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Introduction & Background Information

For the past few years, computer teams from OSU have been working on creating a computer lab for the children of Montaña de Luz (MdL), an orphanage for children with HIV/AIDS located in rural Honduras. The building which currently houses the computer lab originally served as a morgue, which was saw a decline in use as medications and treatments for HIV became increasingly available and affordable. In 2006 a concrete pad was installed to support a 3.8 meter diameter satellite dish which was intended to provide internet access to the orphanage. However, efforts to attain the needed permit for the satellite dish were slow, and the following year emerging communication technology was able to provide a high speed internet connection which employed a satellite dish small enough that a permit was unnecessary. In spring of 2008, internet access was provided for the main office through a group called EConsulting. However, an internet connection to the computer lab itself was yet to be made available. Each year’s computer team teaches the staff and children about computer basics and takes down a few more computers to install. The 2008 computer team left MdL with eight functioning computers in the lab. However, due to a variety of potential factors including harsh climate and heavy use by inexperienced users, only three computers were functioning upon the arrival of the 2009 computer team. This documentation provides a description of the plans made by the 2009 computer team prior to departure, and then discusses their outcome and efficacy as observed while in Honduras.
Overview of Goals

The primary goal was to establish an internet connection in the computer lab for the children, as well as in Vicki Rush’s room (MdL Director). This was to be accomplished by creating a wireless network originating from the front office, and would ideally provide wireless internet to as much of the campus as possible. An important component of providing the children with internet was to establish a system by which the content on the internet would be filtered so as to restrict access to material that may not be appropriate.

The secondary goal was to increase the number of computers available in the lab by installing computers donated to OSU and attempting to fix the broken computers. To extend the lifespan of these computers, wire mesh was to be used to cover their various openings with the intention of preventing insects or small animals from entering and/or nesting inside. To further repel pests from the lab, there were also considerations regarding the installation of an electronic pest repellant device. With the longevity of the computers in mind, the team also planned to install an electronic timer on a pre-existing AC unit to help manage the tremendous heat load the lab experiences during the day. It was known that the door, windows, and roof were poorly sealed, which decreased the efficacy of the AC unit, but there were no plans made to correct this. In an effort to help seal the room and improve the effectiveness of the AC unit, the team planned to install a drop ceiling in the lab, the design of which was to be based off of a similar ceiling in Vicki’s room.

Every computer at MdL prior to 2009 used Microsoft Windows as the operation system. Due primarily to cost and licensing issues however, the team planned to install a free and open source Linux operating system called Ubuntu on the computers that were taken down. Lidia
Romero, the education director at MdL, had requested that all computers in the lab have Word, Excel, and PowerPoint installed to aid them in homework and teach skills which would be needed when looking for a job in the future. Ubuntu comes packaged with Open Office pre-installed, which contains close parallels to each of these programs.

With this injection of technology into the lives of the children and staff, it was considered important that the children receive some basic instruction on computer operation and use. This instruction was to include especially the use of Ubuntu as well as computer rules and etiquette. The team also planned to teach the children how to use the internet for homework and research purposes and how to use some important programs.

Lastly, the team planned to install Skype on the office computer to better improve communications with MdL. Skype is an internet phone service which provides video calling and conference calling features at no cost to other Skype accounts, and telephone features to land lines and cell phones at low cost.

Image 1: Outside view of Lab
Image 2: Inside view of lab (in 2008)
Detailed Plans

A) Fixing Broken Computers
   While in Honduras, the team sought to fix the broken computers in MdL’s computer lab.
   With the help of Dan Vehr (IT Representative at OSU), the team had found various computer
   parts that could be taken to Honduras. Through Vicki, the team planned to find out what exactly
   was wrong with the computers so that the appropriate components could be selected prior to
   departure.

B) Installation of New Computers
   Through Engineers for Community Service (ECOS), six DELL computers (CPUs only)
   were obtained through donation. For the purpose of security, donated computers often have all
   the contents of their hard drives completely erased, including the operating system. Over the
   course of several meetings, the team was able to install Ubuntu on all but one of these computers
   (a more detailed explanation of Ubuntu will follow later in the documentation). One of the
   computers had a defect in the firmware, and installing an operating system was not possible with
   the resources available at the time. Along with the five functioning CPUs, the team planned to
   take two LCD monitors to replace some of the CRTs being used at the time, which would use
   less energy and created less heat. A few additional peripherals were also available which
   included speakers, keyboards, and some mice. The team then planned to install these in the lab
   while in Honduras.

C) Wireless Connection
   Although MdL had internet access in the office, it was yet to be made available in other
   parts of MdL’s campus. Vicki wanted internet to be made available in the computer lab and also
   wireless in her room which she could access using her laptop. In order to accomplish this, the
   team purchased four Engenius antennas with the advice of Gabe Moulton, the team’s advisor,
who was pursuing his MBA after graduating from OSU with a degree in Computer Science and Engineering. There were several options available in terms of setting up the wireless network. It was decided that the best setup would employ two antennas broadcasting wireless signal from the office, one aimed at the computer lab and the other aimed at Vicki’s room; a third antenna receiving signal and routing it to the computers in the lab; and the fourth antenna kept as a backup, since the antennas were the most likely pieces of equipment to fail. The team’s plan was to attempt to establish a direct wireless link between the office and the lab. If it were found that the signal was not strong enough or that the layout of the facility did not allow for such a network, the team also had the option to use an arrangement which would put one antenna at the office, one at the lab, and two on a nearby water tower to relay signal between the office and the lab.

Various other arrangements were also discussed, and the team planned to test different options while in Honduras to create the best system possible with their equipment. Ideally, the best arrangement would:

- Provide Vicki’s room and the computer lab with internet (at minimum).
- Provide wireless signal at as much of the campus as possible.
- Be accessible by an OLPC XO-1 (laptop computers distributed through the One Laptop per Child initiative) as well as other wireless devices.
- Use as few antennas as possible to maximize the number of backups.

**D) Filtration**

The internet can be an extremely powerful learning tool, and when used effectively it has the potential to enhance the user’s understanding of nearly any subject. Unfortunately, the internet can also provide content which is harmful to the computer or is inappropriate for
children. To help minimize threats of this nature, a content filter would be installed in the router to limit content which might be considered harmful or unfit for children.

This had not been an issue in the past because the computer lab had not been afforded access to the internet. MdL had however agreed that as the children gain increased access to the resources on the internet, there was an elevated concern associated with the possible dangers this may present both to the computers and the children. To minimize this possibility, the ASUS router would have a third party content filter called Dan’s Guardian installed.

E) Windows/Ubuntu

In an effort to bring improved technology to the children at MdL, the team decided to install a professional operating system on the computers so the children would gain valuable exposure to the computing tools which will aid them in school and their careers. The team initially considered two choices: Microsoft Windows and Canonical’s Ubuntu. The former is the well-known, popular operating system used by much of the world. In the environment of MdL, the Windows operating system was frowned upon by the team because of its security issues. The team believed that the security of Windows could be more easily exploited whereas Ubuntu is a much safer system. This was important since it would be the children’s first heavy use of a computer, especially after the addition of the Internet. The latter operating system is the most popular distribution of Linux, an open source operating system that is typically more popular on servers (namely because of its added security) than home computers but equally appropriate on personal computers. Another difference between the two operating systems was the price; Ubuntu is free whereas Windows is expensive. Although the team could have contacted Microsoft to ask for a discount for charitable causes, this was deemed as too long of a process that was not needed since Ubuntu already provided a viable alternative.
After careful consideration, the team chose Ubuntu as the operating system to be installed on all new computers brought down with the group. All five computers were to have the latest Ubuntu distribution on them and upon arrival in Honduras they planned to attempt to hook the computers on to auto-update so that newer versions and security releases of the operating system can be installed automatically.

Ubuntu also comes with a variety of applications that have been pre-installed with the option of installing more applications if the need arises, a message which the team planned to convey to MdL and the children in Honduras. In addition, the team planned to keep Windows on the remaining computers in Honduras that already had Windows on them, with the hopes of introducing both operating systems to the children.

F) Microsoft/Open Office

One of the most important applications on Microsoft Windows, Microsoft Word and the rest of Microsoft Office Suite, was not to be included with the Ubuntu operating system. This was due in part to the high cost of purchasing new licenses, but also because Ubuntu already came with a close parallel to Microsoft Office: Open Office.

Open Office is a full office and productivity suite that comes bundled with the Ubuntu operating system and offers open source alternatives to Microsoft Word, Excel, PowerPoint, and the rest of the Microsoft Office suite. In addition, since Ubuntu is an open source system, MdL, should they choose to do so, has the option to freely install another alternative office productivity suite.

G) Teaching Plans for the Kids

Since sustainability is paramount for any project at Montaña de Luz, one of team’s highest priorities was to make sure they equip the children and staff with the means to maintain
and repair their computers and network within reason. For this reason, the team planned to conduct a few informal sessions with the children to teach them how to use the computers and internet. The content and structure of these sessions would be guided at least in part by the instructions given by Lidia Romero. The expected duration for each session was 45 minutes and would be attended by the children broken up into three groups according to grade. A brief description of the plans for each group session is provided:

- **Group 1** (first and second grade students) planned to focus on very basic skills, the rules for the computer lab, and to expose them to some educational games.

- **Group 2** (third and fourth grade students) planned to teach the computer usage rules, the basics of Microsoft Office and Open Office, and also how to access some education games.

- **Group 3** (fifth graders and older) planned to teach more advanced usage of Microsoft Office and Open Office, and also how to use search engines on the internet to help with their homework.

Ideally, it was intended that each child get a chance to use and familiarize themselves with Ubuntu as well, but given the short amount of time and the ratio of computers to children, this was a very tentative plan. The sessions were to be conducted largely by Gabriel McDonald with the assistance of the other team members, and were to be conducted in Spanish as much as possible. The team did consider teaching Group 3 at least partially in English to expose the older children to the terminology, but the decision would be made until the team had a firmer understanding of the children’s knowledge of English. Each session was also going to teach computer and internet safety.
Outside of the sessions, the team planned to work closely with the staff to ensure that they would be able to resolve basic problems which are expected when dealing with a wireless computer network. In addition to teaching actively, the team also planned to make posters to hang in the computer lab to help students and staff.

I) Skype Installation

Efficient communication between MdL and their headquarters in Columbus is a vital part of the survival of the orphanage. In order to save money on telecommunications, plans were make to install the software program “Skype” onto the computers in the administration office of MdL. Skype is a popular program which provides VoIP\(^1\) services at low cost, and would allow for audio and video conferences using the internet instead of a landline or a satellite phone, both of which can be expensive when used for international calls. Furthermore, a Skype call between two computers anywhere in the world with Skype software is free of charge, which was a significant consideration, as it would allow MdL to communicate for free with its various satellite locations.

The team intentionally planned to forego installing the software in the computer lab because it was not necessary or expected for the children to access audio or video conferencing capabilities at the time. Furthermore, webcams and microphones were not available in the lab and acquiring these items was deemed an unnecessary expense.

J) Implementing Sustainability

The computers that were in the lab prior to the team’s arrival at MdL had been breaking down over the past year. This was of particular concern because continuously bringing down

\(^{1}\) VoIP (Voice over Internet Protocol) is a type of software which serves as a telephone, and transmits information over the internet.
more and more computers each year was simply not sustainable. In a pre-departure meeting with Jeff Hutchison, an electrical engineer who had recently returned from MdL, the team was told that only three of the eight computers left operating the previous year were still operable. It was speculated that the main cause for the failures was too much heat in the circuits, possibly causing them to melt/warp. It was also well known from previous trips that a major issue for the computers is that bugs and snakes are able to find their way into the computers through the air holes and other openings in the case. Some of these creatures (ants and wasps especially) are in fact attracted to the electrical currents which exist in the circuits\(^2\), and often they will nest or molt inside the case and cause damage to wires and parts on the motherboard.

In order to keep the computers in working order as long as possible, the environment in which they operate should be kept at a cool temperature (low 70s) so that the parts do not overheat. For this reason the team planned to connect the AC unit in the lab to an electronic timer that will which will activate it during the hottest hours of the day, but turn off as it cools in order to conserve energy. After observing the drop ceiling that had been installed in Vicki Rush’s room, a similar design for a drop ceiling would be installed in the computer lab in order to keep the cool air from leaving through the cracks and gaps which were expected to be found in the ceiling. This will help keep the lab at a constant temperature; one more suitable for the wellbeing of the computers.

In order to control the insect infestation, the DELL computers were to be fitted with aluminum wire mesh (similar to the screen in a traditional screen door) over any openings on the computer tower prior to departure. The mesh was small enough to keep out wasps, snakes, and

\(^2\) This information was according to Dr. Steven Rissing, professor of Evolution and Organismal Biology at OSU, whose research focused on the evolution and behavior of ants.
other small insects but still large enough to allow for adequate airflow to keep the circuits cool. Also, an electronic pest repellant device was considered for installation in the computer lab. This device was to transmit a signal at a specific frequency that would repel smaller insects and animals but not bother humans. This did not however come to fruition because the devices found were targeted at animals such as mice and rabbits, which posed no threat to the computers. There were no devices which were intended to repel snakes, ants, wasps, spiders, or any of the other creatures which had previously been found in the computers.

Because trash appropriate waste disposal and recycling facilities were not available, computers which did not work at the end of the week were going to be taken back to the U.S. to be recycled.
## Cost List

<table>
<thead>
<tr>
<th>Description</th>
<th>Notes</th>
<th>Unit Cost</th>
<th>Quantity</th>
<th>Total</th>
<th>Ordered From</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASUS WL-500g Premium V2</td>
<td>Acts as wireless hub and content filter</td>
<td>$74.99</td>
<td>2</td>
<td>$149.98</td>
<td>Newegg</td>
</tr>
<tr>
<td>LINKSYS EF4116 10/100Mbps</td>
<td>Connects all systems in computer lab</td>
<td>$64.99</td>
<td>1</td>
<td>$64.99</td>
<td>Newegg</td>
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<tr>
<td>Engenius EOC2610</td>
<td>Bridges wireless into Computer Lab</td>
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<td>4</td>
<td>$339.80</td>
<td>Invictus</td>
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<td>Invictus</td>
</tr>
</tbody>
</table>

Table 1: Cost list of wireless network setup

In addition, the team has purchased wire meshing and epoxy to cover the holes in the computers (approximately $18). In Honduras, the team plans on buying materials to improve the ceiling in the Computer Lab room. As of now, the total amount of money spent is approximately $880.
Objectives Achieved

A) Fixing Broken Computers
   After arriving at the orphanage, the team looked at the conditions of the computers in the lab as well as the office. At the time, three office computers were present—one for Dario, who assists with maintenance and finance, Lidia Romero, who assists with education, and Elen Costigan, who assists with supervising the orphanage. When the team arrived, Lidia’s computer had a virus problem and two of the five lab computers were not functioning. The team was able to fix Lidia’s computer with the use of a free virus scanner. Originally, the team had planned on bringing spare parts in order to fix the other two lab computers but information regarding the problems with the computers was not provided in time. Hence, the team was unable to replace any of the broken parts. However, the team was able to find the source of the problem in one of the computers. The first computer had a problem with the power connector, which prevented it from turning on. This problem could not be fixed given the tools and resources available, so the team decided to set it aside to be used for parts. With the second computer, it was determined that the memory drive had malfunctioned. The team replaced its memory drive with the one in the first computer. The second computer was then working properly, and the number of working computers in the lab was raised to five. The broken computer was taken back to the United States and disposed of properly.

B) Installation of New Computers & Printer
   During the first day of work, the team decided to set up the five new computers that were brought down, and all worked with minor difficulty. There was some trouble in getting the fifth computer to work, but the team eventually succeeded in getting it to work. The two LCD monitors that were brought down went to the computers used by Dario and Lidia in the front office, and their old CRT monitors were brought into the lab. The computer lab had a maximum
of nine computers, but one of the lab computers was then given to the psychiatrist on the last
day. In the end, the computer lab was left with eight computers, and the office was left with three
computers.

Gabe Moulton, the team’s advisor, acquired a donated laser printer and new high capacity
ink cartridges to bring to the orphanage. The cartridges should provide for several thousand
pages to be printed before needing to be refilled, which will allow MdL to use the printer for a
long time before needing new ink cartridges. The printer was set up and installed in the computer
lab, and was shared between all the computers, which enabled a document to be printed easily
from any computer in the lab.

C) Wireless Connection

The week before the team left for Honduras, four 50’ network cables were created by the
team. Twenty 14’ network cables were purchased along with four Engenius EOC2610 antennas,
which act as long range Access Points/Client Bridges. All four of these devices were tested
thoroughly to ensure they worked properly prior to departure. The final necessary part the team
bought was a LINKSYS EF4116 10/100 Mbps switch. This unit connects to the antenna serving
the computer lab, and then connects via internet cable to all of the computers in the lab. This
allows each of the connected computers to receive internet access, and still has empty ports
which could accommodate more computers in the future.

In Honduras, one of the Engenius antennas was attached to an unused mast on top of the
administration office, which had previously been used to mount an antenna for a CB radio. The
antenna was angled directly at the southwest corner of the computer lab. A 50’ network cable
was connected from the Engenius antenna through a POE injector\(^3\) to the ASUS router in the office, which then connected to the internet via satellite signal. Using a computer in the office, this Engenius was configured to act as an Access Point: broadcasting wireless signal from above the office. Much to the team’s surprise, it was discovered that wireless signal could be obtained at nearly any point within the compound of MdL using only one Engenius antenna. By only using two antennas, a wireless network was created which exceeded expectations for a three-antenna network, so the two extra antennas were kept as backups.

Since the computers in the lab did not have wireless capabilities, a second Engenius device needed to be mounted above the lab. Saul, the head maintenance work at MdL, attached an unused 20’ steel pole to the back side of the lab, giving the computer team a solid fixture to which the Engenius antenna could be mounted. Once connected to the pole, a 50’ network cable was connected between the Engenius device through the POE injector to the LINKSYS switch which the team mounted inside of the computer lab.

Most of the computers inside of the lab were attached to the LINKSYS switch with the 14’ network cables, however due to the geometry of the room additional cables were made on site to reach the computers which were farther away. Using one of these computers, the team was able to configure the device to act as a Client Bridge, receiving the wireless signal broadcasted from the administration office and channeling that signal to the LINKSYS switch.

**D) Filtration**

Before the team left for Honduras, the team advisor, Gabe Moulton, downloaded a third party software called Dan’s Guardian onto the ASUS router, which was specifically designed to

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\(^3\) A POE (Power Over Internet) injector allows a more substantial current to be run through a standard internet cable so that devices may be supplied both power and data in a single cable-connection.
hold content filtering software. The purpose of Dan’s Guardian is to restrict access to websites that contain content that children should not view. According to the Dan’s Guardian website, this includes: drugs, profanities, hate, pornography, etc. Dan’s Guardian was also installed onto the backup ASUS router.

The team was also successful in installing the ASUS router in the administration office at MdL. With the satellite signal connected to the ASUS router, the websites being accessed on the computers in the administration office were being filtered. The quality of the content filtration was verified by a series of tests which attempted to access several restricted websites. Later in the week, when the computer lab was receiving internet access, the tests were performed once again to verify that the internet being provided to the lab was indeed being filtered as well. Again, all inappropriate sites were restricted, which indicated that Dan’s Guardian software will be adequate for content filtration at MdL.

Testing the quality of the content filtration yielded some rather interesting and satisfying results. For example, searching for “sex” in a web browser caused the results to be blocked. However, searching for “sex education” returned many educational websites and resources, which is precisely the type of filtration sought by the team.

E) Windows/Ubuntu
At the beginning of the trip, the intentions of the team were to bring five donated computers with Ubuntu operating systems and to leave the remaining working computers running Microsoft Windows. However, it was decided that it would be in the best interests of MdL to install a standard operation system in the computer lab. To this end, each computer which used Microsoft Windows had its operating system deleted and Ubuntu installed in its place. Since Lidia felt that exposure to Microsoft Windows was important for the children’s
education, this was a controversial decision which was heavily discussed before and during the trip, and was in fact not implemented until the last full work day at MdL. A detailed explanation of the decision is as follows.

Lidia had requested that the computer team set up the lab so that all of the computers would have the same look and feel, as consistency among the machines would be advantageous for the purposes of both teaching and learning. The team initially struggled to achieve this, given the variation and unavailability of software between the two operating systems, but eventually found a setup which would facilitate an easy and intuitive transition between operating systems. Despite this, there were some important issues with trying to manage the multiple operating systems in the lab.

Simply running Microsoft Windows was problematic in several regards. First of all, Windows XP puts a large demand on a computer’s resources, and the computers on which it was already installed were older machines to begin with. As a result, they ran slowly and generated a significant amount of heat, which both decreased their longevity and contributed to the already high heat load of the computer lab. In addition to their general performance, the team encountered many problems when attempting to share the printer between the two operating systems over the network. There were a host of compatibility issues in attempting to share a printer with the machines available, and while establishing a shared printer is certainly an option on Windows XP, the limited amount of time made this extremely difficult. From the available documentation, it appeared that for the two operating systems to share the printer, the printer would need to be connected to a computer running Windows, which was the system most likely to crash. The last, and perhaps the most important problem with Windows XP, was that it was very prone to viruses and other security issues. The children had attempted to install various
games and software, most of which were doubtless illegal and/or laced with viruses, which not only posed a security threat but further compounded the aforementioned performance issue. This would continue to be an ongoing problem, the severity of which would only be magnified with the addition of internet.

For all of these problems, Ubuntu had a quick and easy solution. While Ubuntu runs perfectly well on newer machines, it was in fact designed to operate on older systems, which made it a perfect candidate for the computers which were struggling to run Windows XP. Being as it is a smaller and more efficient operating system, the performance of the computers noticeably increased. Also, enabling print sharing was quick, simple, and secure on the Ubuntu computers. As an added benefit, the settings are even flexible enough to allow for new printers to easily be swapped or to move the printer to a new computer, should such actions be necessary. Most importantly, Ubuntu is nearly immune to the viruses and security threats which plague Windows-based operating systems. The children will no longer be able to install illicit or harmful software onto the computers.

There is still the lingering concern however, that without sufficient exposure to the Microsoft Windows operating systems, that the children may be adversely affected in the future. While this is a reasonable and understandable concern, the computer team feels that the two operating systems are similar enough that any needed transition in the future would be easy and intuitive for the children, and that the increased availability and longevity of the computers would be of greater value in the long run.

The team’s initial plan to setup the computers to update automatically was abandoned because of MdL’s limited bandwidth. For such a system to be in place, each computer would
need to download updates individually, which would have been a heavy and unnecessary tax on
the available bandwidth.

F) Microsoft/Open Office

The many similarities between Open Office and Microsoft Office were very beneficial
for the children. Given the same instructions, the children were able to seamlessly transition
between the two programs and complete identical tasks. This proved to be especially important
because no computers were left running Microsoft Office. The Open Office Suite (which
includes many parallels found in the Microsoft Office Suite), will provide the children with
many programs which will aid them in their education and pursuit of information.

One point in particular which is especially relevant to the future efficacy of Open Office
is the lack of word-processing abilities possessed by the children. In planning the teaching
sessions (see section G), the computer team overestimated the children’s ability to type. Using
even the most basic of functions provided by the Open Office software necessitates that the user
possess elementary skills associated with word processing and data entry, which as of the team’s
return to the States, the children did not have.

G) Teaching Plans for the Kids

While in Honduras, the team was given a Thursday afternoon, broken into three sessions
each lasting 45 minutes, to educate the kids on the computers. The lesson plans were mainly
arranged by Sriya Parthasarathy with help from Lidia Romero. Gabriel McDonald was
responsible for teaching the lessons, with assistance from the other members of the computer
team, and volunteers from other teams. The lessons were conducted exclusively in Spanish. The
lesson plans were arranged as follows:

• Group 1
The group consisted of approximately eight or nine children in grades three to four. The kids were taught the basic rules of the computer lab (clean hands, no food or drinks, sharing) and given a brief overview on how to log onto the computers. They were then taught about some differences between Windows and Ubuntu as well as which computers in the lab had each operating system. The first program taught was Open Office/Microsoft Office. They learned how to type simple phrases such as, “Mi nombre es…” (English: “My name is…”) and also learned how to change fonts and colors. Afterwards, the kids were taught how to play games such as Minesweeper.

- Group 2
  - The group consisted of approximately seven children in grades five and up. They were also taught the basic computer lab rules as well as how to log onto the computers. Differences between the two operating systems were explained to the children, as well as a brief overview on how to change fonts and colors using Open Office/Microsoft Office. The kids were then taught how to use the internet with the main use of the search engine, “Google.”

- Group 3
  - The group consisted of approximately seven children in grades one and two. The children were taught the very basics of computers, focusing especially on using the mouse and keyboard. They were told to share the computers, not to bring food/drinks, to have clean hands, and to be very careful with all the cords in the room. The children were then taught how to log on to the computer and access
games. Because of their young age, the kids were taught a simple game entitled, “nibbles.”

The biggest obstacle encountered by the team was the unexpectedly low typing ability. Teaching plans for every group needed to be altered in order to accommodate the general inability of the children to type or even find letters quickly. Also, not every child had sufficient experience operating a computer, very elementary mechanics (how to use a mouse, how to press keys on the keyboard, etc…) were covered for the third and fourth graders. Another problem was that some keyboards were in Spanish while others were in English, so some computers were incapable of easily typing characters unique to Spanish, such as ñ or letters with accents.

As one would expect, the students in grades fifth and above were the most experienced with computer usage. This group was the only one introduced to the internet during the classes. They were given a chance to explore the internet freely for a while at the end of the class session. It is noteworthy that the first searches by nearly all the children were either for soccer or Disney Princesses.

Due to pre-departure time and budget constraints, the posters the group planned to make were not created. However, there were already some helpful posters in the lab before work began. There were however, diagrams of the Spanish keyboard layout hung around the room so that the children would be able to type the symbols that do not appear to be available on the English keyboards.

1) Skype Installation

While installing Skype seemed like a good idea in theory, it was decided that it would not be as useful in practice. The live video and teleconferencing capabilities offered for Skype-to-
Skype connections simply go beyond the needs to MdL at this time. Furthermore, while these services are provided at no cost by Skype, there are hidden costs associated with VoIP programs which had not been fully considered. Primarily, the limited and costly bandwidth MdL has at its disposal diminishes the usefulness of services such as Skype. If MdL exceeds its contractually established bandwidth or data transfer ceiling in a given 24-hour period, their available bandwidth will be reduced for the next 24-hour period, and they may also face a fine. Not wanting to needlessly tax the accessible bandwidth, the regular use of Skype (and other VoIP programs and services like it) were deemed prohibitively costly.

**J) Implementing Sustainability**

In Honduras the team was able to add protective mesh to one computer in addition to the three that had previously been meshed back in the United States. This means that four of the computers in the lab have meshing and four do not. This may be a good test to see how effective the meshing is over a one year period of time.

The structure of the lab was in much better shape than was anticipated. There were very few cracks in the ceiling. All of the visible cracks were filled with clear silicone to prevent water from leaking from the roof onto the computers. It was noted that the door frame had considerable gaps on all four edges which made it very hard for the room to preserve cool air.

Because the new computers put an unprecedented electrical demand on the room, it was decided to put the AC unit on its own circuit. Do accomplish this, a 220 V circuit which was not being used was converted to 110 V, and the AC, unit along with the Linksys switch and power supply for the Engenius, were run on their own, dedicated circuit. For four days, the AC unit was plugged into an electric timer that turned the unit on and off at designated times. The set times
and temperature were altered every day to see how the environment in the lab responded. It was
determined by the fifth day that the AC was capable only of maintaining a comfortable
temperature in the lab for several hours if activated early in the morning. However, the
temperature of the lab became nearly unbearable around 3:00pm with or without the AC unit.
The ceiling simply became too hot, enough nearly to burn skin on contact, and radiated too much
heat for the AC unit to compensate. Thus, the team suggested that the AC not be used in order to
preserve energy, and that rather, computer lessons be conducted in the evening when the weather
is cooler.
Additional Achievements

One Laptop per Child XO Assessment

Montana de Luz possesses six functional OLPC XO-1s, the laptops developed for the One Laptop per Child initiative to bring affordable ($99 as of 2009) computers to developing regions. These devices use their own specially designed open source Linux operating system, which is intended to be a minimalist, bare-bones type of system in order to operate efficiently with the machine’s limited resources. Each XO has wireless capabilities, and can access the wireless network that was installed at the orphanage.

The team worked with the XOs to evaluate their effectiveness. The XOs come standard with an internet browser, word processor, VoIP capabilities, as well as many educational applications, and offer a lot of potential for expansion and development. In spite of their great potential, the team found that it was difficult to navigate through the unconventional interface of the operating system. Several children were asked about their experience with these laptops and the general consensus was that it was not very user friendly and it was hard to accomplish supposed simple tasks like user-to-user networking. Some of the laptops were missing keys and a seventh laptop did not work at all.

One possible cause for the difficulty with these laptops is that they are intended for children who have had little-to-no experience with computers. The interface is so basic that an experienced computer user has a very difficult time adjusting to it. Since the children at MdL have had some experience with computers for the past few years, through the computer lab and at school, they may be suffering from the same issue. Even with all these negatives, the laptops are still an affordable tool for helping children experience modern technology and can be a great educational aid.
Acknowledgments

The Computer Team would like to formally thank several people for their assistance in the development and execution of the team’s objectives:

Gabriel Moulton, the advisor for the Computer team, was very helpful in all stages of this project. He is responsible for providing the technical knowledge of the wireless network and content filtering system. He also provided much physical labor in the actual implementation of these ideas.

Vicki Rush, the Director of MdL, was extremely helpful during both the planning and implementation phases of every team’s projects. The feedback given by Vicki was essential to the decisions made by the team.

Lidia Romero, the Education Director of MdL, was very informative as to the educational needs of the children concerning the use of computers and the internet. She worked hard with the team to develop a lesson plan, and ensured that the children paid attention and understood during the teaching sessions.

Saul, the employee in charge of facilities and maintenance at MdL, aided the team in obtaining the necessary tools and materials to make possible the systems installed by the computer team. This included the use of hand and power tools and the installation of a 20’ metal rod to the back of the computer lab to secure the receiving Engenius antenna.

Dr. John Merrill, the professor of the ENG 692 Honduras Service Learning course, helped keep the team on track and was a constant source of motivation. He often gave up his time to meet with the Computer Team to assess their progress and offer advice.
Future Recommendations

For next year’s project, the group strongly recommends improving the computer lab’s ability to maintain an environment more suitable for computers, which will give MdL more flexibility with regard to when the computers can be used. The door to the computer lab should be sealed better to close the gaps present underneath, above, and on the sides of the door. The windows in the lab are horizontal pieces of glass that are meant to rotate in order to provide improved circulation. This style of window allows air to flow in and out, even when tightly closed, so better windows should be installed to improve sustainability. There is also what appears to be an unused drain pipe on the wall with the AC unit, which may be remnants from when the building was a morgue. This hole should be plugged or sealed in some way. In addition, insulating the roof would be a huge benefit to the lab, as the intense heat radiating from the roof is likely the biggest contributor to the high midday temperature. Measurements of the lab itself were taken (see Image 6 below) so that future teams might generate a design for a drop ceiling that would act as a conduit between the roof and the lab itself. If more computers are to be added in the future, the lab will also need to have additional electrical outlets installed.

The physical facility aside, it might be useful for future groups to acquire some Linux compatible educational software. The children would likely get the most benefit from software which taught typing, reading, and math skills. The team had hoped to install a program similar to MS Paint on the Ubuntu computers, but was unable to do so; it is advisable that future teams find a suitable Linux alternative and install it on the computers. Continuing to replace the aging CRT monitors with low-cost LCD displays would also help by reducing the electrical and thermal loading on the room. If the computers taken in 2009 to Honduras are no longer functioning, the new team should consider new ways to lengthen the life of the computers. Checking the status of
the computers without mesh and comparing to those with mesh may be a useful gauge. If the meshing seems to have been effective, consider meshing over holes on other computers (including those in the office) as well. MdL may also want to consider renewing their internet contract to increase their available bandwidth and/or data transfer ceiling, which may open up the possibility of Skype or other programs.

The state of the network and computers used by the administration may also warrant changes or upgrades in the future. General virus protection continues to be an ongoing problem with the office computers. The administration has expressed a desire to have their files backed up so that important documents (medical records, financial records, etc) will face less risk of being lost. Lidia hopes to develop a program which will get the children more experienced with the computers by establishing more intensive classes for the children. If these plans come to fruition, it would be desirable for there to be a feature which would temporarily deactivate the internet in the lab to minimize distractions. The website for Dan’s Guardian in fact says that this is an available feature.

Conducting a survey to study the effectiveness of the projects carried out by past computer teams may also be of importance. In addition to investigating the effects of the meshing, teams might consider examining whether or not Dan’s Guardian, the third party content filter, continued to work as well as advertised after the team returned to the U.S.; it would be worth knowing if there were any problems with content filtering. Also, it would be pertinent to know if there were times that the wireless or other parts of the network were not functioning (independently of extraneous factors, such as electrical outages, etc…), and understanding why these outages occurred.
Most importantly, the team should consult with Vicki Rush and the appropriate staff at MdL before implementing any projects.

Images to Assist with Recommendations

Image 3: Picture of the drain in the lab

Image 4: Picture of the lab door

Image 5: Picture of one of the lab windows.
Image 6: Front and side elevation diagrams of computer lab
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Appendages

Appendix A – Team Agreement

Team Members:

Michael Jewitt           Gabriel McDonald
Sriya Parthasarathy

Team Project Expectations:

- Show up to any meetings on time
- Be prepared for class
- Use constructive criticism
- Share the workload equally

Team Member Roles and Responsibilities:

- Past Experience/Advisor-Sriya
- Computer Background-Michael
- Spanish Knowledge-Gabe

All members should actively participate in discussions and meetings.

Team Meeting Ground Rules

- Discuss and be accepting of all opinions and ideas
- Allow team members to share their thoughts
- Be flexible
- Be awesome and have fun!

Team Member Signatures

1. ____________________________ 3. ____________________________
   Michael Jewitt                      Gabriel McDonald

2. ____________________________
   Sriya Parthasarathy
Appendix B – Packing List
Below is a list of the items taken to Honduras:

1. Printer
2. ASUS Content Filter
3. Linksys Switch
4. Engenius wireless antennas (4)
5. Network cables (11)
6. LCD Monitors (2)
7. Extra meshing
8. Computer towers (6)
9. Extra speakers, mice, and keyboards

Appendix C – Useful Spanish Words
The following words were used in assisting the team with computer lessons for the children, as well as communicating with any MdL staff that spoke only Spanish. A more in depth look at the lesson plan is provided in Section G under “Objectives Achieved.”

<table>
<thead>
<tr>
<th>English</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>La computadora</td>
</tr>
<tr>
<td>Keyboard</td>
<td>El teclado</td>
</tr>
<tr>
<td>Mouse</td>
<td>El raton</td>
</tr>
<tr>
<td>Monitor</td>
<td>La pantalla</td>
</tr>
<tr>
<td>Tower</td>
<td>El torre</td>
</tr>
<tr>
<td>Printer</td>
<td>El impreso</td>
</tr>
<tr>
<td>Internet</td>
<td>La red</td>
</tr>
<tr>
<td>Operating System</td>
<td>El sistema operativo</td>
</tr>
<tr>
<td>To Save</td>
<td>Guarder</td>
</tr>
<tr>
<td>To Install</td>
<td>Instalar</td>
</tr>
<tr>
<td>To Close</td>
<td>Cerrar</td>
</tr>
<tr>
<td>Bipolar Junction Transistor</td>
<td>Transistor de unión bipolar</td>
</tr>
<tr>
<td>Semiconductor Doping</td>
<td>El dopaje de semiconductor</td>
</tr>
<tr>
<td>Electricity</td>
<td>La electricidad</td>
</tr>
<tr>
<td>Electron</td>
<td>El electrón</td>
</tr>
<tr>
<td>Circuit</td>
<td>El circuito</td>
</tr>
<tr>
<td>Engineering</td>
<td>La ingeniería</td>
</tr>
<tr>
<td>To [Surf/Search] the Web</td>
<td>[navegar por/busquear] El internet</td>
</tr>
<tr>
<td>Heat</td>
<td>El calor</td>
</tr>
<tr>
<td>Humidity</td>
<td>La humedad</td>
</tr>
<tr>
<td>Programming Language</td>
<td>La lenguaje de programación</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>El disco duro</td>
</tr>
<tr>
<td>Partition</td>
<td>La partición</td>
</tr>
<tr>
<td>Magnet</td>
<td>El imán</td>
</tr>
</tbody>
</table>
Appendix D – Connecting to a Wireless Network

- Find wireless connection icon on task bar and right click it. Then click “View Available Wireless Networks.”

- Connect to “MontanaDeLuz” network

- Enter type of encryption “WPA-TKIP”

- Enter key “mountainoflight” and click “Connect.”

**note: the quotations are not to be included in the encryption or key**
Appendix E – Gmail Use

Symptom:

Some features of Gmail failed to load use basic mode or an older version.

Fixes:

- Clear your browsers cache
- If that fails you may need to also disable your proxy, caution this means there is no longer any content filtering in place.
- To disable the proxy log into https://192.168.1.1 with username “root” and password “m0nt@n@d3luz”
- Click “Proxy” and then click “Settings.”
- Click the radio button next to “Disabled” should see the image below

![Proxy Settings](image)

- Once this is done regular Gmail may continue to work even after turning the proxy back on

Appendix F – Internet Down

- Unplug both the satellite modem and the ASUS router
- Plug in the satellite modem
- Plug in the ASUS router

**If this does not work, contact EConsulting!**

Appendix G– ASUS Routers

Using the ASUS Backup Router

- A backup router has been kept in Ellen’s office in case the current router fails.
- Unplug the cables from the old router.
- Plug the cables into the new router in the exact same place as shown below, except the power.
- Ensure that the thumb drive (labeled “ASUS Swap”) is inserted into the ASUS router.
- Unplug the power to the satellite modem. Wait a few seconds before plugging the power back in.
- Plug in the power to the ASUS.

Configuring the Content Filter

- Open a web browser.
- Enter “https://192.168.1.1” into the address bar. Press “Enter” and log in.

  **You may get warnings about security, but continue anyway**

- Log in with username “root” and password “m0nt@n@d3luz.”
-The following should appear after logging in:

![System Information]

-Click “Proxy” and then click “Settings.” This page will allow you to turn the content filter on and off.

**THIS WILL AFFECT THE ENTIRE NETWORK!**

![Proxy Settings]

Appendix H - Restoring Configuration Files for ASUS Router & Engenius Antenna Device

Reconfiguring the ASUS Router

-Insert thumb drive called “Docs.”

-Open a web browser.
- Enter “https://192.168.1.1” into the address bar. Press “Enter” and log in.

**You may get warnings about security, but continue anyway**

- Log in with username “root” and password “m0nt@n@d3luz”
-The following should appear after logging in:

-Click on “System” followed by “Backup & Restore.”

-Click Browse.

-Click “My Computer.”

-Double click on “Kingston.”

-Double click on “Config Files.”

-Click on “mainASUSrouter” and press “Open”.

-Press “Restore”.
-Press “Apply Change” (bottom right of page).

-Wait for a few minutes for changes to occur (A confirmation will not appear, you must just wait).

-Click “Logout.”

-Exit browser.

**Reconfiguring the Engenius Antenna Device (above office)**

-Insert thumb drive called “Docs.”

-Open a web browser.

-Enter “http://192.168.1.5” into the address bar. Hit enter and log in.

    **You may get warnings about security, but continue anyway**

-Log in with username “admin” and password “m0nt@n@d3luz”
-Click on “Backup/Restore Settings” under the “Management” tab.

-Click “Browse”.

-Click “My Computer.”

-Double click on “Kingston.”

-Double click on “Config Files.”

-Click on “mdlAP1main.cgi” and press “Open”.

-It may take a few minutes to update, so be patient.

-Close browser.

Reconfiguring the Engenius Antenna Device (above computer lab)

-Insert thumb drive called “Docs.”

-Open a web browser.

-Enter “http://192.168.1.7” into the address bar. Hit enter and log in.

**You may get warnings about security, but continue anyway

-Log in with username “admin” and password “m0nt@n@d3luz”
- Click on “Backup/Restore Settings” under the “Management” tab.

- Click “Browse”.

- Click “My Computer.”

- Double click on “Kingston.”

- Double click on “Config Files.”

- Click on “labbridgemain.cgi” and press “Open”.

- It may take a few minutes to update, so be patient.

- Close browser.