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Telecommunications and Science Education Collaborative Workshop for North American and Latin American Educators

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The National Science Foundation grant to EDC's Center for Children and Technology (CCT) enabled collaborative support for the World Bank's WorLD Links for Development Program (WorLD). The WorLD Links project helps public schools in developing countries learn to use the Internet by working on projects in partnership with other schools around the world. In June 1998, WorLD convened an anchor meeting of educators from six countries in Washington, D.C., to start this project (See Appendix A for participants). At this time, the educators designed online collaborative projects to be conducted throughout the following school year (these included comparing water quality in local rivers – e.g., the Mississippi, the Rio Plata,; reading and comparing literature for young readers from different countries; creating an online atlas of the countries of the participating classrooms). Surveys, focus group results, and informal participant observations from the first anchor meeting suggested that a number of cultural factors would influence effective implementation of these projects.

CCT was asked to analyze how various aspects of the different cultural contexts of education might affect international, telecommunications-based collaborations. CCT researchers thus cast a broad net using multiple methodologies in order to understand the issues surrounding implementation of the projects. We tracked participants' communications via telephone and email, collaborated with the various project partners, and made a two-week site visit to make recommendations for refinements in the program.

As we culled through the collected materials, we examined the following questions:

- How do teachers incorporate these projects into their work (including afterschool programs)? What are the disciplinary foci? What kinds of strategies do teachers use in the context of these projects, and do these differ from the ones they customarily use?

- What kinds of factors, both advantages and barriers, influence international collaborations such as these projects:

  (a) practical matters (e.g., school calendar, teachers' time, technology access, and the like)

  (b) pedagogical matters (e.g., differences in pedagogical beliefs and teaching strategies that can open windows onto new perspectives and can also create barriers)

(c) communications issues (e.g., language, subtle aspects/differences in communication habits and expectations in online environments)

(d) motivational issues (e.g., students' and teachers' expectations of school, perceptions of appropriate activities, interest in communicating with students from different countries)

(e) broad cultural issues (including particular countries' education reform efforts, goals and resources for education, teachers' job requirements, and the like)

(f) administrative support (e.g. leadership support and encouragement provided by schools)

- What kinds of impacts might these collaborative projects have on teaching and learning (for example, teachers' perceptions of their students' learning; connecting students in new and more vibrant ways with an international community; expanding teachers' views of their work, providing powerful and experienced examples that influence pedagogical innovation more broadly; providing more effective ways of covering traditional curriculum topics, and so forth)?

- Do teachers use the project and the technologies as sources of support and collegiality within their own countries as well as an internationally, and if so, how do they do so? Does participation in the project and online environment significantly affect their professional lives and teaching skills?

We explored key interactions and key factors in the carrying out of these international projects. For example, we examined how variables such as time and language impacted pedagogy, student and teacher motivation, and student learning. In addition we looked at how a country's national education context affect the ways that teachers implement innovative projects as well as how technology access and communications issues affect the vibrancy and success of the telecommunications-based component.

Methodologies

The variety of methodologies used gave us an opportunity to look at projects at different points throughout the collaboration

Telephone interviews: Telephone interviews were conducted over a period of two months in the middle of the project year. A researcher from Argentina interviewed several of the participants in South America. A U.S.-based researcher conducted phone interviews with the active North American teachers.

Surveys: Surveys were emailed to all participating American teachers to gauge how the collaboration was going and get a balanced perspective.

Site visits: Site visits were conducted in the spring of 1999 to observe the Latin American schools. The two-week trip allowed a CCT researcher to visit several schools and ministries in Brazil and Paraguay, affording a much more comprehensive look at how the WorLD project was embedded within each of the local schools sites. We were also interested in schools' technology infrastructure and factors that allowed teachers to successfully implement these projects as well as the barriers that would impeded their success.

Because the collaboration was international, it was important to use a variety of methods that allowed researchers to investigate ways in which the collaboration was working over time zones and different cultures.

Anchor Workshops and Project Design

The goal of the 1998 four-day Washington conference was to help the teachers to design the projects for the coming year. The first two days of the anchor workshop were structured so that participants could present examples of their students' earlier telecommunications projects as well as learn from others in an informal environment. In addition, several "open markets" (*Ferias)* and breakout sessions gave participants an opportunity to share lessons learned as well as expertise on how to sustain successful telecommunications projects. Most of these earlier projects had been designed by educational authorities rather than by the teachers who implemented them.

The third and fourth days of the workshop were spent in the design, presentation, and redesign of international projects. Participants grouped themselves and developed joint projects with the following elements: General Objectives and Learning Objectives, Description/Activities, Phases, Timing, Resources, and Evaluation. This planning led to the following projects:

1. *Connections on Earth*

This project proposed creating a collaboratively built website covering the geography, flora, fauna, history, and folktales, of the participating nations. Participants came from Argentina, Brazil, Chile, Peru, Washington State, New York, and Mississippi.

2. *Sinergía (Synergy)*

This project examined community issues and concerns. Students at each school conducted a community needs assessment and then developed strategies to address those needs. Participants were from Canada, Kansas, and Paraguay.

3. *Literature of the Americas*

This project built an online annotated bibliography of literature for young people from the participating nations. All the works in the bibliography were read and reviewed by students. Participants were from Brazil, Paraguay, Union City, NJ, and Washington, D.C.

4. *International Cooperative Atlas*

In this project students created web sites about the history, society, and culture of their country. Each website points to the other Atlas web sites. Participants came from Brazil, Chile, Colombia, Paraguay, and USA.

5. *Environmental Links*

By having students research environmental problems in their own community and sharing that information with their international collaborators, this project encouraged students to become key agents of change in protecting the environment in their communities. Participants came from Brazil, Chicago, and Peru.

6. *The Americas' Water Project*

Students researched and developed multilingual HyperStudio presentations covering the rivers and lakes in their communities. Students researched such topics as geography, history, water quality, and water usage (e.g., recreation, drinking). Participants came from Canada, Chile, New Orleans, and Washington, D.C.

7. *WhaleNet — Surfing with the Whales*

Using WhaleNet and other Internet resources, students followed and learned about whales and their environment. Participants came from New Hampshire, Georgia, New Mexico, and Peru.

8. *Links for Learning*

This project was designed by teacher trainers/consultants participating in the workshop to monitor the collaborative projects developed at the anchor workshop. It did not involve classroom teachers or students.

After a very successful face-to-face meeting, teachers were enthusiastic about the conference and eager to begin the international telecollaboration with their students. The conference facilities were ideal for an international gathering – the large conference and the smaller classrooms for breakout sessions were fitted with headphones at each seat where teachers could hear simultaneous translations of the speakers (Spanish to English and English to Spanish). In addition, all of the rooms had access to the Internet and the latest applications that allowed teachers to construct projects quickly. Many of the factors present at the anchor meetings (high-speed access, translation facilities, and face-to-face dialogue) were not available during the actual implementation when teachers returned to their countries and schools.

How Teachers Incorporated the Projects into Their Teaching

Teachers integrated these projects into their teaching in different ways, depending largely on the national school context. The implementation modalities varied from being completely embedded within the class to partially outside of class to completely outside of class. Also, some teachers were able to create interdisciplinary projects with the involvement of other teachers in their schools

During the planning workshop North American teachers reported the greatest flexibility in integrating the collaborative projects into their classroom activities. Many of these teachers worked with standards that focused on skills and processes, and this facilitated the integration of the collaborative projects. Also, during the planning stage the North American teachers expressed hopes of enlisting other teachers in their schools. However, throughout the project year, the North American teachers were unable to accomplish this.

In some schools projects attempted to create very novel interdisciplinary links between foreign language and science departments. Linkages proved difficult to establish since there were few existing models. One foreign language teacher reported problems in that the students did not overlap between Spanish and science classes; other faculty found it hard to conceptualize the project and were also uncomfortable working in a language they did not

understand. For example, one Louisiana science teacher attempted to enlist the Spanish teacher's help to facilitate a project on water quality with schools in Chile. Few students were in both classes and the Spanish teacher had trouble incorporating the project, with its heavy science vocabulary, into her curricula.

Latin American teachers generally integrated their projects into their students' after school time when teachers had more flexibility in integrating technology. Most of the Latin American teachers were held accountable for very rigid curricula focused on discrete knowledge, which often required teachers to cover extensive material during the school day and made it difficult to implement project-based work. In addition, teachers had strenuous demands on their time (short class periods with large class sizes). Latin American teachers solved these problems by letting students work on their projects during the students' free time. One exception to this practice was the case of Paraguay, where teachers integrated their projects into the computer classes. The Paraguayan students did their research outside of class, but the programming and web design was done during their computer class.

The Latin American teachers were also successful in building strong interdisciplinary projects. Unlike the North American teachers, the Latin American teachers had additional support and commitments from their school colleagues prior to the anchor workshop. They also tended to have strong administrative support (see below). One example was the Sinergía project in a Paraguayan school, which was a collaboration between four teachers: computers (Internet, web design), language arts (the reports), math (the data analysis), and art (web design and "welcome gifts" for the students in Kansas).

Factors Influencing the Development of the Collaborations

The preliminary research at the Washington workshop identified issues and potential challenges for the year-long collaborations. The issues fell into five categories: practical matters (school calendar, teachers' time, technology access, and the like); pedagogical matters (differences in pedagogical beliefs and teaching strategies); communication issues (language, habits, and expectations in online environments); motivational issues (including potential differences in students' and teachers' interests and the like); and broad cultural issues. Our research tracked developments along these issues through phone interviews, questionnaires, email exchanges and site visits. In addition, unanticipated outcomes emerged throughout the year that we have documented.

Practical Matters

Technological Resources

All the Latin American schools present in Washington had a minimum infrastructure of at least four computers in the school (nearly always in a lab configuration) with one connected to a phone line. Some of the South American participants were from well-equipped schools with robust Internet access. In particular, the Chilean schools reported a stable technological infrastructure because of the Chilean national program, ENLACES (see website: http://www.enlaces.cl/). The North American schools represented in Washington had strong technological infrastructures with classroom computers, large laboratories, and dedicated phone lines. The difference in infrastructure between the two regions was stark.

When the collaborative projects failed to develop between the regions, infrastructure difficulties were the first point of investigation. In surveys from the North American teachers, the lack of appropriate hardware in the Latin American schools was the most consistently cited reason for the failure of the project. In phone interviews with the Latin American teachers, none of them identified technological difficulties as an impediment to continuing the project. Most Latin American teachers had encountered difficulties resulting from too few computers and a phone line shared with the rest of the school, but each teacher had developed coping strategies. One widespread solution was for teachers to work on weekends or after hours. But other solutions also abounded: at one Paraguayan school the parents' association paid for a second line; a Peruvian school took up a collection to rent extra time at a local cybercafé; a second Paraguayan school coordinated with the main office not to use the phone during certain hours; a school in Brazil enlisted business donations of old machines; and another school in Peru sought the involvement of a local agricultural college so they could use their Internet connections.

The site visits in Brazil and Paraguay provided a deeper understanding. In both countries we saw schools with very little or no infrastructure. One Brazilian school had prepaid a year's contract with a local ISP and a separate phone line, but the technology never worked. The school, located deep in unreconstructed *favelas* some 30 minutes beyond the last subway stop in São Paolo, where the street literally have no names, had been unable to get the ISP to come to check the connection or repair the phone lines

Structure of the School Day – Teachers' Time

The organization of the teacher's day varied between countries, and the scheduling was especially hard on Latin American teachers. Lack of time to implement projects was cited

by teachers in both continents as a constant impediment to the project. Findings from previous CCT research suggest that thoughtful technology integration in schools often takes time during the school day (Hawkins et al, 1996, Honey et al, 1996). It was apparent from our site visits and the phone interviews that Latin American teachers were dedicating their after school hours to the project.

Because of a scarcity of school buildings, there were often large numbers of students as well as a shortage of qualified teachers in schools in Brazil and Paraguay. To deal with the large student populations, Latin American schools are open from 7am to 9pm. Students are divided into three shifts, and each "shift" attends school for five hours of classes. Latin American teachers at the workshop reported working at least two teaching shifts; a few had three shifts of students: morning, afternoon, and night. As a further complication, teachers reported working at multiple schools with little time to prepare for classes and little compensation

In Brazil, the lack of release time was exemplified by a teacher in São Paolo who donates her time to develop technology-based projects for her students. Lygia, at the Escola Filomena Matrazzo, herself a graduate from Filomena, teaches two shifts at the school and volunteers her time during the afternoon shift (1pm-5pm) as coordinator for the school's innovative programs (the school has no budget to pay teachers when not *in-class).* She expressed her social commitment to public schools but did not know how much longer she could afford not to move into private schools. At one school in Peru, the problem of lack of time was resolved when all teachers involved in the project volunteered to stay one hour a day after classes.

Structure of the school day – Students' Time

Whereas teachers often lacked time, the students often had ample time. Individual students are only in-class for four or five hours a day, and, unless they have work or family responsibilities, many have the rest of the day free. At all the schools we visited, our student hosts were always finished with classes for the day when they came to guide us through their school. This "afterclass time" was a crucial variable, since none of the students reported doing project-related research activities during actual classtime. In fact, this availability of time fills the same needs as block-scheduling in the North American schools. Also, the students are hungry for interesting, engaging projects, and large numbers are very willing to work after class. However, because teachers are seldom available then, students must generally work independently on the projects. To a great extent, the projects were successful in Latin America because of the motivation, and dedication of the students.

At Colegio Nacional Lopez Moreira in Asuncion, Paraguay, students were very excited to tell us about their community research project (see the website at http://server.enlaces.edu.py/cndelm/html/mensiner.htm). The project was integrated into their language arts and computer classes, since the language arts teacher worked on their reports, and the Internet activities were part of their computer class, but most of the work they did outside of class. These students attended the morning session and spent their afternoons researching and developing their project. The forty-four students divided into teams of six or seven to research community problems such as drug addiction, pollution, prostitution, street children, or alcoholism. Before doing their field research, the students researched the issues and identified the pertinent players. Next, the students conducted interviews with the appropriate people – street kids, police, drug addicts, prostitutes etc. From their research they identified the causes of the various problems and then generated possible solutions. This project was a collaboration with a school in Kansas. The students exchanged questions about the different community issues in each locale, and asked how the other community dealt with similar problems.

Classroom Context

Most North American class sizes range from 23 to 30 students. Many of the participating North American teachers were already accustomed to infusing technology as part of their daily classroom practice within a constructivist pedagogical approach (open-ended, hands-on, inquiry based). This classroom context allows teachers to act more as a facilitator as opposed to the more traditional form of pedagogy in which the teacher is the main dispenser of knowledge.

Latin American teachers' conceptions of problem-based/project-centered learning and constructivism were filtered through their reality of a very different classroom context. For example, Latin American teachers' classes averaged 40 students and teachers often were required to follow traditional curriculum. Several Brazilian teachers reported having 60 students in a class. Given that these teachers have two or three sections of students in a single shift and often work three shifts (morning, afternoon, and evening), they might be responsible for upwards of 500 students each marking period. From our site visits, we saw teachers successfully rise to the challenge of integrating project-based learning into these very difficult conditions and piece together some creative solutions in order to fit the work into their demanding routines.

Implementation Strategies –Student Clubs

One of the most common strategies we saw was the creation of a club around the telecollaborative projects. Turning the project into a club offered many advantages. First, a club was a way to create a manageable sized group of students since teachers either picked students or only interested students joined the club. Second, club activities were not limited by the official curricula. Third, a club provided a mechanism to authorize the students to have access to school resources (space and computers) after classes. These clubs were voluntary, and students who chose to participate were still responsible for their regular class activities. The teacher/facilitator would also take on added responsibilities.

At Filomena Matarazzo in Brazil, over 80 students signed up to join the club around the project Atlas Universal (See website http://filomena.enlaces.org.br/Filomena/home_atlas.htm) Students were divided into teams to research different aspects of Brazil – culture, history, language, geography, etc., and to write up their sections. The large group often broke into smaller teams of 24 students in order to work on the design of the web site. Students were so motivated by the technology, project-based activities and by idea of creating web pages about their country in collaboration with other countries that they didn't mind taking on the extra responsibilities and commitments.

When researchers arrived at the school, the teacher sent the word out that we had come to talk with the project team, and within half-an-hour nearly 50 students gathered in the tiny computer room to speak with us. The students reported this as one of the most exciting things they had ever done and that it had allowed them to present *their* view of Brazil. As part of the project, many of these Portuguese-speaking students had begun to teach themselves Spanish so that they could communicate better with students in Paraguay. The teacher was also very happy with the results, since the students had successfully taken on the responsibility for researching, creating, and finishing the project.

Implementation Strategies – Group Work

The Latin American teachers also adopted new classroom management techniques to work with so many students in project-based activities. In the phone interviews and the site visits, teachers made it clear that this had been a challenge for them. The site visits offered researchers the opportunity to compare the standard classes with the telecollaborative activities. The traditional classes in the Brazilian and Paraguayan schools were teacher-directed, centered on knowledge acquisition and memorization. The collaborative projects allowed the students to take more initiative and, in some cases, direct their own research.

Students organized into teams, working independently from the teacher. The amount of student responsibility differed, however. One example comes from the Universal Atlas project. In creating the section on national heroes, one school in Brazil allowed its students to select their own list of heroes, but one of the Paraguayan partner schools had students create biographies of national figures drawn from their textbooks. The Brazilian students wrote about athletes and entertainers; the Paraguayan students wrote about generals and politicians.

Group work presented new and unexpected challenges to the teachers. Many teachers had no prior experience with having students learn about or research different aspects of the same topic. In their previous experience all students are accountable for the same material so all students study the same things. As they transitioned from lecture formats and whole-class activities toward teams and projects, teachers developed new ways to divide up tasks and encountered unexpected problems. One school in Paraguay, working on a web page about a poet, had ten groups of four students each researching the same things. They all found exactly the same information. As the students progressed toward synthesizing their data to build a web page, the consistency of content across the groups left nothing to merge together. At the year-end conference, the teachers involved in the project spoke about this problem and were designing new strategies to assign groups different sections and to encourage more personal interpretations of the author and to cover more poets. This would help ensure that next year all students would be able to make unique and individual contributions.

Pedagogical Matters

National Curricula

Teachers from the two hemispheres differed in their initial goals. The Latin American teachers focused on acquisition of knowledge, whereas North American teachers focused on the development of aptitudes and attitudes. From the beginning the Latin American teachers, in particular, were concerned that their projects be learning experiences with deep content knowledge areas. This was driven by their demanding national curricula. For example, the Latin American teachers frequently cited the volume of required books and tasks as an impediment to activities based on non-required materials. Therefore, the teachers sought to create projects that centered on their required areas. Since national curricula did not coincide, least of all in national history and literature, these differences became a stumbling block for the teachers. During the design phase, the teachers often solved this problem by having each school do research on its own country, city, or community.

The Universal Atlas Project was a good example of this strategy, along with its benefits and unforeseen shortcomings. In our fieldwork, we visited schools in Brazil and Paraguay in the Atlas Project. At all the schools, the students had done extensive research into numerous dimensions of their countries. One group of Brazilian students had completed an impressive examination of the African roots of modern Brazil (see http://filomena.enlaces.org.br/Filomena/home_atlas.htm). One of the Paraguayan schools had focused on Paraguayan mythology. In addition to retelling old folk beliefs, the students displayed a deep sociological understanding of these myths' origins.

While the strategy of having students focus solely on their own country solved the curriculum concerns, the teachers eventually saw it as the source of a new problem. The teachers later identified the tight focus on each school's own country as dissolving the incentive for students to share and collaborate between schools. The teachers have since redesigned the project to focus on activities such as collaborative history, where students compare common aspects or processes such as the impact of the Jesuit missions and early colonization in Paraguay, Brazil, Uruguay, and Argentina.

Reform

In the opening session of the anchor workshop, the keynote speaker, Ms. Regina de Assis, of the Brazilian National Education Council, spoke on Brazilian reform efforts to replace its rigid curricula with a more flexible system of national guidelines and standards. Other Latin American countries present at the workshop were also undertaking similar reform efforts to streamline, decentralize, and modernize both their national curricula and teaching practices. For example, Chile now requires teachers and schools to develop 20 percent of their own curricula, and Argentina has handed day-to-day educational control to the provinces, with only a core of federal requirements. Peru and Paraguay are also reducing core requirements and allowing more flexibility to schools.

Overall, many Latin American nations are encouraging new teaching practices and raising demands on teachers to create their own lesson plans. Since reform and new strategies were topics of shared concern, many discussions between North and South American teachers revolved around school reform, pedagogy, assessment, and teaching strategies. And one of the strongest impacts of the workshops and projects was to generate a conversation among Latin American practitioners about how these innovative practices might look in their classrooms

In the following year, the WorLD projects provided the opportunity for many of these teachers to implement new teaching strategies and to develop new skills. For many of the Latin American teachers, the collaborative projects helped them to experiment and adapt teaching strategies to their context and needs.

Communication Issues

Language

Language played a pivotal role in the success or failure of the collaborations between North and South American teachers. The impact of language was extremely dependent on context. Three different languages – Spanish, English, and Portuguese – were used throughout the telecollaborations. Overall, Spanish was the primary language used between schools, and English was not used between schools. All the Latin American schools participating were public schools or schools in very impoverished areas. Generally, neither teachers nor students spoke enough English to work easily in that language. It is important that we explain the different language dyads since each one functioned differently: Spanish-English, Spanish-Portuguese, and Portuguese-English.

Spanish-Portuguese was the least problematic combination since students native in either language reported being able to read the other language and communicate independently of teacher translation. As mentioned above, many of the Brazilian students were teaching themselves Spanish as a result of their contacts with Spanish-speaking students. Nevertheless, there was a cultural sensitivity around the use of Portuguese for the Paraguayans. In interviews and site visits, some Paraguayan teachers were sensitive to using the language of their large and influential neighbor. However, none of the students expressed any discomfort to the researchers over using Portuguese.

Portuguese-English collaborations proved most problematic because of the lack of Portuguese speakers in the U.S. schools. Some schools attempted to communicate with the Brazilian schools through Spanish, and their experience is covered under the discussion of Spanish-English communication. The only comment to be made here is that Spanish-speaking U.S. students had greater difficulty deciphering Portuguese than Spanish-speaking students from Latin American, probably due to their relative lack of schooling in Spanish compared to the Spanish-speaking Latin American students.

Spanish-English was the language combination of collaboration for the North and South American teachers. Its success was heavily dependent on the context of the U.S. schools and the ability and willingness of students and staff to speak Spanish. In essence, this

language combination worked when the on-line communication was in Spanish, and the English-Spanish translation occurred within the U.S. classroom. Given the limited nature of this study, we can offer only a tentative hypothesis that these projects were successful among U.S. classrooms only where Spanish was a central part of the teacher's activity -- i.e., Spanish as a second language and bilingual classes (e.g., teachers from Goodland, Kansas and Union City, New Jersey). This factor need not be a deterrent to U.S. participation in this type of program since there are significant numbers of students capable of working in Spanish. In 1994 there were 1,680,212 Spanish speaking students in LEP (Limited English Proficiency) programs alone and the number of Spanish speaking students in the U.S. is certainly larger since Latino students were 13% of the entire student population (Fischer, 1998). As well, in 1994 there were 3,220,000 high school students taking Spanish as foreign language (NCES, 1999). Other language contexts were not successful - i.e., a Spanish-speaking teacher in a regular content area; or English-speaking teachers with some Spanish-speaking students in a regular content area.

The successful U.S. teachers reported that the use of Spanish was the factor that most effectively promoted the desired learning objectives. The teachers reported increased responsibility and autonomy on the part of their students and deeper engagement in the material presented in the projects (this mirrors the reports of the Latin American schools). Other outcomes varied depending on the characteristics of the school population

For the teacher of Spanish as a second language, communicating with Latin American students helped her students use Spanish for meaningful dialogue and helped them gain a richer understanding of the modern, lived reality of Latin American youth. Teachers also reported that students also began to perceive Spanish as a world language and the language of a vital modern culture

The bilingual teacher of Latino students reported their renewed sense of self-esteem as students came to view their language abilities as linking them to a world culture instead of isolating them into a subculture. The project gave the bilingual teacher's students the chance to see Spanish as a world language instead of a subordinate language, and provided a link between the parents' expertise and students' schoolwork. The project also created excitement among the parents and brought Spanish-speaking parents into the school, allowing them to be involved with their children's activities as valued learning resources.

Motivation

The Latin American teachers and students were highly motivated to participate in the

projects. Motivation was clearly evidenced by the time commitments both students and teachers made. In interviews, teachers attributed this to the student's excitement at communicating with other countries and the responsibility the projects afforded them. In the site visits the students generally said they liked the projects because they were fun, they learned more. The students' pride and excitement in presenting their work indicated that the sense of ownership was another motivation.

The teachers were motivated for a variety of personal and professional reasons. Most considered the project as an important part of their professional growth that helped them bring reform practices into their teaching. They saw it as a chance to provide their students with an innovative and powerful learning activity linking them with the global community. The teachers gave very positive feedback about the exchange of ideas and experiences with other teachers that was possible at the workshop and on-line. Many teachers at the workshop were planning to report back to their schools about the innovative practices they were learning.

Broad Cultural Values:

The protection of local or national culture vis-á-vis the globalization of "American Culture" was a concern among some of the Latin American teachers (and, in a unique manner, the bilingual teachers in the U.S.). With this in mind, the projects were focused around local research and on issues that had less likelihood of being divisive. For example, the literature project was explicitly about local identity; each country read its national authors, emphasizing cultural pride and an opportunity to share the authors' work and ideas with an international audience. The tensions that emerged here parallel the impact of having students focus specifically on their own country – the reliance on nationalism worked to inhibit international collaboration. The students in one country had little incentive to exchange views with peers in another country about authors only one side knew or read. The teachers also perceived that science projects also avoided divisive issues since they dealt with hard facts. (The water quality project, for example, examined pollution, economic uses of the river, and geography.)

The U.S. teachers of Spanish-speaking students had a very different understanding of the problem of culture and globalization, and they generally tried to internationalize the focus of the projects. In the literature projects, student participation was designed so that they would read a wide variety of authors from many countries, not just the U.S. or their country of origin. One U.S. school was amassing a database of over 500 Spanish titles about life in many countries appropriate for young adult readers. Entries were reviewed and annotated

by young people.

Administrative Support

Administrative support was a crucial factor for success in most the Latin American schools. Most of the active teachers had either active or passive support from their school directors. In interviews and site visits, only one teacher who was still actively engaged in the projects reported lack of support from their director. The previously mentioned issues of class size, limited infrastructure and resources, and the restrictions of the curricula underscore the importance of school administration in resolving some of these barriers. The directors' support was essential in bending and reshaping the school rules and culture to allow these collaborative projects to grow. The type of administrative support cited varied from finding money for materials and supplies, to permitting teachers to shift their curricula to do project work, allowing students to remain after class time, guaranteeing teachers and student access to computers and phone lines, to encouraging other teacher to collaborate. At one school in Paraguay, among the many ways the director supported the successful integration of the WorLD projects was the simple act of giving up his phone line (the only one in the school) for an hour a day to the exclusive use of the students. The directorship at one Brazilian school supported the pedagogical innovations of project-based work by encouraging all teachers to develop project ideas by offering as many resources as possible: for example he authorized field trips or extra supplies if they were tied into a projects, and he arranged planning time for projects. Another Brazilian school made space available for the students to their experiments at the school – these students were experimenting with growing edible plants, producing clean-burning gasoline, creating cooking gas from sewage and a variety of other projects (see web site: http://idalina.enlaces.org.br/subindex.htm).

The Impacts on Teachers

These collaborative projects show potential for changing the learning environment in profound ways, to nurture deep and engaged learning in classrooms, especially in Latin American classrooms. The observed impact was greater in Latin America, which may reflect the stronger programmatic support provided by WorLD and the longer prior involvement of the Latin American schools in WorLD, as well as the novelty of implementing constructivist education for many of these teachers.

Latin American Teachers

Our telephone interviews and site visits in Latin American schools indicated substantial changes in: 1) teachers' perceptions of their role; 2) teachers' increasing professionalism in

designing curriculum, becoming leaders, working on interdisciplinary projects; 3) learning dynamics as students take on more responsibility; and 4) depth of learning as students in project-based learning acquire facts, and develop new aptitudes and attitudes about learning.

1. Changing Roles

The collaborative projects encouraged teachers to become facilitators of student learning. In phone interviews, two of the teachers spoke about their changing roles. One spoke about learning to work with her students as together they learned to research and coordinate long-term projects. In addition, a teacher in Brazil felt that she and many of her colleagues were becoming more guides or coaches to their students in this project.

2. Teacher Leadership

The projects were also a tremendous leadership opportunity for these teachers. All six of the teachers interviewed reported developing skills in coordinating long-term projects, designing curriculum, or handling interdisciplinary teams. A young teacher in Paraguay expressed surprise at watching herself grow into the role of coordinator of five projects involving five colleagues and over 100 students. We later visited this school and saw firsthand the outcomes of these projects and the enthusiasm of her students. In the other site visits we also met with teachers who commented on similar (if humbler) changes as they coordinated activities, meetings, and communications between students, teachers, and administrators.

3. Dynamics of Learning

The way students learn was the area most strongly affected by the collaborative projects. In all the interviews, teachers spoke about their students' motivation for the projects (which universally included working after school) and the level of student autonomy and responsibility. Few teachers had had prior experience with project-based activities, and they were generally surprised to see their students take on the responsibility and commitment to carry these project through to completion. These levels of student motivation and responsibility were evident in all the schools visited. Perhaps the strongest example was a school in Paraguay, where students had been studying ecology as part of one project. The students got it into their heads to visit one of Paraguay's ecological reserves. Completely on their own, they organized a campaign and raised the needed funds from local businesses to take their teachers and classmates on a weekend visit to the park.

4. Depth of Learning

Both teachers and students reported that learning was more engaging and that students were

learning more. Student engagement was clearly indicated by the amount of time they put into their projects, since almost all participants worked outside of classtime. When questioned during the site visit, students reported that learning was more fun and they felt it was more important. Students in Paraguay, for example, felt a sense of responsibility since they were creating most of Paraguay's web presence and providing information about Paraguay to the world. The Brazilian students felt the projects were giving them a voice to comment on their concerns and opinions.

North American Teachers

As mentioned earlier (see section on Language), the successful U.S. teachers reported that the use of Spanish as a means of communicating with the outside world brought the biggest impact. These projects allowed them to engage their students with Spanish, Latin American, and Spanish-speaking youth as rich and complex realities. The teachers reported increased responsibility and autonomy on the part of their students and a deeper engagement in the material.

However, weaknesses in program design in the U.S. were substantial impediments to the long-term success of the project and to a wider participation. The weaknesses on the U.S. side included: 1) lack of U.S. program staff, and 2) mismatch of participating schools and teachers to the needs of these projects. There were also weaknesses in the design of the collaborative projects which stem from the relative novelty of this type of collaboration, and these problems were being corrected by the Latin American teachers as they planned the next year's collaborations.

Technology-Supported Collegiality

Another outgrowth of the WorLD projects was to create a professional support network of teachers engaged in online collaborative projects and in reforming their teaching practices. These new networks were a source of support for dealing with everyday challenges as they attempted to introduce new teaching practices. In actuality, two professional networks developed for most of the teachers: one within their schools and one online.

As reported earlier, many of these teachers took on new leadership roles within their schools, and as part of this new role, they began to extend their conversations about teaching and learning to others. This development built a group of teachers within a school engaged in professional discussion. One young teacher in Paraguay when organizing various projects, systematically changed different components (e.g., size of the teams, grade-levels

of the students, final products, evaluation, content areas , etc.) to see which choices worked best in which contexts. The effectiveness of these changes became a subject for discussion with her colleagues.

The participating teachers also developed online support networks with colleagues in other schools and countries. Often teachers within the same projects would discuss challenges and strategies regarding the projects. For example, Paraguayan and Brazilian teachers in the Atlas Project had an ongoing conversation about the current year's activities and were designing activities for the second year of the project. Teachers in the U.S., Peru, and Paraguay on the literature project shared data collection instruments and collaborated on the programmingtasks. Since the Paraguayan school was a technical school, they handled the programming of the searchable online database (not yet public) that compiled information from all the schools.

Conclusion

These collaborative projects show potential for changing the learning environment in profound ways, to nurture deep and engaged learning in U.S. classrooms, but especially in Latin American classrooms since observed impact was greater in Latin America. In particular, these projects appeared to boost the reform efforts already under way in many U.S. school districts and many Latin American countries. Our research indicated changes beginning in: 1) teachers' perceptions of their role; 2) teachers' increasing professionalism in designing curriculum, becoming leaders, working on interdisciplinary projects; 3) learning dynamics as students take on more responsibility; and 4) depth of learning as students in project-based learning acquire facts, and develop new aptitudes and attitudes about learning.

Interesting impacts were reported in two of the U.S. schools and our research suggests reasons that other U.S. schools were not successful. From our observations, it would appear that language was a substantial barrier for the North American schools. The U.S. schools overall had a very low success rate in maintaining their projects and language appears to be a central issue. In the successful cases, both the teachers and the students spoke Spanish. The only two U.S. teachers able to continue their projects work with their students in Spanish on a daily basis. One woman teaches Spanish as a second language, and the other teaches bilingual math and communications arts to Latino students. Both these teachers reported success in engaging the students in deeper learning and in transforming their

perceptions. All the students saw Latin America as ricjh and interesting part ofg the global community and the Latino students developed an invigorated self-esteem..

A central weakness in the design of this year-long collaborative initiative was a mismatch of participating U.S. schools and teachers to the needs of this type of project. Since these projects appeared beneficial for the Latin American schools, the U.S. bilingual students, and students of Spanish as a foreign language, one recommendation would be to focus U.S. recruitment efforts on schools with Spanish bilingual students and on teachers of Spanish as a second language.

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