access grew from 9.5 to 15% in a year. See the CIDE report for full details on perceptions of the schools' e-facilities.