



**HIGHLIGHTING CHANGES IN THE CLASSROOMS OF A SUCCESSFUL ONE-TO-ONE  
PROGRAM IN RURAL ARGENTINA:**

**CASE STUDIES OF *TODOS LOS CHICOS EN LA RED* IN SAN LUIS**

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## EXECUTIVE SUMMARY

One-to-one computing programs and laptop programs have been a popular approach to education reform in developing countries over the last decade. A motivation behind so many one-to-one laptop programs is the desire to overcome with one powerful resource the historical lack of educational tools and resources available in developing countries. The research on laptop programs in developing countries often finds that these programs help bridge the digital divide and improve students' technical fluency, but the desired impact on academic achievement remains elusive (Valiente, 2010; Winthrop & Smith, 2012; Zucker & Light, 2009). A frequent problem identified in the research is that the laptops, once distributed to the children, may seldom be used in the classrooms. Research on laptop programs easily identifies the challenges to their use in classrooms as teacher training, time constraints, or outdated teaching approaches; however, the research seldom delves more deeply into how laptops might be more completely integrated into daily classroom use (Akbaba-Altun, 2006; Comenius, 2008; Kraemer, J. Dedrick, & Sharma, 2009; Light & Rockman, 2008; Vyasulu Reddi & Sinha, 2003; Winthrop & Smith, 2012).

The technology tools provided to all students and teachers in a one-to-one program are arguably one of the most robust and multifaceted sets of resources that could be integrated into the educational process. Yet, when laptops arrive in a classroom, their use depends on how—or if—these new tools can be integrated with the existing set of resources, tools, and practices being used. If teachers are unable to fit these new tools into their current practices, the devices risk being abandoned in a closet or left on a shelf to collect dust (Jara Valdivia, 2008).

Understanding how technology fits into the complex realities of classrooms was a critical factor for change in developed nations, yet little is known about how laptop computers could be used in the classrooms of the developing world. Our study sought to shed more light on the issue of ICT integration by taking a close look at how laptops were used in the classrooms of schools that were part of a successful laptop program—*Todos los Chicos en la Red* in San Luis, Argentina.

In August of 2011, researchers from the Education Development Center, Inc. (EDC) traveled to San Luis, Argentina, to conduct research in three schools that were part of a provincial education program, *Todos los Chicos en la Red* (*All Kids Online*). *All Kids Online* is a one-to-one laptop program that provides all students with an Intel® Classmate PC—an affordable, durable, water-resistant netbook with full PC functionality, loaded with productivity software, education software, wireless Internet, and designed especially for students to provide a collaborative, interactive learning experience for access at home and at school. The program also provides the necessary technical support to maintain the machine. Along with a suite of other education-enrichment programs, the provincial government has utilized a whole-child approach to making education gains throughout the province.

## ***ALL KIDS ONLINE AND SAN LUIS DIGITAL***

EDC and Intel had been looking for a one-to-one program in a developing country that had achieved sufficient scale and that had external evaluation data showing the success of the program in improving student's academic performance. *All Kids Online* fit both criteria (Bañuelos, 2010). By 2010, the program had already distributed 7,500 laptops (Severin & Capota, 2011) and various evaluations and expert reviews had found an impact on academic performance (Bañuelos, 2009; Dussel & Quevedo, 2010; Finquelievich & Prince, 2010; Fundación CEPP, 2008).

But *All Kids Online* is actually only one strand of a much larger provincial initiative to promote the long-term transformation of the province's economy and society. *San Luis Digital*, started in 2007, is an ambitious, province-wide digital inclusion initiative with its goals rooted in closing the digital divide through social and economic development (Miranda and Odicino, 2009). In part, what enabled the successful development and implementation of *All Kids Online*, and all of the subsequent education programs, was the creation of an information superhighway. In 2008, connectivity was distributed for free to all areas with at least 20 inhabitants (Miranda and Odicino, 2009).

As an education reform program, the *All Kids Online* laptop initiative was part of a larger ecosystem of educational programs from the provincial government that impact the learning environment by providing educational opportunities and programs for students, resources for teachers to use with students, and training programs to provide teachers with new teaching strategies.

## **SOCIO-CULTURAL THEORY OF LEARNING AND THE ROLE OF EDUCATIONAL TOOLS**

Our exploration of the use of these ICT tools in the classrooms of San Luis is grounded in a socio-cultural theory of learning (Vygotsky, 1978) that envisions learning as a social process where students develop and grow intellectually in interaction with other people, and where *tools* play a fundamental role in this process. Tools are embedded in all classroom practice, shaping everything that happens. ICTs represent new sets of tools that replace, displace, or combine with previous tools and strategies. The Classmate PCs and other new tools may be used in new ways, or they may be spliced into old practices.

Access to educational tools and resources in the classroom is an important factor that influences the possibilities for creating engaging and supportive learning environments for students. Providing good educational resources is a concern for schools in all countries, but the level of challenge this presents is a fundamental aspect of schools in developing countries. They frequently lack many educational tools and resources that schools in wealthier countries take for granted.

The lack of resources in the classroom manifests in many ways, such as a lack of reference materials for students, no textbooks at all or only a few copies which students share, no writing paper for students, no paper or no ink for the printer, or no chalk—and the list can go on. The lack of such resources may mean that teachers cannot assign students important learning activities, such as doing independent research or writing a long essay or story; neither can they print out student work to take home.

## **METHODOLOGY**

This study used an instrumental case study approach (Stake, 1995) with a very simple focus: to observe the classroom experience of students and teachers in schools where students are using laptops daily and to document the types of practices emerging around these tools. EDC coordinated with the leadership of *All Kids Online* to select exemplary schools that were using laptops daily. In the end, *All Kids Online* suggested three schools—two typical public schools that represent different aspects of the educational context of San Luis, and a third school that is an innovative model school that had just opened.

The case studies were developed over two days of visits at each of the three schools. At each school we interviewed school leaders, the classroom teachers and other educators, and the professional development coaches provided by *All Kids Online*. We observed classes and conducted informal interviews with students during the school day.

## **THE SCHOOLS**

The three schools in the case study are each unique.

### ***El Manzanar—a one-teacher school***

El Manzanar is a small, one-teacher school in a rural community about 30 minutes outside of the capital of San Luis. There were a total of 19 students, ranging from kindergarten to sixth grade, and students can range in age from 5 to 16 years old. The school day goes from 8:30 a.m. to 12:30 p.m. The children get breakfast and a snack at school, and there is also a recess time for the students. The school has two adjoining classrooms—the inner classroom is for the younger children (kindergarten to third grade) and the other room is for the older students (fourth to sixth grades). There is an open doorway between the two rooms so that the teacher can easily see and hear all the students. There is a small office for the teacher, who also functions as the director. There is also a small kitchen and eating area where students eat breakfast and the snack. A woman who serves as the cook and the custodian maintains both the kitchen and general public spaces. The school also has been assigned an instructional

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\* The names of the schools have been changed to protect the privacy of the students and teachers we worked with.

coach from *All Kids Online*; she spends two mornings at El Manzanar and one afternoon each week planning with the teacher, and the rest of her time at a nearby school.

The population in this community was fairly dispersed and most students came a long way to get to school. Some walked a few miles to get there, but the school also had an arrangement with a local bus company to make a small detour from its normal route at the end of the school day to pick up students to be dropped off along the highway at locations a little nearer to their homes.

### ***Campo del Cóndor—a village school***

Campo del Cóndor is a village that is the center of a tourist region in San Luis. The school had a unique socio-economic mixture of poor, rural families and urban, middle-income people escaping the dense urban environment of Buenos Aires. These class differences caused some tension in the school early on. But the school principal felt that the laptop program had served to equalize some of those differences by giving all students the same set of resources. In general, though, most of the students who attend the public school live in modest circumstances, with parents who move around a lot according to the seasons.

The school was well-respected in the area; the school director reported that many families bring their children to this school specially. Campo del Cóndor is an elementary school from first to sixth grades. In 2009, enrollment reached about 120 students and the school was finally allowed to have a teacher for each grade. There are a total of six classroom teachers, a special education teacher, and the director. An art teacher and physical education teacher also visit the school.

### ***Escuela Nicolás Copérnico—an innovative, experimental school***

The third school we visited is located in the city of San Luis. Escuela Nicolás Copérnico was decidedly different from the other schools: It is newly established model school run by the ULP under a special charter from the provincial government. The model schools were called *Escuelas Digitales*, or Digital Schools, and they all had ubiquitous technology access with a focus on personalized learning. The 24 teachers, who work in all subject areas, were handpicked by the co-directors. The school had been open only three months when we visited. Nicolás Copérnico was built around three central tenets: personalized learning, technology, and the pursuit of excellence. The pedagogical model of Escuela Nicolás Copérnico was based on the model of the *Escuela Fontán* in Colombia, with a student-centered teaching model and mastery learning approach that allows each student to set his or her own pace. Nicolás Copérnico held all students to high expectations for mastering the content, but there was no entrance exam to join the school—all students were welcome. Indeed, the

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school had many students who have missed a substantial amount of schooling. But all students are grouped by age and not performance.

In total, the school has about 300 students in all three educational levels (30 pre-k and kindergarten, 120 primary, 150 secondary). Students were divided by age, not grade, with about 20 students in each age-level “module.” In the classes, students work through the material at their own rate; teachers typically have students working in groups, but each group may be on a different topic. Teachers frequently monitor students’ learning, to be able to adapt lessons to the students’ education plans. The school is working towards designing and administering online tests as a means to more effectively monitor student progress.

## Findings

In all three of these schools we saw how the laptops and the ICT resources had become a daily part of learning in the classroom through a mix of pre-existing teaching-and-learning strategies being enriched and modified by the technology. Some older strategies were slowly being displaced, and new ones were emerging.

In these classrooms, the Classmate PCs—embedded in an ecosystem of interactive whiteboards, a virtual learning platform, and universal wireless connectivity—were being used as frequently as typical Argentine students use their copybooks, and for many of the same purposes. In the absence of other resources, the copybook in Latin American schools is a combination homemade textbook, workbook, study guide, and notebook, as well as a portfolio of work so parents and teachers can monitor each student’s progress (Almeida Costa e Santos & Proença Rebello de Souza, 2005; Chartier, 2007; Gvirtz et al., 2004; Tenutto, 2000). This was why the students and teachers used their laptops every day as a vital part of their learning environment. However, the educational tools provided by *All Kids Online* were also fundamentally changing the learning process.

Ubiquitous computer and Internet access facilitated changes in five strategies or classroom practices, which make the teacher’s job easier and more effective and could lead to substantial improvements in student learning:

*1. Increased efficiency in classroom management.* The laptops and interactive whiteboards greatly facilitated critical classroom logistics, such as distributing resources to students and putting material up on the whiteboard, allowing teachers to spend more time teaching. The ease of distributing resources using the virtual learning platform to place materials directly into each student’s folder also allowed teachers to personalize resources to each student’s level. In schools with a four-hour school day, time was a precious resource.

*2. Increased access to educational resources, creating more time on task.* Both teachers and students were using a wider variety of resources to meet their learning needs with the laptop and other ICT resources. The Internet offered access to a wide range of resources from the complex, such as interactive math activities, to videos and images, to simpler resources such as more varied stories to interest young rural readers. But the technology also allowed the teachers to make their own resources: Some teachers scanned reading material to share with students, and more technically proficient teachers created digital resources such as interactive worksheets. The biggest change for students was that they each had their own copies of all the materials they were using in school, and they could take these resources anywhere with them. In schools with insufficient textbooks, libraries, and other educational resources, this can make a substantial impact.

*3. Increased student ownership of the learning process.* Having full ownership of the laptop from *All Kids Online*, and universal access to the Internet, increased students' ability to have more autonomy and direct their own learning. With the laptop, they could more easily find their assignments and start working, and those students who were moving faster could do more activities or do extra work. Students also were able to do work at home or use the Internet to explore a topic. Shifting more control of their own pacing and progress through the material onto the students increased their autonomy and opened the possibility for them to push themselves harder.

*4. Interactive resources offer more frequent feedback to students.* This change is connected to the one above. Across a range of basic skills and abilities, such as math and spelling, the introduction of interactive digital resources was a way to give students immediate feedback, enabling them to try something, assess, and redo on their own. We saw how activities as simple as an interactive worksheet helped a learner practice and problem-solve his spelling. This enabled teachers to make better use of their time with students, and allowed students to study outside of school.

*5. More fluid communication between teachers, students, and parents.* The laptop and Internet connectivity also changed how students, teachers, and parents communicated in a couple of ways. Two of these schools did parent workshops about the laptops so that parents could learn how to review student work just as they do with the copybook. Some of the families had begun to use email. All of the students were using a chat tool like Skype or Messenger to be in touch with their friends, and most of them chatted with their teachers as well. Through chat, teachers were able to remind students about homework and students were able to ask teachers questions.

## **Conclusion**

There are many pending questions about one-to-one programs in developing countries, given the varied success rates of many of these large-scale projects. In this project, we attempted to approach only one question—Why do many teachers *not*

utilize the laptop resources?—by looking closely at schools and classrooms where the tools are being used in context. What we found was very interesting, and suggests that laptop programs in developing countries may want to think carefully about how these new resources can intersect with the existing educational strategies and tools in each country in ways that can begin to improve student outcomes, but also lay the groundwork for deeper reform.

All learning is situated and embedded in a context. Much of the research on laptops that focused on classroom experience has been done in wealthy countries. Learning experiences of teachers and students in the resource-rich classrooms of the industrialized countries are, obviously, different from those of teachers and students in under-resourced classrooms. These findings shed valuable light on how these ICT tools were positively integrated into the under-resourced classrooms typical of many developing-country schools.

Although some of the teachers we visited also were experimenting with innovative practices, such as project-based learning, in their routine daily practice, teachers were not abandoning their old resources or teaching models nor were they resisting ICT. Rather, they were adapting old practices to work in their new, technology-saturated context. But by infusing ICT into their current practices, there were some fundamental changes in those practices, making them potentially more effective. Many of the examples of the ICT-enriched practices we observed involved a mixture of new digital tools into traditional Argentine pedagogical practices.

This research was only exploratory, intended to examine what daily use of laptops looks like. But many of these mixed activities of older practices with new tools hold the potential to have positive impacts on student learning, since they align with known aspects of good practice: increasing time on task, allowing students more control over their work flow, giving students their own textbooks or reference materials, providing more and varied resources and activities for students. We do not mean to argue that there is no need for deeper pedagogical reform, but that these mixed approaches that transform current common practices may be a good place to start integrating ICT, improving education, and building for reform.



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## INTRODUCTION

One-to-one computing programs and laptop programs have been a popular approach to education reform over the last decade in developing countries. A motivation behind so many one-to-one laptop programs is the desire to overcome the historical lack of educational tools and resources available in developing countries with one powerful resource. The research on laptop programs in developing countries often finds that these programs help bridge the digital divide and improve students' technical fluency but the desired impact on academic achievement remains elusive (Valiente, 2010; Winthrop & Smith, 2012; Zucker & Light, 2009). A frequent problem identified in the research is that the laptops, once distributed to the children, may seldom be used in the classrooms. Research on laptop programs easily identifies the challenges to their use in classrooms as teacher training, time constraints or out-dated teaching approaches, however the research seldom delves more deeply into how laptops might be more completely integrated into daily classroom use (Akbaba-Altun, 2006; Comenius, 2008; Kraemer, J. Dedrick, & Sharma, 2009; Light & Rockman, 2008; Vyasulu Reddi & Sinha, 2003; Winthrop & Smith, 2012). Understanding how technology fits into the complex realities of classrooms was a critical factor for change in developed nations, yet little is known about how laptop computers could be used in the classrooms of the developing world. Our study sought to shed more light on the issue of integrating information and communication technologies (ICT) by taking a close look at how laptops were used in the classrooms of schools that were part of a successful laptop program - *Todos los Chicos en la Red* in San Luis, Argentina.

In August of 2011 the Education Development Center's Center for Children and Technology traveled to San Luis, Argentina to conduct research on a provincial education program: *Todos los Chicos en la Red* (All Kids Online). *All Kids Online* is a one-to-one laptop program that provided students with an Intel® Classmate PC - an affordable, durable, water resistant netbook with full PC functionality loaded with productivity software and education software, wireless Internet, designed especially for students to provide a collaborative, interactive learning experience for access at home and at school. The program also provides the necessary technical support to maintain the machine. Along with a suite of other education enrichment programs, the provincial government has utilized a whole child approach to making education gains throughout the province.

### ALL KIDS ONLINE AND SAN LUIS DIGITAL

EDC and Intel had been looking for a one-to-one program in a developing country that had achieved sufficient scale and that had external evaluation data showing the success of the program in improving student's academic performance. We reviewed all the laptop programs that were showcased at the International Conference on one-to-one computing in Education held in Vienna in 2010 (Valiente, 2010) and *All Kids Online* appeared to fit both criteria (Bañuelos, 2010). By 2010 the program had

already distributed 7,500 laptops (Severin & Capota, 2011) and various evaluations and expert reviews had found an impact on academic performance (Bañuelos, 2009; Dussel & Quevedo, 2010; Finkelievich & Prince, 2010; Fundación CEPP, 2008).

The *All Kids Online* program began distributing laptops in August of 2008 starting with schools in the most rural communities farthest from the San Luis capital, and then moving toward the more urban areas. The province has now reached its goal that all children in primary school, from 1st to 6th grade, receive a laptop that they could carry with them from school to home to enable continuous and ongoing learning. Because of the complete saturation of reliable wireless Internet and the portability of the computer, the students were able to have technology with them 24 hours a day.

The objectives of the program are broader than handing out laptops and include the following:

- To expand the use of ICTs in schools and to promote digital literacy through meaningful learning experiences that will have a positive impact on daily school activities;
- To improve students' learning skills in content areas specified by the provincial Ministry of Education;
- To include students, teachers, and the community in the development of a digital knowledge society.

In order to meet these objectives, the program also offers a wide variety of educational programs. Elementary school teachers also received their own full-size laptop and training on how to use it and integrate it into their teaching. As an incentive, schools where children showed an average improvement of at least 10 percent on their national test scores were awarded interactive whiteboards for all classrooms. Teachers also received training on technology and a *All Kids Online* provides every school with a pedagogical coach to support the teachers in using the technology and in transforming teaching.

But *All Kids Online* is only one strand of a much larger provincial initiative to promote the long-term transformation of the province's economy and society. *San Luis Digital* started in 2007 as an ambitious, province-wide digital inclusion initiative with its goals rooted in closing the digital divide through social and economic development (Miranda and Odicino, 2009). The program was built around three pillars of digital inclusion that stress that all citizens have the right to: 1) computers and network hardware, 2) full connectivity and 3) education and training in new technologies (Miranda and Odicino, 2009). In addition to ensuring that its citizens have access to cutting edge hardware, software and technical education, the other main goals of *San Luis Digital's* agenda are (Weinstock, Odicino, and Miranda, 2010):

- To produce and export more technical products;
- To generate a denser net of Internet users;
- To have more professionals in the area of sciences and engineering;

- And, above all, to create a broader base of experts with university degrees and with the best skills in mathematics, reading, writing, science and ICTs.

In order to meet these ambitious goals, the provincial government launched hundreds of initiatives in six core areas: Infrastructure, Technology, Productivity, Legal Framework, Digital Government, Education and Training (Miranda and Odicino, 2010). University of La Punta (ULP), a technical college on the outskirts of San Luis City, was established partly to carry out the government's education vision as well as its technology plan. *All Kids Online* is managed by the staff at ULP but is only one of various Education programs within the *San Luis Digital* framework.

## **SOCIO-CULTURAL THEORY OF LEARNING AND THE ROLE OF EDUCATIONAL TOOLS**

Our exploration of the use of these ICT tools in the classrooms of San Luis is grounded in a socio-cultural theory of learning (Vygotsky, 1978). A socio-cultural perspective envisions learning as a social process, that individuals develop and grow intellectually in interaction with other people, and that *tools* play a fundamental role in mediating all human action. For Vygotsky and other theorists the term tool encompasses everything from human language, and number systems to books, and automobiles. Tools are fundamental to supporting learning. We understand this to mean that teaching and learning utilizes a wide range of artifacts (i.e., pens, books, copybooks), semiotic systems (i.e., language, images, diagrams), social interaction (i.e., group work, teacher-student questioning) and institutional structures (i.e., education policies, laptop programs). Furthermore, these tools and teaching strategies mediate the students' engagement with the content. Tools are embedded in all classroom practice and they shape everything that happens. An important insight that grounds our work in ICT is that ICTs represent new sets of tools that replace, displace or combine with previous tools and strategies. The Classmate PCs and other new tools may be used in new ways, or they may be spliced into old practices. Teachers may use tools in the ways intended by the ministry or they may develop alternative ways to use the tools. New tools can improve or hinder learning or have no effect, but it is critical to understand how these tools are integrated into classroom practice.

### ***Access to educational tools is a challenge in developing countries***

The importance of "tools" is at the heart of the issues motivating one-to-one programs and the educational challenges of developing countries. Access to educational tools and resources in the classroom is an important factor that influences the possibilities for creating engaging and supportive learning environments for students. Providing good educational resources is a concern for schools in all countries, but the level of challenge this presents is a fundamental aspect of schools in developing countries. They frequently lack many educational tools and resources that schools in wealthier countries take for granted. For example, looking at high level indicators of resources,

a recent study of academic performance in language and mathematics in 17 Latin American and Caribbean countries found that having a school library, the number of books in that library and the level of school infrastructure were connected to higher average performance for students in those schools (Valdés Veloz, Treviño, Castro, Costilla, & Acevedo, 2008). This same study estimated, for example, that only 53% of schools in Latin America had libraries and on average, they had 1,211 books (Valdés Veloz et al., 2008). The statistics for Argentina estimated that 75% of schools have libraries and an average of 1,623 volumes per school.

The lack of resources in the classroom manifests in many ways such as a lack of reference materials for students, no textbooks at all or only a few copies which students share, no writing paper for students, no paper or no ink for the printer, or no chalk and the list can go on. The lack of such resources may mean that teachers cannot assign students important learning activities such as doing independent research, writing a long essay or story; neither can they print out student work to take home. Since these are the challenges educators face everyday, many of the teaching strategies and classroom management approaches in developing countries have developed to work within these limitations.

### ***One-to-one programs as a response to lack of educational tools***

An attraction of one-to-one laptop programs is the hope that providing each student and teacher a laptop will help make up for the historic lack of educational resources available to most Latin American schools. The technology tools provided to all students and teachers in a “one-to-one” program are arguably one of the most robust and multifaceted set of resources that could be integrated into the educational process. Yet, when laptops arrive into a classroom, their use depends on how or if these new tools can be integrated with the existing set of resources, tools and practices being used. If teachers are unable to fit these new tools into their current practices, the devices risk being abandoned in a closet or left on a shelf to collect dust (Jara Valdivia, 2008).

The integration of ICT tools must be seen as a process. Research indicates that the integration of technology into instruction occurs over time and follows a pattern (e.g., Sandholtz, Ringstaff, & Dwyer, 1997). In their work focused principally on schools in developed countries, Zhao and Frank (2003) have suggested that the process of technology integration is an evolutionary one, and that teacher’s beliefs, pedagogy, and technology skills slowly build upon each other and co-evolve as technology is introduced and assimilated into the school culture (p. 14). Initially, teachers incorporate new technologies into existing practices. But if these new technologies are powerful enough, teachers may begin to see changes such as improvements in engagement, behavior, and learning which will motivate teachers to experiment with newer uses of technology to teach in new ways. In this study, we wanted to document one point in time for three Argentine schools involved in a one-to-one laptop program to see how these ICT tools were embedded into their classroom practices. We sought

to explore how these tools were integrated not just with other technology resources but with other educational tools at the school level.

## METHODOLOGY

This study used an instrumental case study approach (Stake, 1995) with a very simple focus: to observe the classroom experience of students and teachers in schools where students are using laptops daily and to document the types of practices emerging around these tools. Once the laptop program was identified, EDC then coordinated with the leadership of *All Kids Online* to select two exemplary schools where they knew the laptops were being used daily. In the end, *All Kids Online* suggested three schools – two typical public schools that represent different aspects of the educational context of San Luis – and a third school which is an innovative model school that the ULP has just opened.

The case studies were developed over two days of visits at each of the three schools. At each school we interviewed school leaders, the classroom teachers and other educators, and the professional development coaches provided by *All Kids Online*. We observed classes and conducted informal interviews with students during the school day.

Table 1: School Visits

School	Subjects Interviewed					Classes Observed
	School leaders	Coaches	Teachers	Students	Parents	
El Manzanar	NA	1	1	2		2 full days*
Campo del Cóndor	1	1	5	5	1	6
Escuela Nicolás Copérnico	2	NA	3	5	1	10
<b>Total</b>	<b>3</b>	<b>2</b>	<b>9</b>	<b>12</b>	<b>2</b>	<b>16 + 2 full days</b>

\* In a one-teacher school, the school day is not divided into class periods.

In addition to talking with school-based educators, we also interviewed the leadership of San Luis Digital, *All Kids Online*, the ULP and the various affiliated educational programs that support or coordinate with the laptop program.

Table 2: Interviews with program staff

Organization	Program	Subjects Interviewed
ULP	Rector	1
All Kids Online	Director	1
	<i>Alfabetización para el Futuro</i> (ICT Literacy for the Future)	1
San Luis Digital	Zero Balance	2
	School Chess Beginners Program	2
	Contexts	1
	San Luis Knowledge Olympics	2
	<i>Grupo Recursos Educativos Digitales</i> (Grupo RED)	3
	<i>Taller de Artes y Juegos</i> (Art and Games Workshops)	2
	Information Highway Data Center	1
Technology Support Team	2	
<b>Total</b>		<b>18</b>

## THE SCHOOLS

Each of the three schools in the case study is unique. Two of the schools we visited were traditional public schools, and the third school was an innovative model school run by the ULP under a separate charter that had only been open for three months.

### ***Case One: El Manzanar—a one-teacher school***

El Manzanar is a small one-teacher school in a rural community about 30 minutes outside of San Luis capital. There were a total of 19 students ranging from kindergarten to sixth grade, and the students can range in age from 5 to 16 years old. The school day goes from 8:30am to 12:30 pm. The children get breakfast and a snack at school, and there is also a recess time for the students. The school has two adjoining classrooms, the inner classroom is for the younger children (K to third grade) and the other room is for the older students (fourth to sixth grades). There is an open doorway between the two rooms so that the teacher can easily see and hear all the students. There is a small office for the teacher – who also functions as the director. There is also a small kitchen and eating area where students eat breakfast and snack. A woman who serves as the cook and the custodian maintains both the

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kitchen and general public spaces. The school has also been assigned an instructional coach from the ULP; she spends two mornings at El Manzanar and one afternoon planning with the teacher each week, and the rest of her time at a nearby school.

The population in this community was fairly dispersed and most students came a long way to get to school. Some walked a few miles to get there, but the school also had an arrangement with a local bus company to make a small detour from its normal route at the end of the school day to pick up students to be dropped off along the highway at locations a little nearer to their homes.

### **Technology Infrastructure**

Every student had a Classmate PC netbook and the teacher had a laptop. There was also an interactive whiteboard in the upper grades' classroom and a printer/scanner in the office. The school had a wireless connection and all students had access to the provincial wireless network from their homes. El Manzanar also used the virtual learning environment created by the ULP - the Sakai platform. There was no library at the school but each classroom had a bookshelf with a few books available: there were a few copies of the textbook distributed by the national government, and then a selection of children's books. In addition to the laptop, each student also brought a notebook or copybook (*cuaderno escolar*) to school everyday. Because students seldom have a copy of the textbook for their personal use, Argentine students traditionally fill up their copybook throughout the year with important information dictated by the teacher or copied from a textbook, and use it to take class notes as well as to do homework and exercises (Gvirtz, Larripa, & Oría, 2004).

All the students at El Manzanar received their laptops in June 2008, and the pedagogical coach from *All Kids Online* started working with the teacher in September 2008. At the time of our visits, the coach had been working with the El Manzanar school for two years. The PEDAGOGICAL coach spent two mornings a week at the school working with the teachers and the students, and one afternoon a week with the teacher planning and developing lessons.

The teacher and the pedagogical coach commented that initially many parents were concerned about the laptops and what their children might be doing with the computer. To allay parents concerns and to get the parents' support for computer use, the teacher did a series of workshops for the parents to teach them how to use the computer, get online to find information, and how to check their children's work on the computer. The pedagogical coach reported that parental support for the laptops increased after these workshops.

### **Classroom Practice**

The daily practices of a one-teacher school were different from the schools that had one teacher per grade level. Since a single teacher works with students from first through sixth grade and few students were at the same grade level, the teacher at El Manzanar was constantly dividing her time between students at different developmental stages and different levels of school readiness as well as different



grade levels. Students were expected to work on their own frequently while the teacher cycled on to other students. Additionally, like many one-teacher schools, El Manzanar served poor, dispersed rural communities and students frequently started school with lower levels of school readiness (i.e. they may not know any letters of the alphabet or the colors), which means that the youngest students needed a lot of personal attention and support. Likewise, as they grew up, her students may have had little access to reading material in their homes before the arrival of the laptops. Through out the school day the teacher constantly moved between students and groups of students to work with one student while the others worked independently or waited for the teacher. A positive side effect of a one-teacher schoolhouse dynamic was that older students helped the younger ones quite a lot while the teacher gave her attention to an individual or a smaller group of students.

During the classroom observations almost every activity the teacher and students did involved the resources of *All Kids Online* (the laptops, the white board, the Internet or the virtual learning platform). Each morning the older students logged into their folders on the platform. From their folders they could hand in their homework, find current projects or download their next assignments. They could also find stories to read and links to other resources. As a result, the older students got started working in about 15 minutes, and the teacher could then focus on the younger students who needed more personal attention from the teacher. She would then work with the younger students, one-on-one or in small groups, with the day's lesson to get the younger students ready for an activity reinforcing the lesson for students to do on their own. At this point, the teacher would turn her attention back to the older students and to introduce new content with a whole group activity.

*More efficient use of time provided more time for learning activities:* Coordinating time and student activities in El Manzanar involved constant juggling. The school had two adjoining classroom spaces so the teacher divided the children by age to create smaller groups that work on their own. Before the arrival of the laptops, a lot of time was taken up in preparing or distributing lesson materials and getting the students prepared to work on their own. Because of the shortage of textbooks, workbooks and even paper to print up worksheets, providing lesson material to students meant that students would have to individually copy material or exercises from a shared textbook into their personal copybooks before they could even start to do the work. It might take considerable time to get the older children set up. Only when the older students were working, could the teacher start with the younger children who required much more personal attention. With this set up before the arrival of the laptops, the pedagogical coach reported the teacher would cover two subject areas each day.

The teacher and the pedagogical coach explained how the laptops, the interactive whiteboard and the learning platform substantially changed the dynamics of the class by saving time streamlining logistics and administration and providing access to

resources to increase the time spent on learning activities.<sup>1</sup> Once the teacher and the students were comfortable with the basic operation of the laptops and the learning platform, the logistics of the school were streamlined. The laptops gave the students greater autonomy and control of the educational resources making it easier for them to work on their own. Students could find all their work on the laptop, and once they learned to navigate the learning platform, the teacher could easily distribute new activities to them by placing new assignments in each student's folder. Instead of handing out a textbook for students to copy into their copybooks, students could go to their folder on the platform and start working. During our observations, in the morning the teacher was able to instruct the older students to open their folders and continue with the activities they had not finished yesterday, and then proceed to the next activity in their folder. She was even able to get the older students started while she was setting up the learning activities for the younger students. She lost much less time in logistics of getting her students set up to work. The pedagogical coach reported that the teacher now routinely covers three subject areas with her students in each day. During one of our observation days, the class worked on four subjects.

*Increased access to other educational resources:* The laptop with Internet connectivity gave the teacher access to a wide variety of resources online. Because all of the students have laptops, the teacher could use the wide offerings of online interactive resources to integrate into the class. She used resources from *All Kids Online*, but also from other websites that offered educational resources in Spanish such as the Junta de Andalucía (Government of Andalucía), Educ.ar and *Zona Clic* (Click Zone). The students might be assigned activities to do on their own, and other activities might be in groups.

The teacher explained that access to resources and the ability to pick and choose had changed how she planned lessons, combining the Government Issue textbook with other resources from online to better meet the needs of her students. For example, in language arts she felt the stories in the national textbook were not always relevant to her rural students, but online she was able to find a wide variety of stories and lessons relevant to her students' lives and needs.

*More effective and efficient whole class instructional activities:* The interactive whiteboard and the laptops shifted the teacher's ability to do whole class (or large group) instruction as well because the technology reduced the amount of time needed to display and share materials. In one example, we observed a class discussion based on a story the teacher found in a book her pedagogical coach had lent her. She scanned the story and was able to post it on the whiteboard and put it in each student's folder on the Sakai platform. The technology eliminated the waste of time for teachers to write things up on the board and for students to copy them down into their notebooks. In another example, the teacher was starting a unit on fractions with the students. She started the activity by reminding the students that they had studied

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<sup>1</sup> The research shows that increasing time on task is an important dimension in developing countries where a lot of instructional time can be lost (Schuh Moore, DeStefano, & Adelman, 2010).

fractions the year before, she had the students get on the virtual learning platform and open up their lesson from last year on fractions. On the whiteboard, she projected the same set of exercises that the students were opening. Together they reviewed the concepts of numerators and denominators, and then she set up an interactive webpage displaying different geometric shapes divided into sections with some sections colored in. The older students continued working as a group with the interactive whiteboard, while the teacher turned her attention back to the younger students. The students had to write in the correct fraction. The page was projected on the whiteboard and also on students' laptops. The students were taking turns solving a problem at the board and explaining their answers.

Prior to *All Kids Online*, for a group activity in math, for example, the teacher might have written her lesson on the chalkboard with exercises for students and asked students to copy them into their notebooks. For reading, the teacher could have distributed the few textbooks for students to share while they read a story in a group and answered questions. With the technology resources, the teacher can now put the lesson up on the interactive whiteboard as well as share the materials to students' laptops over the virtual learning platform. She can use the interactive whiteboard to project her lesson notes, or resources such as story, image, or a math website with online activities. She can also make and distribute her own resources this way as well.

### **Professional support and growth**

In her interview, the teacher described how everything changed once the pedagogical coach arrived. She reported that the students had been very excited when the laptops first arrived, and she tried to use them in the classroom. She had taken a basic technology training once, just enough to learn how to send an email and surf the web, but she had no prior experience of the pedagogical use of ICT. Initially, the only activities she could find were games or ones with very little educational content and this worried the teacher. The school day was so short and with so many things the children need to learn, she felt the laptops were wasting time and she stopped using them in class. But the coach helped her change all that and the laptops have since become a vital constant resource for her students.

The coach's role at El Manzanar was not limited to technology integration and she provided pedagogical support in any way she could. The pair of educators functioned as a team, working together to improve the educational environment at El Manzanar by planning lessons and selecting resources together. The instructional coach also took it upon herself to help integrate more art and music into the curriculum. Because the students live so far from the school, it was not practical to have them return to the school after lunch for the art and music workshops offered through the university. Since the coach worked in two different schools, she was able to share the lessons and other resources developed by one teacher with his or her colleague at the nearby school.

The coach and the teacher have set out a number of goals from continuing to identify new and better online resources, to developing their own resources and lesson plans

and doing more collaborative and group projects, to broader professional learning goals like exploring the specific needs and issues of rural education and multi-age, multi-grade classrooms. The teacher had also decided to pursue a graduate degree from a new online program in rural education.

### **Impact on Students**

*Improved academic achievement:* The teacher at El Manzanar said that she observed more children engaging in reading activities since the introduction of the computers. She noted that the students did not like to read from the few books she had available at the school, but now with material available on the computer, they enjoy reading. And the teacher was also able to find more topics and materials that would interest students. The instructional coach commented that she saw that access to and use of the laptops had improved students' communication skills. She also said more students were passing their classes.

*Automated feedback increased personalization of learning:* In addition to what the teachers said, we observed how access to interactive educational resources can personalize learning and increase student autonomy. The laptops have impacted the ways that students engage with learning content by enabling them to get immediate feedback and allowing them to cover more material. In a one-teacher school, students often work on an assignment alone and wait their turn for the teacher to give them feedback. In El Manzanar, the teacher was able to assign students interactive resources that would give them immediate feedback on whether their response was correct. So students were able to move faster through the material they understood and even do more work to reinforce their learning. Depending on the quality of the feedback, students might be able to master a concept on their own or, at least, the teacher would know where they were having trouble. For example, we observed a first or second grade student working on an interactive worksheet that a fellow teacher had created in Excel. The worksheet had pictures of animals and the student had to write the correct word below the picture, the worksheet would indicate if the word was correct or not, but it would not give the student the answer. As we watched, the worksheet indicated the word "pero" (for "dog") was incorrect, the child thought for a second, and realized he had left out a letter and retyped "perro". The worksheet gave him a green star and he moved on to the next picture. Now, as students work on their own they get immediate feedback that allows students to self-correct or move faster through the material. This dynamic appeared to be a fundamental difference from doing paper worksheets that got graded hours if not days later.

## ***Case Two: Campo del Cóndor—a village school***

Campo del Cóndor is a village that is the center of a tourist region in San Luis. The school had a unique socio-economic mixture of poor rural families and urban middle-income families escaping the dense urban environment of Buenos Aires. These class differences caused some tension in the school early on. But the school principal felt that the laptop program had served to equalize some of those differences by giving all students the same set of resources. In general, though, most of the students who attend the public school live in modest circumstances and their parents move around a lot according to the seasons.

The school was well respected in the area; the school director reported that many families bring their children to this school specially. Campo del Cóndor is an elementary school from 1<sup>st</sup> to 6<sup>th</sup> grades. 2009 was the first year the school had about 120 students and was finally allowed to have a teacher for each grade. There are a total of 6 classroom teachers, a special education teacher and the director. An art teacher and physical education teacher also visit the school.

There is also a pedagogical coach from *All Kids Online* who works at the school three days a week. The role of the pedagogical coach in this school is a little different than in the one-teacher school because her time is divided across more teachers in the building. She plays a key role in coordinating the technology and keeping track of laptops coming into the building or leaving for repair, keeping peripherals working (i.e. cameras, projectors, printers) and troubleshooting.

The director and the teachers were committed to innovation and involved with a number of programs to improve the learning environment and provide more resources for their students. For example, Campo del Cóndor volunteered to be part of the *Escuelas Inteligentes* (Smart Schools) program where schools commit to promote project-based learning and set goals to increase student performance in language arts and math. In the program, schools commit to improving test results in a variety of subject areas, and as their scores improve, the schools earn extra resources, like the interactive whiteboards that Campo del Cóndor received.

The school participated in a number of different programs from the Universidad de la Punta that are affiliated with *All Kids Online*. The school participated in *Contexts* (a literacy program for young readers), *Ajedrez* (the chess program), *Olimpíadas de Conocimiento* (a province-wide series of student competitions), the afterschool art and music program, as well as *Zero Balance* (a school-community collaboration to balance out the village's carbon footprint).

The school is located in the center of the village and the students either walk to school or take a local bus to the village square and walk from there. The school day goes from 8:30am to 12:30pm. There are afternoon workshops in art and music that are

offered through the ULP. The school cannot require students to attend, but it does encourage them to go and many students do.

### **Technology Infrastructure**

The Classmate PC netbooks were distributed to the children in October 2008 making Campo del C3n3dor one of the first schools in *All Kids Online*. But some technological difficulties and connectivity issues meant that the teachers did not really begin to use the computers in the school until 2009. All the students in the school have netbooks that they get when they are in first grade (or when they transfer into the school). Every teacher has a laptop from All Kids Online. And since 2010, every classroom has an interactive whiteboard that the school won through the *Smart Schools* program. The school also has wireless Internet connection and access to the learning platform. Additionally, the teachers reported that all of the students live within range of a node of the provincial network and the students can access the network from anywhere in the village itself.

Campo del C3n3dor also had access to the virtual learning environment, Sakai platform, but the teachers said they were just beginning to become familiar with the platform, so the students were not yet using it in many of the classes.

Like El Manzanar, the teachers at Campo del C3n3dor had conducted parent workshops to help them learn about the laptop and get comfortable with the idea of letting their children have the laptop.

### **Classroom Practice**

Unlike El Manzanar, each teacher had her own classroom working with the same 20 students all day at Campo del C3n3dor. Over two days, we observed six classes at this school. At Campo del C3n3dor, most of the classes observed were built around whole class activity led by the teacher, but technology still played a constant part of daily activities. All students had netbooks that they were expected to bring to class everyday. Even the first grade students had netbooks which they had received the week before and were just starting to learn how to use them.

*More effective whole class instructional activities:* The students used both their netbooks and their copybook (*cuaderno*) everyday, but the central technology tool tying together the classes was the interactive whiteboard and the teacher's laptop. The teachers spoke about how the interactive whiteboards really brought everything together and allowed them to bring the computers more centrally into their teaching because it gave them a way to present computer-based resources to the whole class, and then share them with each student. Prior to the arrival of the whiteboards, teachers found themselves in a paradox: the laptops gave them access to lots of new resources from interesting stories, to reference sites to interactive, but presenting these resources to the children or explaining how to use the sites was challenging. The teacher had to juggle between having 20 students huddled around one laptop screen to understand how to access the content. Now the teacher can do the instruction on the whiteboard while students follow along at their own computers.

Even though these teachers were using more student-centered learning activities, such as small groups class discussions and debates, and student presentations, the classes still used teacher-facilitated, whole class activities. In the classes we observed, the whole class activities were used to present new material or explain the new activities before students broke up into groups, worked individually or began their homework. For example, the second grade teacher used a combination of digital resources in a lesson about weights and scales. To start the lesson she used a simulation of a scale (a Roberval Balance) on the whiteboard and the teacher could place different size weights on either side of the scale. She was showing students what would happen as weights were added or removed and asked students "why". Then she moved on to having the students predict what would happen if they added a certain weight or removed a certain weight. When a student offered a prediction, the teacher would ask for other students' thoughts, thus creating a conversation among the students about what would happen and why. The students were enthralled by the discussion; even though they had the same website on their netbooks, they were all focused on the teacher, the whiteboard and their peers. After this discussion, the teacher put up pictures of a variety of scales on the whiteboard to remind the students that there were many types of scales including the digital scale they probably saw at the food market. She then showed them the cover of an electronic book about kilograms ("*El Kilo se presenta*"). She had found the book online and sent it to all of the laptops. The students were asked to read the story at home.

In fact, we saw an example of the type of challenges teachers might face with using laptop-based resources without the ability to present them to the whole class when one of the whiteboards was not functioning properly during a fifth grade math class. While the teacher was able to effectively use the chalkboard to draw the relevant shapes, when it came time to watch a video, rather than watch one video on the big whiteboard screen, each child had to input the web address into his or her computer. This process was tedious, inefficient and rife with places for typing errors illustrating the amount of time that can be lost.

*Increased access to resources:* The use of digital resources and the whiteboard stood out when compared with the lack of books, manipulatives and other learning materials that would have shaped the learning process prior to the arrival of *All Kids Online*. The Internet, the computers and the whiteboards brought in a wealth of resources that teachers could not have accessed and used otherwise, and the teachers at Campo del C6ndor were making full use of them. One teacher, for example, commented that the government textbook was too centered on Buenos Aires, and many stories were not relevant for her rural students and she was happy to be able to find other stories.

The laptops and the whiteboard also give access to resources like specialized teachers. We observed a sixth grade class participating in the school chess project that was taught by a chess instructor 200 kilometers away. The PD coach was present to set up the technology and oversee the students. Using a specialized chess portal, the instructor had set up a particularly challenging situation on the whiteboard while her

voice came through the coach's computer speakers asking questions, explaining her moves and giving students tips on strategy. The students, who were all logged into the portal, used the chat function to answer the teacher's questions and ask for clarification. The pedagogical coach walked around the room helping the students with the technology and giving them advice on game tactics. After 10 minutes of set up, and 10 minutes of instruction, the instructor, from across the province, initiated a class competition, pairing students up randomly to play against each other on their laptops. Students were paired up twice for two quick games. It was clear that the technology provided a number of affordances including access to specialized teachers and content as well as the ability to instantly set up the chessboard. Playing chess online gives students more time to actually play the game because less time is wasted setting up the physical game board and pieces. The coordinators of the School Chess program whom we interviewed at the ULP said that setting up traditional chess sets for a room full of children can take 20 minutes. Finally, the teacher does not have to worry about lost, stolen, or broken pieces, and no extra space is needed for storage.

*Emergence of blended teaching and learning strategies:* Similar to El Manzanar, the technology was changing the type of resources that teachers and students can access and the way they are using these resources. Another classroom observation highlights the mix of old and new strategies and resources that was emerging in the classrooms with the technology resources at Campo del C6ndor. The first grade teacher was reviewing numbers and teaching the students the numbers from 20 to 29. At the start of the lesson students were each given a photocopy of a math exercise of number lines with intermittent blanks up to 29 ("1,2,\_, 5, \_, etc") to glue into their copy books. The teacher moved around the room ensuring students were completing the task, then she started a presentation at the whiteboard. The teacher reviewed the idea that numbers are grouped in 10s. In the space of five minutes, the teacher was able to move between multiple representations of the number line grouped by 10s and pictures of things grouped by 10s. For the activity, the teacher put up on the interactive whiteboard a picture of a train pulling cars loaded with numbers and blanks ("20, \_, 22, \_, \_ 25, ...") and a list of numbers piled up on the station platform. Students would come up to the whiteboard and drag the correct number into the blank with their finger. The teacher was also able to go to variations of train activity once students completed the train up to 29. After this introduction and review, the students began to work independently on the exercise they had glued into their notebook.

This observation suggested a number of ways old and new practices blended to create a hybrid. First, even the traditional practice of having students create their own workbooks was facilitated and made more efficient by technology. The students could paste a photocopied exercise into their copybook, which in the past, the teacher would have written the exercise on the board and asked her students to copy it by hand into their copybook. Only then could students complete the activity. Now, the teacher designed an activity for her students, printed and copied it, and the students only needed to paste it into their books. Second, the review lesson utilized a number of



different visual and graphic representations of the concepts the teacher was covering. This allows her to reach a wider range of students with diverse learning strategies. Finally, she used an interactive tool to allow the students to work through the new material together. And the teacher was able to clear old answers and refresh the interactive material more quickly than would have been possible if she had handwritten them on the whiteboard.

### **Professional Support and Growth**

The teachers at Campo del Cóndor were a strong learning community prior to *All Kids Online*, and they were eager to join the program and keep innovating. The school was well known in the region for a commitment to seeking out new teaching approaches and for participating in many initiatives. One of the teachers interviewed said she had attended all the trainings offered by the ULP including the Intel Teach course as well as an evaluation course and a course about how to use the Sakai education platform. In an interview the regional educational supervisor described Campo del Cóndor as the school where she has seen the most progress towards integrating the new teaching paradigm. The school director spoke about a long and close relationship between the ULP and Campo del Cóndor stemming from previous innovative projects. For example, as a faculty, the Campo del Cóndor teachers volunteered to join the “Smart Schools” program and to use student-centered teaching strategies. So when *All Kids Online* started, the school was already on its way to integrating more active learning activities, but the technology did provide new tools and access to new resources.

Campo del Cóndor also had a PD coach from *All Kids Online* but Campo del Cóndor had a different set of needs than in El Manzanar. Campo del Cóndor has both more teachers and more students, and the PD coach played a critical role in providing tech support to keep over 120 computers working and in supporting teachers in the classroom as an extra set of hands to help students get to the right places. She also helped direct teachers towards education websites and online resources to incorporate into their lessons. The PD Coach facilitated many of the extra programs and activities that *All Kids Online* provides to the school – the chess program for 6<sup>th</sup> grade, the art and music afterschool workshops, the Contexts reading program and the school’s participation in Balance Zero.

### **Impact on Students**

Besides using them for homework and other school-related endeavors, students talked about using their laptops to go on the Web, play games, and chat with their friends. Because of the ubiquitous Internet, students are able to do all of these activities at school as well as in their homes. When asked directly about impacts on the students at Campo, stakeholders spoke about a number of academic, social, and behavioral changes since the introduction of the laptops and whiteboards in the school.

*Increased academic achievement:* Everyone we spoke to agreed that the students were more motivated and enthusiastic about school since the introduction of the laptops. The instructional coach noted an increase in technical knowledge where the students were now able to use Power Point and make videos as well as solve technical problems on their own. One teacher spoke about increased writing output because for students who don't like to write, typing is better for them, they can move faster. A parent we spoke with shared a similar anecdote about her daughter reading and writing her own stories now that she could use a keyboard rather than a pencil and paper. Students also like that since the computers, teachers are creating more collaborative lessons and giving them the opportunity to work with their peers on different projects.

*Expanded horizons:* The Director mentioned increased social integration among the different social classes of kids; in that way, the computer acts as an economic equalizer for students. The *Aula 1a1* (One-to-one Classroom) software has a chat function as well as a discussion forum so that students can interact with their peers at Campo del Cóndor as well as at other schools. The laptops afforded great access to resources for students that came from the most rural areas. These children now had more access to music, news and other information helping expand their knowledge of issues both locally and beyond. Similarly students are now doing more learning while at home. One parent said her child was more motivated at home. She can play games, browse pictures, look up answers to questions, and use the education software that is included in the computer.

*Personal growth:* She reported that students also have more self-control, they understand that music and games are meant to be used at home and that while at school, they need to use the Web for more educational purposes. The coach talked about one child in particular who used to be painfully introverted who is now more comfortable interacting with other students. She mentioned another child who increased his motor skills since using the laptop. Teachers note that students' self-esteem has improved because the kids can see things that they have published on the Internet and that their work is valued. The work does not only live in the classroom, it is shown to a wider audience as well.

### ***Case Three: Escuela Nicolás Copérnico—an innovative, experimental school***

The third school we visited is located in the city of San Luis. Escuela Nicolás Copérnico was decidedly different from the other schools: it is a newly established model school run by the ULP under a special charter from the provincial government. The schools were called *Escuelas Digitales* or Digital Schools, and they all had ubiquitous technology access with a focus on personalize learning. The 24 teachers

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\* The names of the schools have been changed to protect the privacy of the students and teachers we worked with.

who work in all subject areas, were handpicked by the co-directors. The school had been open only three months when we visited. Nicolás Copérnico was built around three central tenets: personalized learning, technology, and the pursuit of excellence. The pedagogical model of Nicolás Copérnico was based on the model of the *Escuela Fontán* in Colombia with a student centered teaching model and mastery learning approach that allows each student to set his or her own pace. Nicolás Copérnico held all students to high expectations for mastering the content, but there was no entrance exam to join the school - all students were welcome. Indeed, the school had many students who have missed a substantial amount of schooling. But all students are grouped by age and not performance.

In total the school has about 300 students in all three educational levels (30-pre-k and kindergarten, 120-primary, 150-secondary). Students were divided by age, not grade with about 20 students in each of these age level modules. In the classes students work through the material at their own rate, so teachers typically have students working in groups but each group may be on a different topic. Teachers frequently monitor students' learning to be able to adapt the students' education plans. The school is working towards designing and administering online tests as a means to more effectively monitor student progress.

### **Technology infrastructure**

Like the other schools we observed, all students and teachers had computers and every classroom had an interactive whiteboard. All of the students from kindergarten to high school have Classmate PCs. The school had wireless Internet throughout and was also using the Sakai Platform from ULP. Since the school is in the city, all students had access to the wireless through the provincial network throughout the city. At the time of the site visit, the school had only been open for three months, so the teachers were still developing their routines and getting used to the ICT infrastructure. More so than at the other schools, some of the Nicolás Copérnico teachers were still unsure of the reliability of the technology. Some of the classroom activities we observed reflected these concerns. For example, teachers had students copying from the whiteboard or the computer into their copybooks in case the computer crashed.

### **Classroom Practice**

As a model school, the Nicolás Copérnico School had a unique pedagogical model that teachers had been trained to use and they were beginning to implement in the classrooms. The core of the model was a focus on individualized learning pathways where each student moved at his or her own pace through the material. In contrast to El Manzanar and Campo del Cóndor where the whiteboard was the catalyst for many of the changes in classroom practice, at Nicolás Copérnico, it was the students' netbooks that were at the center of most of the innovations. The teachers we spoke with whole heartedly believed in this individualized model; one teacher cited that the more traditional model actually held students back by forcing them to move at the same speed as their peers.

*Increased personalization of learning:* In the classes observed at Nicolás Copérnico School, the teachers seldom taught from the front of the class. In the classrooms we observed, we did not see any whole class activities, most students worked in small groups if they were on a similar topic or individually, if not. Students either completed learning activities on their laptops or worked in their copybooks doing activities from the interactive whiteboards. Students entered a classroom, opened their laptops, and began working on whatever activity was next in their personal learning sequence. The teachers worked more as facilitators and guides moving between groups of students checking in on their progress or asking questions. At times, teachers used the interactive whiteboard to work with one group of students on a topic for which she needed visuals or the interactivity of the whiteboard. But, at these moments, the rest of the students were busy with other activities. For example, in a middle grades math lesson, there were seven students in the classroom. The teacher was working with two students explaining new material to them, while a more advanced student was working by herself, and four other students were sitting at another table working on a different set of activities.

An observation in a middle school music classroom, though, highlighted the benefits and challenges to this individualized learning model and the autonomy facilitated by the laptops. As the students entered the classroom, they automatically opened their netbooks and started working on things. But we observed that many students were not on the appropriate task and the teacher had to make his way around the room giving personalized instructions. This took time and some students did not get his help until half way through class.

*Increased access to resources:* Teachers and students both talked about using the laptops and Internet to access information. Teachers were able to access worksheets and images that they would not have had access to without the Internet. Whether for homework, or during the school day, students also used their laptops and the ubiquitous Internet connection to access information that they otherwise would not have available to them. Though the Sakai Learning Platform was still new, teachers and students at Nicolás Copérnico were becoming adept and navigating the site. A table of students in a classroom of eight year-olds gave a tour of Sakai showing where different files were stored and the portal they used to pass in their homework. A child in the nine-year old group demonstrated how she used the chat function on the platform. Students used Aula1a1, an online educational website funded by *San Luis Digital*, to compete in academic competitions with other schools as well as to look up information and to find homework assignments. For their music class, a group of older students was able to access free DJ software that allowed them to mix music from their existing library.

*Emergence of mixed teaching and learning strategies:* Despite being a Digital School, the teachers at Nicolás Copérnico were very aware of the value of providing students with tactile activities and hands-on learning projects that did not involve their computers. Teachers were very clear about the technology being just another set of tools they had available to them, not the only form of instruction. The blending of the

old and new teaching practices was most apparent in the frequency with which teachers had their students copy from the interactive whiteboard or from their computer into their copybook. Teachers acknowledged that parents still had some traditional expectations about school and preferred to see their children's work in the copybook.

The Nicolás Copérnico school also used the worksheets to structure children's activities. Across subject areas, students at Nicolás Copérnico also used worksheets, but instead of working on paper students downloaded the materials from the Sakai Learning platform, completed it on the computer and saved it back onto the platform in their personal file. This mix of old and new learning and teaching approaches increased efficiency and productivity in the classroom because students could begin working instantly rather than waiting for the teacher to pass around worksheets and instructions. Similarly we observed a group of older students reading a scientific text and answering open-ended questions about it. Though the reading and writing was being done off of the computer the students all had their computers open so they could quickly access additional resources if necessary.

### **Professional support and growth**

The teachers at Nicolás Copérnico School had all successfully completed special university training courses on the use of ICT and student-centered teaching. The teacher candidates took a month long course at the ULP during the school vacations and the final 24 teachers were chosen from the successful graduates of that course. The teachers in primary taught all subjects but the high school teachers were departmentalized. One teacher commented on the increased instructional freedom she had at Nicolás Copérnico compared to the Catholic private schools she worked in previously. She also enjoyed the fact that the teachers used a whole language learning approach to teach literacy. The school's co-Directors were deeply familiar with the ULP's pedagogical paradigm and worked closely to support their teachers in growing professionally to support that paradigm in the school.

This school also had a unique professional development situation; as an experimental school the faculty were working together to build and develop their teaching approaches and the curriculum on a daily basis. The teachers gave class until lunch (12:30pm) when the students went home. The teachers ate together at the school and then spent the afternoon planning their lessons and working across modules to create curriculum and organize other special events. This collaboration across age levels and across subject areas helped teachers build a more cohesive teaching and learning community.

## Impact on Students

Nicolás Copérnico was a new school that had only been open for three months when we visited. Students at this school had come from private, catholic and public schools all over the city and were all experiencing the new individualized teaching model for the first time. Their point of comparison was not change before and after the laptops, but rather differences between their old schools and their new school, Digital School.

*A more engaging learning environment:* Despite the fact that students had more work and had to put more effort in at school, they universally preferred the learning environment at this Digital School to their previous schools; one student described it as “more fun.” Another student noted that at his previous school, they used computers for games and music, and that most of their classes were free periods, but that he “didn’t learn anything last year.” It was a change for him to use computers for academic and serious work. Another student said she liked having the computer because it was more interesting than just taking notes off the blackboard. Similarly another student appreciated the fact that the computers allowed them to “look up information when they needed to.” The directors also shared evidence that students were happier to come to school. They reported that students return to school on time after a vacation period, when before they would more readily disregard the set vacation dates and come back a number of days later.

*A new way of learning:* The school co-directors noted a change in teaching pedagogy among the teachers at the school. Teachers are doing much less upfront lecturing and more guiding and facilitating with individuals or small groups of students. In our observations, teachers did almost no upfront lecturing, and were more likely to be moving around the classroom, checking on individual students and guiding them to remain on task. The directors say this has changed the relationships between teachers and their students who now have more freedom to control their own learning. This change is pushing students to learn how to learn in a new way. As a result, students say they have more work at Nicolás Copérnico than they did at their old schools.

*Personal growth:* Various stakeholders noted changes in student behavior and personal growth. Directors and teachers alike agreed they have seen changes in students’ self-esteem since the beginning of the school year. Students who were quiet before are now more active and more outgoing. High-level students can now move through the material at their own pace and feel good about the progress they are making. A parent shared a moving story about the progress she has seen in her son since he came to the school. The child’s father had died five months before and she said the computer had been a really good distraction for him and his brother. In addition, she told me the boy had always struggled in school because he has a vision problem in one of his eyes and could not see the board properly. As a result, he didn’t know his letters or numbers. She said that with individual computers, he doesn’t have

to struggle as much to see, and it is not as obvious to the other kids that he has a vision problem. He does not get teased as much and can focus more on his schoolwork.

## **San Luis and the broader context**

During the case studies, we looked closely at how the tools (the netbooks, Internet and the digital resources) were used by students and teachers in the classroom. But through our interviews with people at the ULP and our research on other changes taking place in the province of San Luis it became clear that *All Kids Online* is just one aspect of broader shifts occurring in the province promoted by the government. Just as a socio-cultural theory of learning situates the technology within the classroom context, it is important to recognize that the success of *All Kids Online* was supported by provincial government's efforts to transform San Luis by creating a dense ICT infrastructure, creating digital rights, incubating digital companies, and developing a digital workforce and citizenry (Weinstock, Odicino, and Miranda, 2010). The government of San Luis had created drastic changes in infrastructure and had prompted a society-wide conversation about the value of technology, access and digital literacy that extended far beyond the schools, but the government was also promoting a number of educational initiatives that reinforced All Kids Online. This section explains the province's infrastructure initiatives and the array of educational programs.

### ***San Luis Digital and a province-wide infrastructure***

In part, what enabled the successful development and implementation of *All Kids Online*, and all of the subsequent education programs, was the creation of an information superhighway. In fact, none of the University of La Punta (ULP) programs, and most importantly, the *All Kids Online* program, could function as it does without robust and reliable wireless Internet, electrical connectivity and human support systems through out the province. In a speech given at a national conference in 2011, the Rector of the ULP made clear that *All Kids Online* was not itself a digital inclusion project it was strictly an educational project but that *San Luis Digital* was a digital inclusion project focused on providing e-resources to all of society (Bañuelos, 2011).

In 1998 the province hired the Ministry of Industry in Canada to design a strategic plan for a telecommunications infrastructure and services platform that would reach all geographical areas of the province (Miranda and Odicino, 2009). By 2001 a master plan was created to guide the implementation of the new infrastructure. For the government, the platform would serve as a tool for organization and administration while the citizens of San Luis would use it to access a suite of electronic services. The network and the Data Center, the brain and arms of the Information Highways, were inaugurated in 2003 (Miranda and Odicino, 2009). In 2008 connectivity was distributed for free, in 24 towns, providing free wireless Internet to all areas with at least 20 inhabitants (Miranda and Odicino, 2009).

The province-wide wireless Internet breaks down the walls that confine learning to the school building. Students were able to carry their laptops home and connect to the same websites, games, and portals that they did at school. They could share these online resources with parents and siblings while also teaching the technical skills involved with navigating a computer. They could use Skype or messenger to chat with friends, family and their teachers. The *Centros de Inclusión Digital* (Digital Inclusion Centers) provide computers, educational software, and Web2.0 technology to individuals hoping to finish primary and secondary school. Better educational levels boost productivity and efficiency, which in turn can promote innovation at work. These Centers are also aimed at entrepreneurs and small and medium sized companies. The *Educativa Hospitalaria* (Hospital Education) program provides laptops to school-aged children who are hospitalized. The objective is to prevent students from falling behind in their schooling while providing some recreation and amusement during recovery. The *Abuelos en la Red* (Grandparents Online) program encouraged grandparents to get online, join social networks and build their technical skills.

The Province of San Luis actually offered two networks to its citizens. Through the Data Center at the ULP, the province provided a safe and secure network for the *All Kids Online* laptops. The students have free access to the internet at home, but their laptops have been preconfigured to only connect to the province's secure and filtered network for children.

Finally, technical support was vital to the efficiency and effectiveness of the network. The ULP maintained two different technical groups to support *San Luis Digital* and *All Kids Online*: one assigned to fixing the cables, nodes and towers around the province, and a second group that solely supports the *All Kids Online* program. The tech support for *All Kids Online* had a number of vans that drove around the province on a weekly basis visiting schools, fixing hardware and delivering computers.

### ***Opportunities, resources and training: All Kids Online and other educational programs***

As an education reform program, the *All Kids Online* laptop program did not operate as an isolated program; it was part of a larger ecosystem of educational programs providing new resources and opportunities. Combined the programs and resources coordinated through the ULP impact the learning environment in three ways: educational opportunities and programs for students; educational resources to use with students; and training programs to provide teachers with new teaching strategies.

#### **Educational opportunities for students**

The *All Kids Online* program was interconnected and aligned with a number of other provincial educational programs being funded through ULP that created novel learning opportunities for students. The schools we visited were participating in at



least a few of these programs including *Ajedrez Escolar Inicial* (School Chess Beginners Program), *Olimpiadas Sanluisenñas del Conocimiento* (San Luis Knowledge Olympics), *Contextos* (Contexts), *Balance Cero* (Zero Balance), *Talleres de Artes y Juegos* (Arts and Games Workshop), and *El Parque Astronómico La Punta* (Astronomic Park "La Punta"). This collection of in-school and after-school enrichment opportunities gave students who normally attended classes for just four hours a day, an increased number of contact hours with educators and educational materials in structured and safe environments. In their interviews, the director of *All Kids Online* and the ULP described how most of these programs developed over time in response to needs and concerns that emerged as the *All Kids Online* grew and the ULP team spent more time in the schools.

Programs such as the School Chess program and the Olympics of Knowledge fostered a healthy sense of academic competition that encourages students to explore their own unique intellectual interests and master their use of logic and problem solving. Both programs utilize the laptop and wireless Internet technology. The Chess program could be used as part of the school day or as an afterschool program. Students receive chess lessons virtually from teachers in other towns in the province and then play chess online using their laptops. During the chess lessons, children would play against other students in the group, but the project also organizes provincial championships where students would play multiple elimination rounds online, and the finalists would come to the capital for the last rounds. The Olympics of Knowledge encourages students to pursue their interest in a particular subject area by completing online exercises with the support of a virtual expert; students who excel are awarded significant prizes like international trips.

*Balance Cero* (Zero Balance) and the *Talleres de Artes y Juegos* program (Arts and Games Workshops) are both afterschool programs that encourage students to pursue other interests outside of the typical academic subject areas. *Zero Balance* was a more structured youth activity and the Arts and Games Workshops offered an open environment to explore music, the arts or to just play.

Zero Balance was an environmental program that plants trees to offset the carbon output in a community. With the communities' agreement, student volunteers visit all the households in their community and collect data on household energy use which they enter into a web-based datasheet on their laptops to estimate how much carbon the village emits. Students used another web-based program to calculate how many trees of which type the town needs to plant to balance out the carbon. Zero Balance was a multi-year commitment for each village, and the program had planted 1,000's of trees across the province. The village of Campo del Cóndor was in the process of planting trees during our visit.

The Workshops offered two types of activities. First, the Workshops brought professional artists and musicians to work with students to explore their artistic and

musical abilities. But the Workshops were also an opportunity for children to play board games with friends. All of the games available were selected because they supported cognitive development and critical thinking such as chess, puzzles, memory games, or math games.

Finally, *El Parque Astronómico* (Astronomic Park at La Punta), on the campus of the ULP, had an observatory, a planetarium and various telescopes where students would visit on fieldtrips. The Interactive Science Center at the Park offers visitors an interactive, educational experience meant to “awaken interest in natural science” (<http://www.cic.ulp.edu.ar>). A mobile astronomy lab brings telescopes and other equipment to communities to incite curiosity in the cosmos. The Park also offers training courses for teachers in the province.

### **Educational resources for teachers to use with students**

The *All Kids Online* initiative also supported the development of digital resources for teachers and students to use on the computers. A key resource was the Sakai e-learning platform a virtual learning space where each teacher could build a virtual classroom that all their students could access from their laptop. The platform made it very easy for teachers and students to share resources, collaborate, share and save work. The Sakai platform allowed teachers and students to upload, edit, share, and save education content such as worksheets, video and writing assignments. It also allowed publishing, editing, commenting, and sharing of different types of educational materials. Since this is a collaborative space, the Sakai platform also made it possible to share information through the blog or wiki applications. Teachers and students could also communicate with each other through the forums or chats to share their experiences.

Teachers had access to their own space inside the platform, where they could design, distribute, store, and share their own materials. Students were registered according to grades, classes, and subjects. Teachers could follow their students’ progress through notifications that appear when individuals have completed an assignment or uploaded other work. Teachers could also send messages to the whole class or individual students enabling personalized and continuous guidance. The Sakai Learning platform facilitated differentiated teaching and learning by creating, distributing and grading lessons easier and more efficient. This platform was originally designed for studying and training at higher education levels, but it was adapted to be used in elementary school classrooms in the *All Kids Online* project.

*Aula 1a1* was another educational software that was available on all the children’s laptops. It incorporated a variety of web 2.0 tools with other interactive curricular resources. It was meant to bridge learning in the classroom and at home. The software had been tailored to the San Luis curriculum, but was also available throughout Latin America. The content was based on priority learning concepts as defined by the

Ministry of Education in each country. There were four main pillars of the Aula 1a1 software: Reinforcing Concepts, Moderated Social Networking, Collaborative Intelligence, and Content Creation and Storage. The software was aimed at giving teachers access to more dynamic multimedia lessons and homework assignments, creating virtual space for communication and collaboration between students and with teachers, providing students with tools to develop their own content, engaging parents in the education of their children, and monitoring student learning more continuously and accurately.

The ULP was also creating its own content. *Grupo Recursos Educativos Digitales* (Grupo RED – Educational Digital Resources Group) was made up of teachers and content specialists in different fields of study including language, mathematics, science, social studies, with its own multimedia production. These specialists elaborate content for Sakai Learning Platform and teach training courses about how to incorporate student centered learning into the classroom.

The educational materials they developed include methodological sequences for teachers, interactive activities for students, consulting materials, additional materials to deepen classroom work, and teaching and assessment resources. *All Kids Online* mentors receive a holistic training on using ICTs in a one-to-one classroom including implementing Grupo RED content and materials, using the different online applications offered, and on developing the skills involved in each teaching lesson.

All three schools we observed also participated in the *Contexts* program. The *Contexts* early literacy program promotes reading for pleasure among young children by providing kindergarten, first and second grades with classroom libraries and giant pillows to create a reading corner. Once a month a storyteller visits the classrooms to read to the children. Often the storyteller was the PD coach from All Kids Online. There was also a training component for teachers and school directors to learn how to promote reading for fun.

### **Training programs to provide teachers with new teaching strategies**

The ULP also offered multiple supports to the teachers in *All Kids Online* with technology training and a teacher coach program. All of these programs were designed to meet teachers and schools where they are and to adapt to different needs of teachers and schools. Through the free *Alfabetización Para el Futuro* (APF – ICT Literacy for the Future) training program, teachers are trained to integrate more math, science, and ICT into their curricula. The training program was guided by the idea that making changes in classroom routines was not enough; teachers needed to make conceptual and attitudinal changes in order to keep pace with the technological changes happening around them. These new technologies are changing the role of the teacher and as a result teachers need to fundamentally transform their pedagogical approaches in order to facilitate and guide students in the new interactive learning

environments. Courses vary in length from a few days to full year programs and the teachers meet through a mix of face-to-face and virtual classes.

*All Kids Online* also had over 300 teacher coaches who worked in all the schools as mentors to help their peers in a variety of ways. As could be seen from the schools we observed, the pedagogical coaches developed a long-term relationship with the schools they are supporting. According to the *All Kids Online* III report, “the pedagogical coaches are the mediators between the organizational stage of the project and the teachers in charge of the daily practice in the classrooms” (p. 57). The pedagogical coaches take on various roles including solving technical issues, directing teachers to various online resources, helping teachers to integrate more technology into their lesson plans, aiding with the facilitation of the various ULP educational programs, and facilitating the interaction with the technicians to repair the laptops. According to the *All Kids Online* III report, which is also very much in line with our own observations, the mentors’ “presence at the schools provides security to the faculty and school board members in regards to the activities done with the computers. The mentors’ function is fundamental for the development of the project, since they guarantee its material and pedagogical maintenance. They are always welcome in the schools and have adapted to the dynamics at each institution” (p. 57). We observed that the mentors served as the liaison to different programs generated at the ULP. The coaches were already trusted within the school contexts and they often ran the extra programs in the schools such as *Zero Balance* or *Contexts*.

*Red de Escuelas Inteligentes (Smart Schools Network)* is a voluntary program from the ULP and the province of San Luis to foster educational improvement initiatives. The initiatives were aimed at fostering deep changes across multiple areas of the school context. Schools commit to using student-centered approaches to improve students’ math and language arts scores. With the help of the ULP, schools design their own strategic improvement plan based on a baseline evaluation of students’ academic outcomes. Principals and teachers then must commit to using ongoing student assessments, participating in professional development courses, implementing various learning programs designed by the ULP, and attending school improvement forums. Joining the Smart Schools Network also provides access to a set of resources and incentives for school improvements including access to teaching resources (activities, lesson plans, etc.), reduced bureaucracy burdens at schools, and various implementation supports provided by the ULP. Two of the three schools we visited were part of the *Smart Schools* network.

During the time we spent with the directors and coordinators of *San Luis Digital* at the university, it became clear the importance of the institution’s role as not only a program generator and support organization, but also as a driver of change throughout the *San Luis Digital* Initiative. University of La Punta, the institution in charge of managing all of these education programs, got its funding from the provincial government and as a result, its research is closely linked to the economic

development needs of the province. The ULP is also in charge of the management and maintenance of the infrastructure and operations of the wireless network. As such, the ULP acts as both the intellectual incubator and technical operations hub managing existing education and technology initiatives as well as developing new and innovative programs.

## Discussion

The research on large-scale laptop programs in developing countries has frequently found that the laptops were not used in many classrooms. The same research easily identified programmatic challenges such as teacher training, lack of time or curricular constraints (Akbaba-Altun, 2006; Comenius, 2008; Kraemer et al., 2009; Light & Rockman, 2008; Vyasulu Reddi & Sinha, 2003; Winthrop & Smith, 2012). Instead of looking at the design of the laptop program and the teacher training supports in this study, we asked a different question about what daily use of laptops looks like in the classroom in the belief that understanding how schools make daily use of the laptops would help explain why the laptops are being used. In all three of these schools we saw how the laptops and the ICT resources had become a daily part of learning in the classroom.

What we saw was a mix of pre-existing teaching and learning strategies being enriched and modified by the technology, some older strategies slowly being displaced and new ones emerging. In these classrooms, the Classmate PCs - embedded in an eco-system of interactive whiteboards, a virtual learning platform and universal wireless connectivity - were being used as frequently as typical Argentine students use their copybooks, and for many of the same purposes. In the absence of other resources, the copybook in Latin American schools is a combination homemade textbook, workbook, study guide, and notebook as well as a portfolio of work so parents and teachers can monitor each student's progress (Almeida Costa e Santos & Proença Rebello de Souza, 2005; Chartier, 2007; Gvirtz et al., 2004; Tenutto, 2000). This was why the students and teachers used their laptops everyday as a vital part of their learning environment. However, the educational tools provided by *All Kids Online* were also fundamentally changing the learning process.

Ubiquitous computer and Internet access facilitated changes in five strategies or classroom practices which make the teacher's job easier and more effective and could lead to substantial improvements in student learning:

- 1. Increased efficiency in classroom management.* The laptops and interactive whiteboards greatly facilitated critical classroom logistics, such as distributing resources to students and putting material up on the whiteboard, allowing teachers to spend more time teaching. The ease of distributing resources using the virtual learning platform to place materials directly into each student's folder also allowed teachers to personalize resources to each student's level. In schools with a four-hour school day, time was a precious resource.

*2. Increased access to educational resources, creating more time on task.* Both teachers and students were using a wider variety of resources to meet their learning needs with the laptop and other ICT resources. The Internet offered access to a wide range of resources from the complex, such as interactive math activities, to videos and images, to simpler resources such as more varied stories to interest young rural readers. But the technology also allowed the teachers to make their own resources: Some teachers scanned reading material to share with students, and more technically proficient teachers created digital resources such as interactive worksheets. The biggest change for students was that they each had their own copies of all the materials they were using in school, and they could take these resources anywhere with them. In schools with insufficient textbooks, libraries, and other educational resources, this can make a substantial impact.

*3. Increased student ownership of the learning process.* Having full ownership of the laptop from All Kids Online, and universal access to the Internet, increased students' ability to have more autonomy and direct their own learning. With the laptop, they could more easily find their assignments and start working, and those students who were moving faster could do more activities or do extra work. Students also were able to do work at home or use the Internet to explore a topic. Shifting more control of their own pacing and progress through the material onto the students increased their autonomy and opened the possibility for them to push themselves harder.

*4. Interactive resources offer more frequent feedback to students.* This change is connected to the one above. Across a range of basic skills and abilities, such as math and spelling, the introduction of interactive digital resources was a way to give students immediate feedback, enabling them to try something, assess, and redo on their own. We saw how activities as simple as an interactive worksheet helped a learner practice and problem-solve his spelling. This enabled teachers to make better use of their time with students, and allowed students to study outside of school.

*5. More fluid communication between teachers, students, and parents.* The laptop and Internet connectivity also changed how students, teachers, and parents communicated in a couple of ways. Two of these schools did parent workshops about the laptops so that parents could learn how to review student work just as they do with the copybook. Some of the families had begun to use email. All of the students were using a chat tool like Skype or Messenger to be in touch with their friends, and most of them chatted with their teachers as well. Through chat, teachers were able to remind students about homework and students were able to ask teachers questions.

## Conclusion

There are many pending questions about one-to-one programs in developing countries, given the varied success rates of many of these large-scale projects. In this project, we attempted to approach only one question—Why do many teachers *not* utilize the laptop resources?—by looking closely at schools and classrooms where the tools are being used in context. What we found was very interesting, and suggests that laptop programs in developing countries may want to think carefully about how these new resources can intersect with the existing educational strategies and tools in each country in ways that can begin to improve student outcomes, but also lay the groundwork for deeper reform.

All learning is situated and embedded in a context. Much of the research on laptops that focused on classroom experience has been done in wealthy countries. Learning experiences of teachers and students in the resource-rich classrooms of the industrialized countries are, obviously, different from those of teachers and students in under-resourced classrooms. These findings shed valuable light on how these ICT tools were positively integrated into the under-resourced classrooms typical of many developing-country schools.

Although some of the teachers we visited also were experimenting with innovative practices, such as project-based learning, in their routine daily practice, teachers were not abandoning their old resources or teaching models nor were they resisting ICT. Rather, they were adapting old practices to work in their new, technology-saturated context. But by infusing ICT into their current practices, there were some fundamental changes in those practices, making them potentially more effective. Many of the examples of the ICT-enriched practices we observed involved a mixture of new digital tools into traditional Argentine pedagogical practices.

This research was only exploratory, intended to examine what daily use of laptops looks like. But many of these mixed activities of older practices with new tools hold the potential to have positive impacts on student learning, since they align with known aspects of good practice: increasing time on task, allowing students more control over their work flow, giving students their own textbooks or reference materials, providing more and varied resources and activities for students. We do not mean to argue that there is no need for deeper pedagogical reform, but that these mixed approaches that transform current common practices may be a good place to start integrating ICT, improving education, and building for reform.

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