Powering up: Information Technology for Rural Schools in Latin America and the Caribbean

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Abstract

In the global fight against poverty, educational inequality between urban and rural areas in the developing world is of major concern. With 70 percent of the world's poor living in rural areas, it is widely recognized that education is key to poverty reduction and development. To address the need for greater educational opportunity in rural areas of Latin America and the Caribbean, Enersol developed the EduSol program, which uses solar photovoltaic (PV) energy to power laptop computers to improve the quality of children's education and provide educational opportunities for youth and adults in areas located beyond the reach of the electrical grid. In 2000, Enersol began to experiment with the concept of providing solar powered computers in schools. Over the next six years, Enersol's concept evolved into the EduSol program. In developing the program, Enersol learned about the importance of demonstrated community commitment and buy-in for project success, the obstacles communities themselves face in fulfilling their project obligations, difficulties working with information technology (IT) in rural areas, the challenges and successes in using IT in the classroom, and the communities' own uses of the project infrastructure. To date, Enersol has implemented 29 EduSol projects that serve over 1,900 children and their families.

Introduction

In the global fight against poverty, educational inequality between urban and rural areas in the developing world is of major concern. With 70 percent of the world's poor living in rural areas, it is widely recognized that education is key to poverty reduction and development.[1]

Children in rural areas of Latin America and the Caribbean are not receiving quality education and lack educational opportunities. Textbooks are scarce with other scholastic materials even scarcer. Teacher education and preparation is often limited and of poor quality, libraries are nonexistent, and school shifts are short. This reality is aggravated by the widespread prevalence of multi-grade classrooms where teachers are supposed to teach several grades at the same time. In practice students are often taught subjects below

[1] FAO, *Education for Rural People Homepage*, http://www.fao.org/sd/erp/index_en.htm

or above their abilities and spend a great deal of class time waiting for the teacher to address their grade. The results are unfortunate: The 2003 FAO-UNESCO study of rural education in seven Latin American and Caribbean countries confirmed that learning achievements are low in general compared to developed countries, and notoriously low in rural sectors compared to urban areas.[2] Moreover, rural children are more likely to repeat grades or abandon studies than their urban counterparts. In the Dominican Republic, for example, children from the most affluent 25% of rural families on average have fewer years of formal education than those from the poorest 25% of urban families![3]

Consensus is growing on the value of applying modern information technology (IT) to the problems facing education in the region. A report on a meeting of the leading practitioners in the field states, "indeed the IDB [Inter-American Development Bank] believes that the judicious use of these technologies can help bridge the gap separating mature education systems from the diverse but collectively disappointing education systems of Latin America and the Caribbean[4]."

The Education for All (EFA) in the Americas Regional Framework of Action also highlights the importance of using IT in education:

> *The current technological revolution in information and communication has produced new ways for people and organizations to relate to one another. Education cannot remain outside of these changes. Increasingly, teachers assume the role of facilitator and mediator so that students may critically utilize these new technologies;*
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> *These technologies should be included as a key factor in the improvement of processes and opportunities of teaching and learning;*[5]

IT enhances education by allowing teachers and students to access information and learning tools previously unavailable. A simple computer armed with educational software can broaden learning horizons in a rural school by an order of magnitude. This computer can supply interactive games to improve basic reading and math skills and teach material from the social and natural sciences. It can provide a library of storybooks, textbooks, encyclopedias, dictionaries, maps, videos, and other reference materials, as well as traditional word processing and spreadsheet capabilities. The interactive nature of computers helps children develop critical thinking skills and the ability for self-learning. Computers in classrooms can also compensate for some of the drawbacks of the multi-grade teaching environment. Teachers can place one group of children at the computer to practice skills and study independently while they work with another grade. Moreover,

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[2] FAO-UNESCO, *Educación para la Población Rural en Brasil, Chile, Colombia, Honduras, Paraguay y Perú* (Rome: FAO, 2004) 34.

[3] Dominican Republic, Secretaría de Estado de Educación, *Plan Estratégico de Desarrollo de la Educación Dominicana 20003-2012, Situación de la Educación Dominicana, al año 2002*, vol. 1 (Santo Domingo, April 2003) 27

[4] Claudio Moura de Castro, ed., foreword to *Education in the Information Age* (Washington, DC: Inter-American Development Bank, 1998) 7.

[5] *Education for All in the Americas: Regional Framework of Action* (adopted by the Regional Meeting on Education for All in the Americas, Santo Domingo, Dominican Republic, February 10-12, 2000. UNESCO, 2001, http://www.unesco.org/education/efa/wef_2000/regional_frameworks/frame_americas.shtml, Commitments of the Regional Framework of Action.

older students can practice investigation skills and report writing where before there was no encyclopedia to consult.

Despite IT's promise for improving educational quality, there is growing discussion about the potential for a "digital divide" whereby societies will evolve into the haves and have-nots of the IT revolution. This digital divide not only has the potential of dividing industrialized and developing countries, but also of widening the inequality within developing countries themselves between urban and rural areas and worsening differences in standards of living. In Latin America this is most true for the 55 million people that lack access to modern forms of energy, including electricity. In fact, only 50% of the rural population has access to this most basic prerequisite for powering IT.

The EduSol Program

Enersol's EduSol program seeks to reduce the inequities that rural children face in obtaining a decent education through the careful use of renewable energy and IT to improve education and provide educational opportunities in unelectrified rural areas of Latin America and the Caribbean. The EduSol program enables communities to operate "electronic learning resource centers" with small, efficient renewable-energy systems. The centers feature 2–4 energy-efficient laptop computers, a printer and educational software powered by a small PV array (100–200 W) and are primarily located in one- or two-room elementary schools serving up to 100 students.

Specific program objectives are:

- **Improve educational resources:** Computers and software expand educational resources in remote areas. Teaching and learning are improved by using the software, which includes interactive games for reading, math and early childhood development, electronic reference materials such as dictionaries and encyclopedias, and a word processing programs.
- **Increase capacity to use IT:** Teachers and community assistants learn computer skills to teach children, youth and other community members basic computing and to use IT resources as teaching and learning tools.
- **Strengthen community management capacity:** Community groups learn the skills and processes to manage project infrastructure in order to offer a sustainable, high-quality service.
- **Increase awareness of sustainable energy:** Users learn energy efficiency and conservation by monitoring and maintaining their PV system.

Program Development

Enersol began experimenting with the concept of providing solar-powered computers in rural schools and community centers in 2000 and over the course of six years EduSol evolved along a path that can be broken down into three phases.

Phase I - Piloting the concept with affiliate NGOs (2000-2001)

Enersol piloted the EduSol concept through its direct affiliates in the Dominican Republic and Honduras, local nongovernmental organizations (NGOs) ADESOL (Asociación para el Desarrollo de la Energía Solar). First established to support a network of small PV supply businesses through technician training and consumer financing, the affiliates were

effective in assisting entrepreneurs that focused on PV systems sold to private users such as households and home-based enterprises. As Enersol's focus shifted from private users to community projects, program delivery through affiliates proved less appropriate due to increased requirements for specialization in community building, project management and on-site assistance. It also became clear that using one organization to serve many dispersed communities would not provide the strong local presence to ensure adequate support. Funding the affiliates also became quite expensive and in 2002, after initiating nine projects[6], Enersol wound down its support of the affiliate NGOs, opting to try more effective options for program delivery.

Phase II—Field Research (2002-2003)

After piloting the concept with the NGO affiliates, Enersol knew we needed to do our own field research in order to develop an EduSol program methodology and we initiated three pilot projects of our own in the Dominican Republic. Since Enersol had not previously worked in the education sector, we selected Centro Cultural Poveda (CCP), a leading NGO from the education sector in the Dominican Republic, as our partner for the EduSol pilot projects. With a mission to promote processes for socio-educational and cultural change for the most impoverished sectors, CCP brought experience in teacher training, community education and community building, as well as knowledge of the Dominican education system in general.

With the guidance of CCP, Enersol chose to work in the three closely located communities of Loma de Comedero, Los Pinos and El Can in the province of Sánchez Ramírez in the Central Cibao region. Through directly implementing these pilot projects, Enersol developed our strategy for community selection; building community management; PV system design, installation and maintenance; supporting rural IT; teaching computer basics; and integrating IT into teaching and learning practices.

As a first experience replicating the EduSol project outside of our program countries of the Dominican Republic and Honduras, Enersol implemented three projects in Haiti with the support of Rotary International, the CHERBEC Foundation and United States Peace Corps Volunteers. The projects were implemented from 2002 to 2004.

Phase III—Pilot Program Roll-Out with Local Rural Development NGOs (2004-2006)

Based on an evaluation of our early work with the ADESOLs and our later work with CCP, Enersol developed the EduSol program methodology. The program methodology provides for fairly standardized implementation through multiple local NGOs. Since Enersol is a small organization, this uses funds more effectively and provides greater potential for replication through numerous partners. Enersol supports local rural development NGOs with a package of small grants, in-kind donations and technical

[6] Three projects were implemented in the Dominican Republic, with two in the province of Puerto Plata (Bella Vista and Guzmancito) and one in Monte Cristi (Los Amaceyes). In Honduras six projects were implemented in the departments of Santa Bárbara (San Luís Planes, San Luís Pacayal, La Nueva Florida), Comayagua (Río Negro and Buenos Aires) and Choluteca (El Fortin).

assistance. The program draws on the services of local PV and IT technicians and computer training institutions based in neighboring towns.

During the project roll-out phase, Enersol implemented 14 projects in collaboration with United States Peace Corps volunteers and local NGOs in the Dominican Republic and Honduras. The following tables detail our NGO partners and projects.

Table 1: NGO partners in Dominican Republic (DR) and Honduras

NGO	Location	Description
Associación Bayan (Bayan)	La Ceiba, Honduras	Educational NGO serving Honduras' north coast and Mosquito coast. Bayan's projects are located in elementary schools that serve as centers for the SAT program (Sistema de Aprendizaje Tutorial), a rural, tutor-based learning system for areas without established secondary schools.
Christian Children's Fund - Honduras (CCFH)	Tegucigalpa, Honduras	International NGO working in 223 communities in Honduras. CCFH's education program collaborates with communities and local government authorities to provide early childhood education, and ensure adequate nutrition, classroom space, school supplies, and well-trained teachers in primary schools.
Instituto para el Desarrollo del Noroeste (INDENOR)	Mao, DR	Regional NGO serving the four northwestern provinces of the DR working in agriculture, education, environment, health and sanitation, housing, and youth.
Junta Yaque	Jarabacoa, DR	Consortium of community-based farmer and environmental groups that promote sustainable management of the upper watershed of the Yaque del Norte River.
Sociedad para el Desarrollo Integral del Nordeste (SODIN)	Nagua, DR	Regional NGO in northeastern DR focused on agriculture, education, environment, and health and sanitation.

Table 2: Roll-out projects in Dominican Republic

Community	NGO
Jaiquí	INDENOR
La China	Peace Corps
La Luisa	INDENOR
Loma Atravesada	INDENOR
Los Corozos	Peace Corps
Los Dajaos	Junta Yaque
Sabana al Medio	Peace Corps
Vuelta Larga	SODIN

Table 3: Roll-out projects in Honduras

Community	NGO
Batalla	Bayan
El Ocotillo	CCFH
Las Flores	CCFH
Los Amates	CCFH
Pompoa	CCFH
Rio Negro	ADESOL
San Marcos	Bayan
Batalla	Bayan

Program Methodology

The EduSol program methodology is built around five principal lines of activity:

Partnerships

Enersol partners with local NGOs, providing them with in-kind donations, financial resources and technical assistance to build their capacity to implement the EduSol program. This support is provided to the NGOs in a standardized package. The in-kind donations include the solar PV equipment (solar modules, inverter, and charge controller) and IT equipment (laptop computers loaded with educational software and printer). The financial assistance or cash grant provides funding to contract a PV technician to install the PV system and purchase the remaining materials required for the installation, to contract an IT instructor to provide basic computing training to the teachers and community assistants, to contract an IT technician to resolve any IT problems that may surface within the first year of the project, and to help cover the labor and transportation of the NGO's rural promoter working in the community to implement the project.

For Enersol, partnering with local NGOs is important for two reasons. First, the local NGOs are knowledgeable about the communities they serve, which is important when selecting which communities to work with. Local NGOs have knowledge of a community's participation in and maintenance of past projects. A history of participation and appropriate maintenance of sanitation, water or other projects are indicators of future success in an EduSol project. Second, local NGOs have an established presence in the communities. This offers the advantage of continued project monitoring and support after the EduSol project has officially been completed.

NGOs interested in partnering with Enersol must meet minimum criteria established by Enersol and complete an application form. The criteria are detailed in Table 4.

Table 4: NGO partner selection criteria

Objectives and Philosophy
Work in rural education
Work in unelectrified areas
Willing to supply resources to deliver community organizing activities and trainings (labor, transportation and teaching materials)
Willing to receive training and guidance from Enersol
Accept conservation and efficiency requirements of the project: classroom needs will be met with 2 - 4 computers
Accept the practice of applying maintenance or user fees to maintain the project
Willing to procure equipment and services from the private sector
Administrative Support Capacity
Secretary working at least 25% FTE
Reliable telephone or fax
Personnel use e-mail
Credibility
Two positive references
Implementation Capacity
Presence of personnel in rural areas
Personnel available and experienced in project implementation
Personnel experienced in community organizing
Have a vehicle
NGO has a relationship established with an IT service provider
Personnel familiar with IT

The application form provides Enersol with general information on the NGO (such as region the NGO works in, number of communities it works in and how many communities are unelectrified, number of employees at the administrative level and rural level, number of vehicles, and the NGO's mission and specific goals and objectives), the NGO's knowledge of and experiences with IT and photovoltaic service providers, a description of recent projects including a discussion of successes, failures and most notable results and lessons learned, description of the workshops, methods and materials the NGO uses in community organizing activities, and financial information of the NGO (including its principal sources of funding and if the NGO uses an automated accounting system and undergoes regular audits). The NGO also provides two references. Upon approval of the NGO's application, Enersol and the NGO sign an agreement, which outlines both parties' roles and responsibilities with regard to the project.

Sustainable design

A major focus for Enersol is to implement projects that the communities we serve are capable of maintaining. Since our partners serve small low-income communities, project designs transferred from urban settings to schools in unelectrified areas most often create an infrastructure that rural populations cannot sustain. We have found that small systems incorporating efficient technology are suitable options for the populations we serve. EduSol projects are designed to be energy-efficient and low-maintenance to ensure that communities can afford to pay the ongoing costs of maintaining their solar-electric and IT systems and meet the complexities of running their centers. EduSol systems provide enough energy to run the computers, a printer and other peripherals, and a lighting system, but are small enough to retain the ongoing costs at a level that is affordable for

the communities. As in the case of the energy system, the IT hardware and software are also configured to ensure ease of use and to minimize the need for maintenance from an outside IT technician, which ultimately translates into keeping maintenance costs to a minimum and within the community's reach.

Local ownership

The success of an EduSol project over the medium-run[7] depends upon the community's responsibility for and ownership of the project. The EduSol project is not for every community since organizational capabilities and priorities vary between communities. Therefore, Enersol and our partners must ensure that projects are implemented in appropriate communities.

Enersol uses a three-pronged approach to select project sites. First, Enersol employs a set of minimum criteria to select candidate schools. This preliminary selection is done with our partner NGO. Our partner NGO uses data it has on the communities with which it works to generate a list of communities meeting the minimum criteria.[8] Second, we rely on the guidance of our partner NGO. Our partner NGO not only has the basic data on the communities, it also has experience working with the communities on other projects. Community participation, management and outcomes in past projects are indicators of future performance. Finally, the centerpiece of our approach is self-selection. Communities which meet the minimum eligibility criteria, are recommended by the local NGO, and are interested in the project, ultimately self-select by meeting strong financial and organizational requirements. Meeting these requirements demonstrates the communities' commitment to the project. Before Enersol and our partners act, the community must raise the money to purchase the batteries for the solar electric system, seed a project maintenance fund, and open a bank account to house the maintenance fund. Not every community possesses the organizational capabilities or the commitment to such an educational project to meet these challenges. Communities that demonstrate their commitment show the most promise for successfully implementing and sustaining the project over the medium-run.

Training communities to manage their centers

Integral to the EduSol project is building the capacity of the beneficiary community to manage its center. It is well known that parachuting in a project without having the capacity in the community to manage it, results in broken projects and wasted resources. Enersol experienced this first hand when we piloted the EduSol concept with our local affiliates. Without the proper experience working in community based projects, our affiliates did little more than install project infrastructure. It is interesting to report that the majority of these projects today are non-operational or completely defunct.[9]

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[7] Enersol defines the medium-run as five years.

8 Criteria include distance from electrical grid, student body size, condition of the school, past experience with community projects, teacher's willingness to learn computers and openness to experiment with the new technology, among others.

[9] Of the nine projects, two are defunct, three are non-operational (project infrastructure is present, but equipment is infrequently, rarely or not at all used), one is emerging from non-operational status thanks to the efforts of a Peace Corps Volunteer recently placed in the community, and three are functioning. It is worth noting, that of the three functioning projects, one was considered defunct until a group of donors

Enersol adapted methods and developed our own strategies to meet the needs of the communities we serve to operate and maintain their centers over the medium-run by building on our past experiences working with the micro-credit PV program for private users and our community water projects. We also researched best practices and worked closely with CCP in our pilot projects to develop community organizing methods suitable for the EduSol projects. Enersol developed strategies for forming inclusive project committees that encourage community members with leadership potential to assume responsibilities in the association. Rejecting top-down methods that often unintentionally snake their way into community organizing work, Enersol and our partners assist the community to develop project by-laws from the ground up beginning with defining the nature and objectives of the group. We guide the community through the process of developing a financial model to estimate the costs of operating and maintaining the project over a five year period and we train the committee members to use financial reporting tools that aid in balancing project income and expenditures with the project's financial model. Clearly recording all income and expenditures promotes transparency and wards off allegations of misappropriated funds. Transparency is the backbone of the project's financial sustainability.

The importance of partnering with local NGOs also comes into play here. Although capacity varies greatly between organizations, most local NGOs have experience with community organizing. By partnering with local NGOs, Enersol benefits from their community organizing capabilities and materials. Many community organizing activities that EduSol projects require are part of most development projects, such as forming committees, training officers in their roles and responsibilities and creating by-laws. The NGOs' community organizing capacity and materials are a good foundation from which to build on. Enersol bolsters the NGO's capacity, building on their previous experience and existing methodologies to ensure that the community organizing processes are rooted in democratic and participatory approaches that truly work to build the community's management capacity and are not perfunctory top down activities.

Computer training and educational applications

Teachers and community members with an interest in serving as assistants in the centers are trained in basic computing skills. Using funds donated by Enersol, the local NGO contracts a computer institute or instructor to deliver the training either in a regional town or at the project site. Contracting a local instructor or institute makes sense because it relies on local capacity that already exists, supports local business and service providers, and establishes a connection between the services providers and the community. For most course participants, this is their first experience using a computer. Ensuring that the course material is appropriate for rural users with no prior computer experience and with basic educational levels is of utmost importance. The training varies but typically involves 30 to 40 hours of class time dedicated to learning the basics of Microsoft Windows, Word and Excel and provides an introduction to educational software like the electronic encyclopedia Encarta.

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decided to support the project with financial and in-kind donations in Fall 2005. The project resumed operations at the beginning of 2006.

Project Costs

Enersol developed a standardized package to implement the EduSol program through local NGOs. Enersol provides the local NGO with an in-kind donation of PV and IT equipment, technical assistance in the EduSol program methodology and a $2,000 cash grant that is used to finance the PV and IT systems installation and computer training for the teachers and monitors and to cover part of the labor and travel of the NGO's rural promoter working to coordinate the project. Fifteen percent of the cost of the project is funded by the local NGO and the beneficiary community is responsible not only for funding a small percentage of the initial costs (the purchase of the two batteries and half the cost of the computer table) and all the ongoing costs, but also contributes its time to participate in community organizing activities and managing the center over the life of the project. Table 5 outlines the implementation costs of an EduSol project.

Table 5: EduSol Project Budget

Administrative costs and overhead		**$1,500**
PV equipment (imported & taxes)		**$1,360**
PV modules	950	
1 Charge controller	150	
1 inverter	100	
2 6V batteries*	160	
IT equipment (imported & taxes)		**$1,550**
2 used laptops	900	
1 dot matrix printer	225	
Accessories	75	
Software - library of educational CDs	200	
1 table**	150	
Grant to NGO		**$2,000**
PV installations (materials & labor)	300	
Funds for rural promoter labor	1000	
Local IT support	200	
Computer training for teachers and monitors	500	
Salary NGO rural promoter* **		**$600**
Travel** **		**$1,540**
Program contract labor		**$2,725**
Evaluation contract labor		**$675**
Phone		**$100**
Printing & copying		**$50**
Supplies		**$25**
Total		**$12,125**

* funded by community
** half is funded by community
*** funded by local NGO
**** $840 funded by local NGO and $700 funded by Enersol

Lessons Learned

From 2000 to 2006 Enersol implemented 29 EduSol projects in three countries, with fourteen in the Dominican Republic, twelve in Honduras, and three in Haiti, serving over 1,900 children and their families. The lessons learned presented here are drawn from our experiences with these projects.

Lack of community organizing expertise: Missing mortar in laying projects' foundation

Partnering with local NGOs not only provides Enersol with the local NGO's knowledge of local communities and culture and the local presence necessary for successful and sustainable projects, but partnering also provides a mechanism for EduSol project replication and program expansion. While Enersol recognized that our EduSol partnerships would require guidance and training in the EduSol methodology, we did not anticipate the lack of community organizing capacity on the part of our local NGO partners. This lack of expertise was exhibited on three levels. First, there was a lack of understanding of the role community organizing activities play in project implementation. Only one of the five NGOs we partnered with demonstrated an understanding of the importance of building a project foundation through participatory community organizing activities. In fact, the NGOs (except for the one NGO) did not share Enersol's philosophy that the first step in implementing a project is organizing the community, which includes cultivating community understanding of the project, building community commitment to the project, outlining all stakeholders' roles, responsibilities and expectations, establishing the goals and objectives of the project, developing a financial plan, and training project committee members. For the NGOs, the project began with the project infrastructure: installing the PV and IT equipment. In fact, all but the one NGO failed to follow the EduSol methodology of beginning the project with approximately six months of community work. In the case of the majority of the projects, we found the PV and IT equipment installed before any real community organizing work had occurred. Second, we found that the community organizing work that did occur was not completed in accordance with the guidelines outlined in the EduSol implementation handbook. Despite receiving a copy of the handbook (and in many cases, participating in an EduSol workshop or training where the handbook was employed), not a single NGO completed all of the community organizing modules outlined in the handbook. Third, the NGOs lack established community organizing methods and materials. Not one of the five NGOs had developed and institutionalized community organizing materials or methods (in the form of a handbook, modules, documented activities, etc.) For Enersol, the lack of community organizing expertise we encountered not only provided for EduSol projects being built on less than ideal platforms, but also provided Enersol with the opportunity to introduce the NGOs to the role that community organizing activities plays in project implementation and to strengthen the project implementation capacity of the NGO.

Community centers: An alternative to schools?

Enersol experimented with implementing EduSol projects in community centers in the communities of Bella Vista (Puerto Plata, Dominican Republic) and Sabana al Medio (Dajabón, Dominican Republic). Although the concept sounds appealing, the reality Enersol encountered in the field caused Enersol to focus on implementing EduSol projects in primary schools. The principal problem Enersol faced with projects based in community centers is the lack of a person to open the building on a regular basis. In a school there is at least one teacher that is paid and responsible to staff the school nine months a year. In contrast, a community center is generally a space that is maintained by the community and available for the community's use, but does not employ individuals to run the center. The simple lack of a person to open up the community center proved a substantial challenge to achieving regular and meaningful use of the equipment. Housing the project in a school ensures regular access to the equipment and promises greater possibility for achieving regular use of the equipment since the teacher is in a position to use the computers and software on a daily basis in the classroom.

Community selection: Importance of demonstrated community commitment and buy-in

Communities typically approach NGOs soliciting projects such as potable water, electricity, and roads. Communities, especially those without electricity, usually do not ask for computers. So if a community itself does not first identify the EduSol program as a need, how does Enersol assure that the community will support and maintain the project, especially with so many other needs the community is sure to have?

As mentioned, Enersol uses a three-pronged approach to community selection. The first two steps, working with our partners to generate a list of candidate communities and requesting NGO recommendations, are filters to help narrow down the pool of potential communities. In the third step, Enersol presents the project concept to the community. As to be expected, the vast majority of communities express their desire to have an electrified school and computers. How exactly does Enersol hone in on communities that are truly committed to the project? The answer is we don't; a community does. If a community is interested in the project, it must meet strong financial and organizational goals before it will be considered. These include selecting a temporary project committee, raising funds to purchase the two required batteries (approximately US$200), raising funds to start a project maintenance fund, and opening a bank account to house the fund. Although Enersol begins the third step by presenting the project concept and requirements, the community ultimately finishes it by applying for the project and either meeting the requirements or not. In the end (and in theory), neither Enersol nor our partner NGO selects the community; the community effectively self-selects.

A community that has little organizational experience or is divided will have a difficult time meeting the strong organizational and financial goals. By contrast, a community with previous organizational experience or a unified community will have little trouble. Accomplishing the goals demonstrates to Enersol that the community is able to work together, solve problems, and reach goals. These are good indicators of a community's potential for managing and maintaining an EduSol project. A unified, organized

community will be more likely to successfully collect user fees, fundraise and maintain transparency, as well as problem solve and keep the equipment in good working order.

Enersol has used this method for community selection since initiating our program roll-out in 2004. In theory, a community pursues the project, which is what demonstrates its commitment. However, theory and practice are two distinct worlds. With the 14 projects Enersol has implemented[10], all of the communities have formed project committees, raised money to purchase the batteries and start the maintenance fund, and opened bank accounts. It is doubtful, however, that these activities were accomplished without interference from the local NGOs. On many occasions, Enersol suspected the NGO assisted the community in completing the application form (or out right completed it for the community), encouraged the community to organize and reach the goals, or made several follow-up visits to the community, instead of waiting for the community to contact the NGO. Significant encouragement and follow-up in fact voids self-selection.

There are two recommendations Enersol would offer for future projects. First, we recommend taking extra care to fully explain the community selection process to the NGO and the objective of the self-selection component. In order to accomplish the objective of the community pursuing the potential project, it is important to emphasize a "hands off" approach on the part of the local NGO, which allows the community to work the process on its own. The second recommendation is to make the financial goal more demanding. We found that many communities responded that raising the money for the batteries would be "no problem." A possible solution to making the goal more challenging would be to establish a minimum amount for the project maintenance fund such as $300. Currently, the community only needs to raise enough to open the account which in general the minimum amounts in the DR and Honduras hovers around US$20. This would bring the total financial goal up from about $220 to approximately $500. Alternatively, as suggested by a rural promoter that works with one of our partners in the Dominican Republic, we could require the community to purchase one of the two solar panels. The panel has a value of approximately $400.

The steps required to meet the organizational and financial goals, in other words to self-select, are good measures of a community's commitment to the project. The majority of the early EduSol projects, the ADESOL project concept pilots and Enersol's own pilot projects (12 in total), are either defunct or are teetering on the edge of becoming non-functional. Whereas of the 14 roll-out projects, there is only one that is not functional, due to the fact that the community was wiped out by a hurricane in November 2005, and one project that is teetering on the edge of becoming defunct. It is worth noting, however, that this community did not in essence self-select. Our partner NGO actually selected the community and encouraged it until it met the goals.

In the end, the success of a community based project is determined by the community in whose hands the project ultimately rests. The beneficiary community is a major player in implementing the project and is solely responsible for managing and maintaining the project once the implementation phase is completed. For this reason, the selection of the community in which to work is of utmost importance. While Enersol employs a three-pronged approach to community selection, we have found that the use of strong financial

[10] These are the 14 roll-out projects Enersol implemented in the DR and Honduras.

and organizational goals that must be met is the most effective tool for identifying communities that are truly committed to improving education and educational opportunity.

Un-honored deals: The biggest challenges communities face

It is telling to examine what the communities Enersol identify as the greatest challenges they confront in operating and maintaining their EduSol projects. During a survey conducted in March and April 2006 of five projects in the Dominican Republic and in July 2006 of five projects in Honduras, all of the communities interviewed responded that the biggest challenge they face is collecting the monthly user fees from project participants.[11] Communities report that at the beginning of the project most families paid the fee, but after six months to a year, payments dwindled. In two communities in Santa Bárbara, Honduras, the reason given was that no regular fee is assessed since the community's income is not steady and shadows the harvest (October through March). The community prefers to organize activities to raise funds. Enersol finds the community's arrangement appropriate; however, the funds being raised are insufficient to maintain the project over the medium-run. In the majority of communities, the reason given for the low fee collection is that the project committee struggles to collect the fee. Some communities put the treasurer in charge of fee collection and others assign the responsibility to the teacher. The most common complaint from the committee is that the members tire of asking for the fee, often having to go from house to house in a collection effort. Likewise, the teacher expresses her exhaustion with reminding students and parents of the fee as well.

The second most frequently mentioned challenge is community members that received the computer training are not making good on their commitment to serve as community assistants.[12] As part of the EduSol program, our partner NGOs assist communities in selecting community members that are interested in participating in the beginning computer course with the school teacher(s). Interested community members endorsed by the community, receive the training in exchange for agreeing to serve as community assistants or monitors to help other community members learn how to use the computer and open the center after school and on the weekends. Community members and teachers alike complained that those who received the training were not giving back to the community. When approached, participants commonly responded that they were not able to help because their responsibilities at home had increased due to family circumstances, or they were studying or working outside of the community. Some responded that they were available but that no one in the community had approached them.

Rural IT: Challenges and solutions

Working with IT, not only in developing countries but more specifically in the remote rural areas of these countries, posed several challenges. During the implementation and

[11] Enersol requires the communities to establish a modest monthly maintenance fee. The fees hover around US$0.30 per family in most communities although they are double in some.

[12] Five out of the ten communities interviewed voiced the issue as a major concern although Enersol and our partners observed the issue is common to all ten communities.

monitoring of the EduSol projects, the main issues Enersol encountered were the corruption of the operating system, failed CD-ROM drives, deterioration of CD-ROM based software, hard drive failure, and the limitations of using the private sector to repair the computers.

The laptop computers used in the projects were primarily donated by AT&T and Comcast Cable in batches of 20 to 40 computers, with all computers being of the same brand and model. The first batch was a group of Hitachi computers with limited RAM and low capacity processors. The other two batches included a group of IBM ThinkPad 380XD (Pentium II) computers and a group of Compaq Armada 1700 (Pentium II) computers.

The first IT issue that surfaced was the corruption of the operating system Windows. Teachers and children, many of which had never seen a computer before, were eager to use the new machines. In learning how to use the mouse, work with windows, create documents and then later find them, new users would unintentionally move or delete important operating system and program files. This resulted in computers that would not boot or software that would not run. The need to protect files, folders and potentially entire disks was essential. Since the donated computers Enersol worked with had limited capacity, Enersol was forced to use Windows 95 and later Windows 98. Neither of these operating systems offered options for desktop security such as hiding files, folders, and disks that Windows 2000 and subsequent Windows platforms offer.

Enersol experimented with several desktop security software programs. The programs proved effective in keeping windows from being corrupted, but caused other problems. First, in order to adequately secure the computers, we had to hide and disable important features like the control panel, the ability to install hardware and software, and right click capabilities that not only users wanted to access in order to learn how to use them, but also that local technicians needed to access in order to modify or repair the computer. Second, the programs were in English (we were unable to find a program in Spanish) and were only accessible with a password. Due to the language barrier and also to the skill levels of the users, Enersol did not train the teachers in how to use the programs. We did inform the school director of the password, but remembering the passwords proved challenging. If Enersol were to use this type of program in the future, training a teacher, community assistant and local technician how to use the program would be indispensable.

Failed CD drives, the deterioration of CD-ROM based educational software, and hard drive failure proved onerous as well. We installed the Hitachi computers in the projects initiated between 2000 and 2003. These computers did not have integrated CD-ROM drives and we compensated for the deficiency by using external drives. These drives proved troublesome, as they would stick, break or disconfigure regularly.

Replacing the Hitachi computers with newer machines resolved most issues with the CD drives but did not tackle the bigger problem Enersol encountered with CD-ROM based software. Improper use, humidity, and accidental loss threatened the EduSol CD-ROM based software libraries in the schools. A visit to just about any of the EduSol projects yielded equivalent observations regarding the CDs: only about half worked. The other half were severely scratched or deteriorated. This damage resulted from little hands that were unable to adhere to the generally accepted manner of handling CDs, and that in their

excitement rush to put the CD in the drive without paying attention as to what side goes up or down. Combined with the effects of a high humidity environment, a CD's life span in a rural school is short.

While the Hitachi computers presented challenges due to the lack of a CD drive and limited RAM, processor and hard drive capacity, Enersol did not experience hard drive failure until we began working with the newer IBM and Compaq machines. An estimated 40% of the hard drives failed in the donated IBM and Compaq machines. With the IBMs, the drives failed both in storage (before being deployed to the project sites) and at the project sites. With the Compaqs, the failures occurred while technicians were working to format the disks.[13]

Linking up the private sector with communities to provide IT repair and maintenance services for EduSol projects, a pillar of the EduSol program, generated its own problems. EduSol projects are managed by the local communities. When problems arise, Enersol and our partners instruct communities to contact local service providers. We found that when a computer needed to be repaired, the community would take the computer to a technician who would fix the computer often by reformatting the hard drive. For the personal home computer this works fine, however for an EduSol project, this process erases the security configuration and all of the educational software, including some programs specially configured for EduSol projects. Although some teachers and community youth are competent in software installation, installing the entire software library is not an easy task. And unfortunately some of the more widely used programs, such as Sinera Clic, prove too complicated for novice users.

Enersol's solution to the myriad hardware and software problems was to create an image for the EduSol computers based on Windows 2000 that allowed us to eliminate the use of CDs and facilitated ease of use for rural users. Windows 2000 offers desktop security options that eliminate the need for Enersol to use a separate program. Enersol's eye had been on switching to Windows 2000 for nearly four years, however due to the limitations of the machines we were working with at the time, as well as conflicts with some of the educational software we were using, we had been unable to switch.

Developing a way to eliminate the need to use CDs was also a priority. The first step to achieving this goal was to slim down the program's educational software library. Contrary to popular belief, Enersol found that more software did not equal better results. Teachers and students used certain software more than others and some software not at all. Moreover, it became obvious that a 30 plus program software library was daunting to many teachers. By narrowing down the selections to just over half of the original library, Enersol not only helped the teachers zero in on the most effective software, but also opened up the potential of installing the programs onto the hard drives. Our main challenge in installing the programs onto the hard drive was disk space. The majority of the computers had 5GB hard drives, with a small percentage being smaller (in the 3 to 4GB range) and a small percentage being larger (in the 8 to 10GB range). We discovered a virtual game drive program that compresses software programs to 70% of their original size. After analyzing the space requirements of the software in light of the virtual game drive program, we realized we would need a 6GB drive in order to load all of the CDs

[13] The exact reasons for the failures is unknown and Enersol does not wish to speculate here.

onto the drives. To make the most of the resources at hand, we developed the image for a 5 GB drive in order to accommodate the majority of the machines and selected to leave the two programs for learning English and the Honduras Encyclopedia off the image configuration (thereby requiring users to use the respective CDs).

In order to protect the computer from unintentional damage by new users and to make the computer as easy to use as possible for small children and semi-literate children, youth and adults, we created a special configuration based on user groups. We established three user groups. The two primary user groups are "inicial" (beginner) and "avanzado" (advanced). The beginner desktop is intended for use by the youngest of students, pre-school through third grade, and the advanced desktop is intended for use by teachers, community youth and adults and students fourth grade and up. The final group is the password protected "administrador" through which a capable teacher or a technician can access all of the drives and files to perform maintenance tasks, install or uninstall hardware and software, and make repairs.

Enersol developed the image through field testing in schools in the Dominican Republic early in 2006. Once the image was completed, we tested the ability of local IT technicians to install the DVD-based image on EduSol computers. In both the Dominican Republic and Honduras, we found capable technicians in the towns where our partner NGOs are based. The only roadblocks we encountered in installing the image were first, the technician needs to have an IDE adapter which is an inexpensive part that is widely available in the U.S. but is scarce in our program countries. And second, the technician must use the software version of Norton Ghost that Enersol used to create the image.

No simple task: Using IT in the classroom

Installing the solar-electric system and the computers was the simplest part of every EduSol project. Despite the teachers' and students' excitement for the project, getting the teachers to use the project infrastructure with their students was no easy task. Enersol encountered three main challenges that slowed the process of integrating the IT resources into the classroom.

The first hurdle Enersol had to overcome was changing the teachers' perception that their main mission was to protect the computers. For fear of damaging the computers, many teachers preferred to use the computers as little as possible, thereby keeping them safely locked up and out of harm's way.

The second obstacle Enersol encountered was that many teachers did not understand the purpose of the EduSol project. Although Enersol and our partners worked with the teachers and community to outline the project and the objectives, teachers could not see past the physical computer. Teachers saw their purpose as teaching "informática" and were stuck on teaching their students what they had learned in their computer training, skills such as creating folders, opening and closing windows and using Word. Enersol's challenge was to change the teacher's perception of the project from a "learn informática" project to an "improve the quality of education" project. We needed the teachers to view the computer not as an end in itself, but as a teaching and learning tool. Moreover, since teachers believed their mission was to teach "informática", many struggled to make time in their class schedule to use the computers. Teachers told Enersol that if "informática" were part of the national curriculum as defined by the Ministry of

Education, they would use the computers more. The third impediment was that teachers were not sure how to use the computers as an educational tool in their classroom. Teachers could not envision how two computers could work in a classroom of 20 or 30 students, nor could they fathom how to be in two places at once – at the computer with some students and at the blackboard with others. Despite the initial challenges, teachers eventually incorporated the computer into their classroom. Yet, just as no two people are the same, neither are the ways in which the teachers applied the new resources in their classrooms.

In Los Pinos (Sánchez Ramírez, Dominican Republic) the teacher, Catín uses the computer as an alternative to the traditional blackboard to present information to the group and as a tool for her students to learn the alphabet and how to read. Catín uses the computers daily. Although Catín has two computers at her disposal, she favors using only one when she is working with all of her students at the same time. She gathers all 10 to 20 students around a single computer to work on reading skills. She is particularly fond of the Reader Rabbit Series and a program called Abrapalabra. With all of the students seated around the computer in a semi-circle, she uses the mouse to move from activity to activity, engaging her students in following the stories, poems and songs. She asks them questions and they respond. At times she directs the questions to the entire group and at other times to particular children. Catín also places the children in work groups according to grade and has them work independently at the computers practicing their reading skills, which allows her to work with other students at the blackboard.

The school in Los Dajaos (La Vega, Dominican Republic) is a Centro Básico that goes through 8th grade. There are three teachers and enrollment is 140 students. The school has three classrooms and a separate resource room, which houses a small library of books and other didactic materials as well as the two computers. Given the number of students, the teachers developed a system to provide students with the best opportunity to use the computers. Everyday students go to the resource room in groups of five to work on the computers. Each group is allowed two hours of time to work on the computer. Sometimes the students have a specific homework assignment they complete and other times they are free to play the educational game of their choice. The students work independently with periodic supervisory visits by a teacher. With the younger students, the teachers select an appropriate CD and start the game for them. Students rotate so that every week and a half they have the opportunity to use the computer.

The teachers in El Ocotillo (Santa Bárbara, Honduras) struggle to integrate the computers and educational software into their school days. The primary reasons appear to be the persisting view of the computers as an end in themselves and not as an educational tool and the teachers' resistance or fear of changing their teaching methods. During the July 2006 site visit to the community, the school director, who is new and arrived after the EduSol project was implemented, explained his reasons for not using the computers. He said that since he teaches the youngest of students, first and second graders, he can not leave one group of students alone in the classroom in order to go next door (the computers are located in another classroom) and work with a smaller group of students at the computers. He also explained that his students are too small to learn 'informática" and since the ministry of education requires him to teach a vast amount of material in the basic subjects, there is no room in the school day to teach "informática". It also appears

that two of the five teachers see themselves as incompetent to use the computers with their students. One of these teachers is new to the school, but the other received the computer training offered with the EduSol program.

Despite these persisting views, the teachers are taking steps to integrate the computers into the school day. The director explained that up until now, only a handful of students were using the computers. However the teachers recently established a schedule for computer use for all students in third grade and up. Computer hour will be from 12:00pm until 1:00pm Tuesday through Friday and will be taught by the two teachers that have their high school diploma in computer science.

The school in Los Amates (Francisco Morazán) is a community run school under the Honduran PROHECO program, a government sponsored program that supports remote communities that have a difficult time attracting and retaining teachers. The schools' current teacher, María Jesus, arrived in February 2006 at the start the school year. Although María Jesus arrived in Los Amates after the EduSol project had been implemented, she was delighted to find the computers in the classroom and embraced the didactic tools thanks to computer courses she had taken while at the Normal School and also on her own.

The way the teacher in Los Amates uses the computers is a good example of the EduSol project off-setting the disadvantages of the multi-grade classroom. There are 42 students enrolled at the school and the day is divided into two shifts. First, second, and third graders attend in the morning from 8:00am until 12:00pm, and fourth, fifth, and sixth graders attend in the afternoon from 1:00pm until 4:30pm. The teacher groups the students by grade and sends them to the computer in 30 minute blocks where she accompanies them. The remaining students work independently in groups on exercises out of their text books and off of the blackboard. In the afternoon, the teacher sends the students to the computer in their respective grades to work independently while she works with the remaining students at the blackboard. Also, the number of hours the system is used during class time is notable. In the morning shift, the second and third grade students use the computers between 10:00am and 11:00am, for a total of five hours a week. In the afternoon, the fourth, fifth and sixth graders use the computer from 1:00pm until 3:00pm or 4:00pm depending on the day, totaling 10 to 15 hours per week. Combined this is a total of 15 to 20 hours of class time use per week.

In La China (Puerto Plata, Dominican Republic), the teacher, José Ramón, designated Tuesdays and Thursdays for computer use during both the morning and afternoon school shifts. José Ramón prefers to send students to the computers individually. Each student is allotted approximately 20 minutes to work on specific exercises. José Ramón primarily uses the Sinera Clic program to reinforce math and language skills with his-third and fourth grade students. Student assistants, Meliza and Roselía, are 11 year-old fourth grade students that José Ramón trained to be student assistants. The teacher selected the girls because they were his brightest students. He worked with them three days a week teaching them how to use Windows, Word and several of the CDs. The third and fourth graders also have an assigned hour in the afternoon as well. From 3:00pm until 5:00pm Mondays, Wednesday and Fridays.

José Ramón is committed to using the computers and educational software with his students. Part of his motivation comes from the successful completion of a study Enersol conducted in the school for six weeks in May and June 2006. The study aimed to examine the effect the regular use of math software had on math achievements of the 12 third and fourth graders in La China. In particular, the study dealt with multiplication and fractions. Students were administered a baseline test, a midpoint evaluation and a final evaluation. The final evaluation showed that out of 12 students, 11 multiplication scores improved, while one showed no change. The average of the baseline test scores was 41% and the average of the final evaluation scores was 68%, illustrating a positive net change of 27%.

Besides the direct effect of improved math achievements, indirect effects also caught José Ramón's attention. First, the teacher reported improved student attendance. The numbers in fact are impressive. In January there were 39 absences and only one student had perfect attendance for the month and in February there were 33 absences and three students with prefect attendance. In contrast, there were 10 absences and seven students with prefect attendance in the month of May and in June there was only one absence and 11 students with perfect attendance. Furthermore, the teacher reported that initiating the 2006 - 2007 school year every single student attended from the first day of school forward, which is unusual since typically students do not assist classes for the first two weeks of the school year (this is a chronic problem in the Dominican Republic). He also said that parent participation in the project meetings and in paying the monthly fee increased. He attributes the change to the parents witnessing their children's enthusiasm for the project because of the math study.

Homegrown uses

The EduSol program was designed to enhance educational resources, increase capacity to use IT, strengthen community management capacity, and increase awareness of sustainable energy in rural communities located beyond the electrical grid in Latin America and the Caribbean. During program development, Enersol envisioned teachers using the computers in their classrooms with their students and also before and after school for administrative tasks and lesson planning. We thought of students using the computers individually and in small work groups both during class time as well as after school for homework assignments and as an extracurricular activity. Enersol also saw the potential for out of school youth and adult community members to use the center to learn basic computer skills and other skills such as English through the use of educational software. Of all the ideas we had for the project, some of the best uses we never predicted. Although every community discovered its own unique way to use the EduSol systems, La China and El Ocotillo are highlighted below to offer examples of some of the practical uses communities have found for the EduSol projects.

La China's teacher, José Ramón, is an active member of the community's neighborhood association, which started a community bank in 2003. In the beginning, deposits and withdrawals were recorded by hand in a notebook, but this quickly changed once José Ramón realized that he could use the spreadsheet program Excel for the community bank bookkeeping. During one particular site visit, José Ramón showed Enersol's program coordinator his spreadsheet. The spreadsheet listed all 50 bank members and indicated the dates and amounts of their deposits and withdrawals. It even kept a running total on

the interest each member had earned on his or her savings or owed on a loan. The highlight of the financial tool, however, was that it included a colorful graph to further illustrate the members' savings and loans. When the program coordinator asked José Ramón what he liked about using Excel for the bookkeeping, he responded, "it is easier to do [the accounting]. [Excel] adds automatically and calculates the interest automatically." Enersol's program coordinator was impressed with the practical use of the project. She was further impressed when José Ramón casually brought out a disk from a worn cardboard box stored behind the computer. Understanding the importance of the bookkeeping file and the possibility of computer failure or file corruption, José Ramón kept a backup copy.

In many EduSol projects, it is common for community members, such as students studying at nearby secondary schools, out of school community youth and adult community members to enroll in computer classes offered by the community assistants. In the community of El Ocotillo, Enersol discovered that the school's teachers and students were not the only ones using the computers as an educational tool. Non-traditional students, community associations, and the community at large were also taking advantage of the resources at the EduSol center.

First, four students studying under the distance education program Maestro en Casa for those who have dropped out of traditional schools, use the electronic encyclopedia Encarta to aid them in the completion of assignments and research projects. Second, an adult community member, Nolvin, who studies at the Instituto Hondureño del Café (Honduran Coffee Institute) in Santa Bárbara, receives course material on a CD. He uses the computers at the EduSol center to access all of the course materials and complete homework assignments. The program has 60 modules and will require 5 years to complete. Nolvin is in the first year of the program and is not the only person to use the EduSol center for CD-based learning. The President of the Junta Rural de Productores de Café (Rural Association of Coffee Producers) and the Mayor (both at the municipal level) take advantage of the EduSol facilities periodically as well. The president imparts CD-ROM based classes to the members of the association on themes regarding improving production, combating pests, etc., while the mayor, who represents the watershed management program MARENA jointly sponsored by the Inter-American Development Bank and Honduran government, receives program materials on CD and is able to present the material to the community thanks to the EduSol project.

One of the first things that the community asked about during a site visit in July 2006 was if the PV system could power a TV and VCR/DVD player. The school has been selected as a Telebásica center, a national program adapted from a Mexican model that provides seventh through ninth grade instruction through centers that use a comprehensive set of instructional materials, including comprehensive student and teacher manuals, instructional video sequences and training of teachers in active teaching and learning methods.[14] As part of the program, the school receives televisions, VCR/DVD players and a radio. Since the community still awaits electrification, it is interested in exploring the possibility of beginning the program using the PV system. After inspecting the

[14] Seth Spaulding, *Recent Research on the Impact of Alternative Education Delivery Systems in Hondu*ras (paper presented at the Annual Meeting of the Comparative and International Education Society, Orlando, FL, March 6-9, 2002) 7.

consumption of the new equipment, Enersol established that the Telebásica program could be powered by the PV system if the community were to purchase a larger capacity inverter. Within weeks the community purchased a new inverter.

The community's health coordinator, Martyr, excitedly expressed his aim to use the TV and video player for public health education on AIDS, prenatal care and sanitation. He reports that he has a library of materials available to him through different organizations, but until now has been without the means of presenting them. Martyr announced that he also intends to invite other communities to join the video presentations. Poignantly, Martyr summarized the proud accomplishments of the community, all of which are tied to education: "Now, our school is now electrified and we have computers with all sorts of educational programs; we have teachers with degrees; our school is going to be a Centro Básico [a Primary School through grade 9 – previously the school only reached grade 6]; and we are going to be a Telebásica Center."

Conclusion

Enersol encountered numerous challenges in our experience developing and implementing the EduSol program. Enersol learned the importance of community selection and buy-in, and how to most effectively accomplish both. Enersol also experienced a host of roadblocks in working with IT in rural areas of the developing world. We experienced hardware problems, software problems and resistance from the users themselves. In fact, Enersol learned that a major obstacle to achieving meaningful use of IT for education is resistance from teachers. To begin using IT to enhance education, Enersol must first address teachers' fear of harming the computers and fear of failure and teachers' assumptions that they are teaching "informática" and needed to be IT experts.

Clearly, there are several barriers to break down before teachers open up to integrating the computers and software into their teaching practices. Ways of thinking must be changed, fears must be conquered and change must be embraced. But, each teacher finds his or her own way to incorporate the new educational resources into the classroom. Some teachers prefer to send students individually, while others prefer small groups, and still others prefer to send an entire class to work at the computer. Some teachers require students to use specific programs to work on specific skills while others prefer a less structured approach. Yet, once the barriers have been overcome and the teachers have shed their initial fear, we encounter common threads underlying the use of the computers in the classroom. First, the computer becomes an alternative to the blackboard as a tool for presenting material to a group and second, the computers become a primary didactic tool for practicing reading and math skills. Teachers' responses are also uniformly positive: EduSol teachers report that the computer makes their job easier and that students pay noticeably more attention to the material when they are gathered around the computer.

Enersol's partner NGOs recognize the benefits of the EduSol program in the communities they work with. In fact, both of Enersol's partners in Honduras implemented their own rural education projects. Bayan and CCFH implemented educational IT projects using their own resources and support from other partners. CCFH adapted the EduSol program to serve electrified communities it works with. With assistance from U.S. child sponsors,

CCFH obtained laptop computers, printers, educational software and funding to implement projects in several of CCFH's kindergartens and early childhood education programs.

Although the program's achievements are notable, challenges remain. One challenge is to achieve appropriate use of educational software. Fourth and fifth graders using software designed for early childhood education does not provide the educational value the project seeks, nor does it aid Enersol and project stakeholders in achieving project goals. A second and larger challenge is the difficulty Enersol faces in working with local NGOs whose understanding of the importance of community organizing work and whose capacity to implement community organizing activities is limited. Enersol's commitment to promoting replicable models that draw on the strengths of local organizations and private service providers presents Enersol with the opportunity to support local organizations and businesses in their missions to serve the communities they work in and to develop profitable businesses that meet client needs, but also carries with it the responsibility to strengthen the capacity of local NGOs to implement successful, sustainable community-based projects.