

# INTEL® TEACH ESSENTIALS COURSE: A STRATEGY TO IMPLEMENT THE CHILEAN REFORMS IN THE CLASSROOM

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**Abstract:** Creating change in classroom practice is the most difficult task that ministries face when promoting the integration educational technology. This paper looks at case studies of two schools in Chile that are involved in the Intel® Teach teacher professional development program to explore how distinct features of the program combine with features of Chile’s educational reform to help promote change at the school and classroom level.

## Categories and Subject Descriptors

K.3 COMPUTERS AND EDUCATION

## General Terms

Human Factors

## Keywords

Educational technology, Policy, Professional Development

## 1. INTRODUCTION

All across the Latin America, national governments, non-government organization and multi-lateral organizations are dedicating substantial resources and time in the continuing effort to integrate information and communication technology in meaningful ways into the region’s classroom. Chile has been promoting educational technology since the 1990’s, but the hallmark of Chilean education is, perhaps, the methodical and deep reforms in the system since the restoration of democracy in 1990. The relevant features of the current system are the model of privatization that Chile inherited from the dictatorship; the curricular reforms of the 1990s; and the national educational technology program, Enlaces (Links). This type of systemic change is slow and complex, even with ample funding and resources often available in the developed countries let alone in the context of limited resources available in many Latin American nations. Chile provides an interesting opportunity to examine the complex challenges of integrating educational technology into the education system.

multiple programs and efforts come together to promote change at the school and classroom level.

With a grant from the Intel® Corporation, the authors conducted case studies of two schools from the Intel Teach Essentials Course that are considered to be “good examples” of using technology in the classroom. The case studies were designed to identify underlying factors and patterns [16] that enabled these schools to be successful. In both schools we found that the educators we interviewed felt they had been able to implement both new ICT activities and new teaching approaches with their students after the course. Additionally, we found that no single factor or program accounted for these schools’ ability to move forward. Instead it was a combination of programs and policies coupled with the motivation and skills of the educators in each building that enabled the schools to innovate.

## 2. STUDY DESIGN

### 2.1 Theoretical framework

A large body of research, mostly focused on wealthy countries, has identified a number of common factors shared by projects that successfully integrate ICT into educational programs.[6, 8, 9, 15] And this framework of common factors has begun to be applied to the experience of developing countries.[14, 13] While the exact number of key factors may vary from one writer to the next, multiple studies have underscored the importance of a minimum core group of factors. We examined seven of these most commonly cited factors to help understand the case studies: pedagogical objectives and goals; leadership; professional development and ongoing support; experimentation, adaptation, and critical reflection; time; infrastructure; and financing and sustainability. This paper reports the studies findings in relation to these seven factors.

### 2.2 Selecting the schools

The Ministry of Education (MINEDUC) and the Pontificia Universidad Católica de Chile in Santiago, which oversees the program nationally, and the Intel Education Manager met with the local evaluation team to generate a list of schools that met their terms of success and were “typical” Chilean schools. The local evaluation team reviewed the list to make the final selections. The schools selected a government-subsidized private school in a lower middle class neighborhood of Santiago Chile and a small

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municipal school in a rural town. The private school has 2,747 students from pre-K to Grade 12, and the municipal school serves 97 students from pre-K to Grade 8. The private school has five ICT labs, some with as many as 20 computers. The municipal school has a lab with 15 computers, plus four laptops, a digital camera, a TV, a printer, two LCD projectors, and a wireless network.

### 3. Context of Chilean Education

The privatization of education that occurred under the Pinochet dictatorship is a central characteristic of the Chilean system. [17] Chile currently has three types of schools:

1. Municipal Schools (serving 44.98 percent of students in Chile:[2] With funding from the national government—a set amount according to each pupil’s actual attendance—municipalities own and administer these schools., The schools are often located in rural or urban areas where there are no private schools and the pupils often are from the poorest families.
2. Subsidized Private Schools (serving 46.51 percent of students in Chile): These schools receive partial funding from the government but belong to private, nonprofit entities. The government limits the fees the schools can charge parents and provides a subsidy per student (students mostly come from working class and lower middle-class families) that is prorated to the amount charged to the parents. Funds are paid directly to the school, based on monthly attendance rolls. This strategy generally means that subsidized schools have more funds per pupil than municipal schools.
3. Privately Paid Schools (serving about 6.95 percent of students in Chile): These schools are completely funded by the parents, and there is no limit to the fees.

Although the democratic governments have left the basic privatized system intact, they have pursued policies to improve the resources and infrastructure of the poorest and lowest performing schools, whether municipal or subsidized.[3,17] However, the privatized system came under serious pressure in 2006 when Chilean students across the country staged a national strike. The *revolt of the penguins* (a colloquial reference to the traditional school uniform) lasted for months, and one of the protesters’ demands was an end to for-profit education.[18]

Since 1990, successive Chilean governments have undertaken a series of curricular reforms. These reforms constitute a systematic, coordinated approach to gradually transforming the administrative and policy context of the education system and modernizing the teaching and learning in Chilean schools.[7, 17] The MINEDUC has improved and extended the school infrastructure, transformed the curricula, instituted full-day schooling (Jornada Escolar Completa), developed a national examination (SIMCE), invested heavily in teacher professional development, and integrated ICT into schools. Chile also participates in international assessments like TIMSS and PISA. The Ministry established curricular frameworks in primary (1995) and secondary (1997) education and has recently issued adjustments to refine and improve the curricula based on actual experience. According to one of the architects of the reform, Cristián Cox, move away from “encyclopedic” knowledge towards “the development of skills for accessing knowledge as major guiding principle.”[4]

The MINEDUC first extended compulsory education to 12 years and preschool has since been added. The MINEDUC mandated that

all schools—municipal and subsidized—expand the school day to eight hours, increase the amount of time students spend in core areas, and create space for students to engage in optional activities or project-based learning experiences. Additionally the Ministry requires that all schools have an Unidad Técnica Pedagógica (Pedagogical Technique Unit) or a department of pedagogic support.

Along with the introduction of a longer school day and more demanding curricular contents, the Ministry implemented new professional development programs. For example, the Ministry offered a free, voluntary 70-hour course on the new curricular framework during the summer holidays.[3] However, most experts agree that the continuing challenge facing Chile’s education system is the impact of these reforms on actual practice in the classrooms.[4, 17] There continues to be a gap between what is expected of teachers and how teachers are able to implement or enact changes in the classroom with their students.

In tandem with the government’s other reforms, Chile also began laying the groundwork to integrate ICT into schools. The *Enlaces* program (Enlaces means Links in Spanish) started in 1992 as an experiment to integrate technology into just one poor rural school and was expanded to 55 schools in 1995 before the program was taken to scale.[1] By 2007, Enlaces had provided hardware, software, and connectivity to more than 10,300 of the 11,033 schools in Chile (94.3 percent).[2] Enlaces considers teachers to be the principal change agents in schools, so the program is focused on teacher professional development and has provided substantial professional development to 110,000 teachers in Chile.

However echoing the concerns of experts in Chile’s educational reform efforts above, the leadership of Enlaces are not satisfied with the extent to which teachers are using ICT in the classroom with their students:[1]

We had provided just a basic *seed* that allowed schools and teachers to recognize the potential benefits of ICT. Technology has already been incorporated into the school culture, but it has not really been incorporated into teachers’ regular teaching practice. If ICT is to make a contribution to teaching and learning practices, we still have a long road to follow. The next steps of Enlaces are directed towards the effective curricular integration of ICT.[12]

#### 3.1 Intel Teach Essentials Course in Chile

The Ministry piloted the Essentials Course with teachers in 2003 and decided to integrate the program as a professional development offering as part of Enlaces activities.[5] The RATE (Red de Asistencia Técnica de Enlaces)—a network of universities throughout Chile selected by the Ministry—offers the standard 40-hour course to teachers in their region. Within each university, academic centers that specialize in educational technology house the Essentials Course. The course is free to teachers in municipal and subsidized schools that are part of the Enlaces program.

The Essentials Course is professional development course created by the Intel Foundation and offered in collaboration with ministries of education and local education organizations in over 30 countries. The central content and structure of the course is the

same everywhere. The core of the Essentials Course curriculum focuses on preparing teachers to integrate ICT across the curricula as a tool for learning, and to design and implement inquiry-driven, project-based learning activities. The program uses a train-the-trainer model in which Senior Trainers (STs) train Master Teachers (MTs) based in local districts or schools, who then run the course with Participant Teachers (PTs). The standard version of the course is 10 modules over 40 hours, but some countries have expanded the duration of the course (i.e., 60 hours) or have added extra modules before or after the course in response to local needs. However, none of the countries has removed content from the course.

#### **4. DATA COLLECTION**

In each school, we interviewed school administrators, teachers, technology coordinators, students, and the MT or ST who supported the Essentials Course as well as other local officials for the village school since they played a central role in municipal school systems. We also observed standard classrooms as well as the computer lab. Furthermore, we asked the school to identify some of their best or most innovative teachers because we wanted to see what the best teachers were able to do in each context. In total we spent two days in each school, interviewed ten educators, conducted two focus groups and observed seven classes.

#### **5. CASE STUDIES**

##### **5.1 Urban School – Colegio El Sembrador**

Colegio El Sembrador is a government-subsidized private school serving a mostly middle-class population in the neighborhood on the outskirts of Santiago. The school has now been in existence for 20 years. Our visit was to the middle and high school buildings. There are 60 teachers in the school and the average class size is 36. The students at El Sembrador score above the national mean on the SIMCE exams. For Grade 4 and Grade 8, the school's SIMCE exam scores are in the top 10 percent of schools of a similar socioeconomic level; the scores are in the top 25 percent for high school (Grade 10). Most members of the school's leadership team have been at the school since the beginning. The leadership consists of the school's owner, the principals of each school level (pre-K, primary, and secondary) and the head of the Unidad Técnica Pedagógica (UTP—the Pedagogic Technique Unit). At El Sembrador, the head of the UTP is also a Master Teacher (MT) for the Essentials Course and is clearly the driving force behind the integration of ICT into teaching.

According to the head of the UTP and the principal of the elementary school, pedagogy at El Sembrador has changed over the years. She noted that while the school used very teacher-centered, lecture-based approaches in the early days, the school was attracted by the reform in 1996. When these educators participated in the government training programs about the reforms, they liked much of what they heard, and they felt the new approaches were better for the students than the traditional approaches. Both leaders thought that many schools in Chile just made superficial changes to comply with the reforms in name only.

The central task of the UTP is to promote good practice in the school, and the head of the UTP has a clear vision of what she wants to see in the classroom. She stated that the school leadership expects teachers to use problem-based teaching

approaches, to explain learning objectives to students, and to give students a voice in deciding how to attain those objectives. El Sembrador's vision of technology as an interdisciplinary tool reflects the messages of the Ministry and the Enlaces program. The school leaders we interviewed noted that El Sembrador worked hard to avoid the problem of many other Enlaces schools, in which ICT became a teacher planning tool but did not make it into the hands of students. Although the school was already integrating ICT into classrooms, The head of the UTP reported that the Essentials Course introduced the school to two new things—inquiry-driven learning and the use of holistic rubrics for student assessments.

In keeping with the school's vision that good teachers are constantly improving their practice, the school has a strong internal professional support structure with the UTP. The Chilean Ministry of Education requires all schools to have a weekly teacher meeting for planning and training. El Sembrador takes advantage of this time for reflection and professional growth. Each year, the faculty selects a theme which they work on for the entire year. In 2008, the faculty focused on lesson planning using an approach (*Planificación Modelo T*) that is similar to the "backwards design" approach in the Essentials Course.[19] The head of the UTP is assisted by three teachers who split their time between teaching and providing support to their peers. They offer internal training sessions, as well as encourage teachers to sign up for external professional development offerings, such as the Essentials Course or the new Intel Teach Essentials Online.

In addition to continuous professional development, the school provides pre-made unit plans and assessment tools so that teachers do not need to develop everything themselves. One set of materials is a collection of unit plans that teachers at El Sembrador created in the Essentials Course and then refined as they piloted them in their classes.

The school values ICT as a tool for more than simply learning to use computers. According to one of the computer teachers, "the object is not to teach them computers, children are always going to know more! The thing is to teach them other things—skills and behaviors—like researching." This value was echoed by a focus group of 10th-grade students, who said that they used technology in almost every subject for research and to create publications, Web pages, and presentations. In one of the lab sessions we observed, students were doing projects around a novel they read in class (*Alfonso Caso: El Explorador de Monte Alban*). As part of the project, they were making brochures, presentations, and a Web page using their reading of the book to answer the question "Can we learn about human culture through literature?"

Students and teachers alike mentioned a variety of common uses of ICT. Teachers spoke of using the Internet to conduct reference research and to make PowerPoint presentations. Additionally, the teachers at El Sembrador challenged students to act as researchers and make their own interpretations of primary documents or raw data on the Web. In one instance, we observed a lab session where a teacher asked students to examine photographs of Chilean life in the early 19th century and reflect on how these images contrast with the official interpretation of Chile's history. Two teachers, who had recently completed Intel Teach Online, were experimenting with blogs. We observed a class of seventh-grade

students working on blogs about the Industrial Revolution in Chile.

## 5.2 Village School – Escuela Básica Pedro Aguirre Cerdá

Escuela Pedro Aguirre Cerdá is a small rural school in a township at the foot of the Andes. One of six schools in the municipal school system, it serves mostly children from low-income families. The municipality plays a strong role in leading the school system. The national government provides a flat amount of money per student, but the township provides additional funding because the national funds are insufficient. The township has a smaller student/teacher ratio because most of the schools are rural. Therefore, the township employs more teachers than a typical Chilean school. There is a strong leadership team formed by the Municipal Director of Education and the Head of the Municipal UTP. The Director of Education (the former principal of Pedro Aguirre Cerdá) was very clear that ICT should be used to “deepen learning and not just be an add-on activity.”

The township participates in a great variety of educational programs offered by the MINEDUC: Enlaces; Bicentenary Project; School Management 2008; the Programa de Mejoramiento de la Calidad y la Equidad de la Educación/Rural (Program for Improvement and Quality of Education/Rural), also known as the “MECE-Rural” program; the Essentials Course; and the Healthy Schools project. The head of the UTP commented, “When you have nothing, you’ll put your name in for anything.” The programs have helped the schools acquire ICT resources and many training opportunities.

Both of the school system’s leaders support the educational reforms promoted by the government since the 1990s, and they both know well the challenges of creating a real change in the classroom. Although the Ministry offered a number of professional development programs explaining the reform vision, Pedro Aguirre Cerdá augments the Ministry’s professional development with its own professional development and other strategies to support change. Across the system’s 57 teachers, only a portion of teachers are comfortable with and using the new student-centered approaches. They consider Pedro Aguirre Cerdá to be their best school in attempting to integrate ICT and student-centered learning. The municipal education leaders both feel the course complements Chile’s curricula and national reform efforts and reinforces the vision of Enlaces for ICT use with students. They feel that one of the strengths of the Essentials Course is that it does fit so well with Chile’s reform agenda, and it does not introduce contradictory approaches or messages.

At a bend in a dirt road, Pedro Aguirre Cerdá School is fenced in with two grassy fields for football and school events. Each building is a line of classrooms that open up onto the courtyards. The school has 97 students from pre-K to Grade 8. There are six classroom teachers, and an additional five teachers visit the school to teach Music and English or to provide special education services. With only six teachers for eight grades, some teachers have combined classes—combining Grade 1 and Grade 2, for example. The average class size is 15 students. The students’

scores on the Grade 4 and Grade 8 national exam are above the 70th percentile among similar students nationally.<sup>1</sup>

As noted, Pedro Aguirre Cerdá is part of the special MECE-Rural national program for rural schools, and it has participated in the project since 1998. The MECE-Rural program provides resources and trainings. In addition, as part of this program, each month the Pedro Aguirre Cerdá faculty hosts a full-day teacher meeting with colleagues from another rural school. During the meeting, they work together to improve their teaching and to do professional development.

All classes have two ICT lab sessions a week, but the teachers reported that it is easy to schedule extra lab time whenever they need to do so because the school is so small. Since the teachers have all completed the Essentials Course, they work with their own students in the ICT lab, and there is no separate ICT teacher. Additionally, the laptops and projectors allow teachers to integrate ICT in the classrooms, especially for students’ presentations.

The teachers at Escuela Pedro Aguirre Cerdá do a lot of schoolwide projects that involve all students from all grades. Each year, they try to do at least one special project. Sometimes, the projects focus on the content. In other cases, the projects serve to connect the school to the life of the community. Students’ first project, for example, was to do histories of all the old houses in the village by collecting stories, names of the inhabitants, photographs, etc. from the community. After taking the Essentials Course, the school did the multi-grade Pequeños Habitantes project that they had designed in the training. Each grade did an insect-themed project connected to the curriculum and shared the results with fellow students. Then, the seventh and eighth graders compiled all of these experiences into a blog.

## 6. EXAMINING THE CASE STUDIES

The following section uses the analytical framework of the seven key factors to examine how each of these schools has been able to realize the changes they sought to make by experimenting with new teaching strategies, integrating ICT use with students, and following up on the Essentials Course.

### 6.1 Pedagogical objectives and goals

The research on educational innovation suggests that it is important for schools to share a reformed vision of teaching and learning in order to create sustainable change at the school and classroom levels. Additionally, in respect to ICT integration, the research suggests that successful projects have clear and consistent messages concerning the role of ICT in supporting that vision, and that teachers see how ICT supports their students’ learning.

In Chile, educators saw a close correlation with the Essentials Course and government education reforms. Both schools were working hard to transform their learning environments in accordance with the Chilean reforms and clearly saw ICT and Essentials as tools to support that larger goal. The educators we interviewed understood Chile’s reform agenda, the promotion of student projects, and the use of ICT resources as an integral part

<sup>1</sup>SIMCE results for every school in Chile are available at <http://www.simce.cl/>.

of the learning environment they sought to create in their schools. All of the teachers we interviewed felt that the ICT use and projects were valuable learning experiences for their students; none of them expressed that they felt like they were using ICT merely to comply with government regulations. In their conversations, educators at both schools shared that they saw a close alignment between the Essentials Course and the government reform. Moreover, they felt the Essentials Course went beyond theory to address practice, providing them the practical training and skills to enact the goals in the classroom. Additionally, El Sembrador was working hard to incorporate new assessment strategies into their classrooms, and they valued the rubric assessment materials in the Essentials Course.

## 6.2 Leadership

The research literature also indicates that leadership at various levels of the system is important if an innovative project is to take root and grow at the classroom level. Chilean schools function with two or three levels of leadership depending on whether they are private or municipal. For both types of schools the MINEDUC sets overall policy, curricula, and national assessment. Next, for private schools, there is the school leadership that makes the day-to-day decisions, but for municipal schools there is the municipal education secretariat and then there is the building leadership. Issues of national leadership are important for technology projects [10, 11], but these case studies further suggest that building level leadership is key and that the two levels need to work in tandem. The school's leadership is the key nexus in the process of reinterpreting a broad, national vision into a practical vision that teachers can enact in their classroom. The MINEDUC has developed a framework of Good Administration (Marco para la Buena Dirección) that highlights the leadership's role as an instructional leader as well as a good administrator of resources.

The findings from these two schools highlight three aspects of the role of building-level leaders in supporting a process of ICT integration and pedagogical innovation. First, leadership does not come only from the principal. In both schools, other figures were also advocates for technology and the Essentials Course. In each of these schools, the Essentials MT was a key figure in providing ongoing support after the training itself.

Second, the leaders of the ICT initiatives did not just set the vision and provide clear expectations for teachers, they served as instructional leaders by providing support and guidance in teachers' classrooms. In Chile this activity was supported by the Mineduc reforms since the reform requires an UTP for each school. So the Chilean schools had pedagogical coordinators (e.g., the head of the UTP), who were central in encouraging teachers to use technology and new teaching strategies. Most of the teachers had no prior experience with the activities they were being asked to do, and the principals, the head of the UTP, or MTs were often in the classrooms with support, suggestions, and praise. In the Chilean schools, the pedagogical coordinators were constantly visiting classrooms and planning with teachers.

Third, a central role for the school principal is to make key decisions about resource allocation. An instructional leader as described above is very important, but there are also specific administrative and logistic challenges around using ICT that school administrators must solve. All of these schools had resource limitations on time, infrastructure, staff, space, and

funding, and the administrators had to find solutions to allow change and innovation to take place with the resources that were available. ICT infrastructure is a constant problem for schools in developing countries, and the decisions administrators have to make are often frustrating because they cannot give all students all the access they would like to give them.

## 6.3 Professional development and ongoing support

Both school communities value professional growth and seek out opportunities to learn about new teaching practices. For much the same reasons that supportive leadership is important in helping teachers innovate, ongoing professional development also appears to be a critical factor. There are various ways that the Essentials Course supports Chile's approach to reform. First, the MINEDUC has set long-range goals for teachers that align with the Essentials Course. Not only are teachers expected to use technology as a teaching tool, the MINEDUC established guidelines for teacher evaluation (Marco para la Buena Enseñanza y Práctica Docente) that encourage practices that Essentials supports like lesson planning and peer review. Second, the UTP in each school is expected to provide in-service training for teachers. In the context of education reform, the tools and teaching strategies are new to many of the teachers; therefore, both the quality of the professional development courses and the presence of ongoing support for teachers in their classrooms are important. First, the case studies suggest that the Essentials Course offers teachers multiple points of entry into practices supporting ICT use and student-centered teaching. This allows teachers to begin changing their practice from whatever point their context and current practice requires. For example, teachers in Colegio El Sembrador were digging into the use of holistic rubric assessments, and Escuela Pedro Aguirre Cerdá was focused on group projects and multi-grade collaborations.

The case studies also highlight two features of the teachers' professional learning occurring in these schools: the importance of using the Intel unit in the classroom as part of the program follow-up, and the informal professional communities that exist in these schools.

Designing their own unit plan is a key strategy of the Essentials Course, and the case studies suggest how it helps teachers bridge the gap between the theoretical discussion of a training course and the practical needs of classrooms. A common feature in both cases was that the schools actively promoted the teachers' use in their classrooms of the unit plans designed during the Essentials Course. The chance to implement an ICT-rich, student-centered activity allowed teachers to experiment and see for themselves how these new ideas, tools, and approaches could work in the classroom. El Sembrador, for example was building a library of units designed during the Essentials Course.

Additionally, both of these schools has established a culture of constant improvement and professional learning. Educators at both schools talked about meeting in groups to plan and discuss new strategies and to share challenges and successes. Both schools had faculty-wide planning opportunities. At Colegio El Sembrador teachers plan a common professional-development agenda for the year, and the school creates time for the teachers to meet and discuss new topics or bring in outside speakers to

present. The village school also had common meeting times to discuss their teaching and to plan together through the MECE-Rural program.

## 6.4 Experimentation, adaptation, and critical reflection

Perhaps because there are so many changes being promoted by the Ministry in Chile, both schools expressed a willingness to experiment and take risks with new programs. For example, the municipal Education Director said that they will put the school's name on the list for just about any government program. And, Colegio El Sembrador was also active in joining in experimental projects and programs from the Ministry. This attitude connects back to the schools' support for the new vision of teaching and learning embodied by the reforms and a desire to offer their students a different environment.

Both of these schools used the Essentials Course and the unit plans designed during the course to create opportunities for the teachers to experiment with new teaching practices and the ICT in a supportive environment where teachers could take risks to experiment. In each school there were supportive leaders—the principal and the heads of the UTP—to help the teachers during their initial use of the Intel-designed unit plans.

## 6.5 Time

Much like a physical resource, time is a scarce resource that schools must manage carefully. Time has to be viewed in two dimensions: (1) teachers' professional development and planning time, and (2) students' time in the classroom or learning activity. Because of full-day schooling, teachers in both schools felt they had enough available class time to use ICT in class. Students have two lab sessions per week, and teachers reported that it was easy to schedule additional time if needed. In relation to planning time, both schools have developed strategies to create time for teacher planning and reflection or create pre-made teacher resources tailored to the school's needs to alleviate time demands. For example, as noted, Pedro Aguirre has a monthly day-long meeting for teachers to plan and reflect on their teaching as part of the MECE-Rural program. El Sembrador also has weekly planning time for teachers, as well as offering the UTP's bank of ICT-rich unit plans and rubric assessments.

## 6.6 Infrastructure

In many developing countries, ICT Infrastructure also is commonly a limited resource in schools, but Chile, in this regard, maybe atypical: It is a smaller country, and the government has invested heavily in building out the infrastructure. Both schools reported sufficient infrastructure and class time to do ICT activities during class, as the teachers required. The schools have sufficient computers and labs to provide students with easy access to technology for learning activities. The larger school, Colegio El Sembrador, has five labs to facilitate scheduling students. The smaller Escuela Pedro Aguirre Cerdá can make do with one lab. Each school also has laptops available so that teachers can take ICT into the classrooms, offering them greater flexibility in when and how they can use ICT.

## 6.7 Financing and sustainability

Costs and sustainability are ongoing challenges for all of these schools when attempting to bring in new, complex resources such as ICT. These schools attempt to do two things to manage sustainability of their ICT activities: First, they try to obtain resources from as many sources as possible, and second, they try to control the costs related to ICT activities. The subsidized and municipal schools have different financing structures. In the Chilean system, both schools can apply for many government programs that provide infrastructure and training. Pedro Aguirre Cerdá has built up its infrastructure mostly through these government programs, even though the municipality also provides additional funding to the school system. El Sembrador, as a subsidized school, has more resources available. Thus, although the school participates in many Ministry-sponsored professional development opportunities, the leaders have also decided to invest the school's own resources in buildings a strong ICT infrastructure.

## 7. CONCLUSION

The research in Chilean education reform reflects the complexity of the challenges in creating real change in classrooms. The Ministry has sought to create the conditions needed to support the new teaching paradigm—including new curricula, a longer school day, and professional development—but the final step of a meaningful change in the classroom is still difficult. In their oversight of the educational technology component of the reforms, the leadership of Enlaces sought more strategies to promote ICT use in classrooms. They selected the Essentials Course to help them move towards this goal because they perceived that it aligned with their vision and targeted classroom use.

Our findings suggest that necessary changes are much broader than just the introduction of a new tool or one new practice. Instead, change begins by deeply reshaping life in the classrooms—from educators' beliefs about learning to the relationships that make up the school community. In each context, the teachers found points of engagement between the model of ICT use and teaching in the Essentials Course and the possibilities and limits of their context. The schools we visited in Chile reflect that challenge and reveal how schools and school leaders are actually overcoming those final hurdles to changing practice around ICT use. The educators we interviewed were sensitive to the fact that many teachers seldom follow up on professional development in their classrooms. The leadership at both schools was proud that they and their teachers had carried the new approaches and tools from the Essentials Course into the classroom to the extent that they have.

But the responsibility for change cannot rest solely on the shoulders of the teachers—bringing about these changes is a long-term, incremental process. These two schools' path to success show the important inter-relationship between the actions of the Ministry and the schools, and how a program like Essentials can play a role. There are a broad range of factors from leadership to funding to effective professional development that help create and sustain the conditions for change. Effective reform requires sustained investment and support along multiple dimensions of the educational system, including physical and technical infrastructure, human resources, curricular frameworks, standards,

and assessments. In the end, the success of teachers dependent on the conditions in which they work

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## REFERENCES

- [1] Cancino, V.C. and Donoso Díaz, S. El programa de informática educativa de la reforma educativa chilena: Análisis crítico. *Revista Iberoamericana de Educación*, 36. 129-154.
- [2] Chile. Ministerio de Educación. Estadísticas de la Educación 2007. Departamento de Estudios y Desarrollo ed., Santiago, Chile, 2008.
- [3] Cox, C. Innovation and reform to improve the quality of primary education: CHILE paper commissioned for the EFA Global Monitoring Report 2005, *The Quality Imperative*, UNESCO, Geneva, 2004.
- [4] Dussel, I. Curricular reform in Latin America: Assessment and future prospects *Segunda Reunión del Comité Intergubernamental del Proyecto Regional de Educación para América Latina y el Caribe (PRELAC)*, UNESCO, Santiago de Chile, 2006.
- [5] Educational Computer Institute. Final Report: INTEL® Teach to the Future Project Evaluation, University of La Frontera, Temuco, 2003, 12.
- [6] Ely, D. Conditions that facilitate the implementation of educational technology innovations. *Journal of Research on Computing in Education*, 23 (2). 298-305.
- [7] Ferrer, G. Las reformas curriculares de Perú, Colombia, Chile y Argentina: ¿Quién responde por los resultados?, Grupo de Análisis para el Desarrollo (GRADE), Lima, 2004.
- [8] Fullan, M. *The new meaning of educational change*. Teachers College Press, New York, 1991.
- [9] Hawkins, J., Panush, E.M. and Spielvogel, B. National Study Tour of District Technology Integration, Summary Report, Center for Children and Technology, New York, 1996.
- [10] Hepp, P., Hinojosa, J.E., Laval, E. and Rehbein, L. Technology in schools: Education, ICT and the knowledge society, World Bank, Washington, DC, 2004, 86.
- [11] Kozma, R. National policies that connect ICT-based education reform to economic and social development. *Human Technology*, 1 (2). 117-156.
- [12] Laval, E. and Hinojosa, J.E. Chilean Schools: The Enlaces Network *Techknowlogia*, 2002, 14-18.
- [13] Light, D. and Manso, M., Educational Technology Integration in Developing Countries: Lessons from Seven Latin America SchoolNets. in *American Educational Research Association*, (Seattle, 2006).
- [14] Light, D., Vilela, A. and Manso, M. Aprendiendo de los Pioneros: Una Investigación de las Mejores Prácticas de la Red TELAR. in Bonilla, M. and Cliche, G. eds. *Internet y sociedad en América Latina, investigaciones para sustentar el diálogo*, FLACSO/IDRC, Quito, Ecuador, 2001.
- [15] McMillan Culp, K., Hawkins, J. and Honey, M. Review Paper on Educational Technology Research and Development, Center for Children and Technology, New York, 1999, 35.
- [16] Stake, R.E. *The art of case study research*. Sage Publications, Thousand Oaks, 1995.
- [17] Valenzuela, J.M., Labarrera, P. and Rodríguez, P. Educación en Chile: entre la continuidad y las rupturas. Principales hitos de las políticas educativas. *Revista Iberoamericana de Educación*, 48. 129-145.
- [18] Vogler, J. The Rise of the Penguins. *NACLA Report on the Americas*, 40 (1). 51-52.
- [19] Wiggins, G.P. and McTighe, J. *Understanding by design*. Association for Supervision and Curriculum Development, Alexandria, Va., 1998