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Education and Technology in Paraguayan Classrooms

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Education and Technology in Paraguayan Classrooms

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In collaboration with
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Executive Summary

Background

Cerrito schools have limited accessibility to technological resources. To bridge the digital divide, we introduced free-to-use applications. This allows for rural Paraguayan students to develop technical skills. The addition of technology to classes allows for students to enhance digital literacy and access more educational tools.

Project Goals

The team gave insight to Cerrito educators and students on the educational capabilities of WhatsApp. For example, with smartphone access, students could interact with peers and teachers outside of schools’ hours.

Deliverables

The team successfully delivered:

1. Technologically influenced lesson plans for teachers for use in their specific classrooms
2. WhatsApp group chats for each participating classroom to enhance student-teacher communication
3. A WhatsApp workshop promoting open discussion among Cerrito educators about their experience in the implementation of technological resources

Methods

To develop lesson plans, we utilized a combination of teacher interviews and classroom observations at each of the eight schools. We created these groups for all interested teachers. Educators used these group chats to share and distribute lesson plans. In addition, teachers also shared online resources for a variety of topics. We expanded these networks to students to allow them to submit assignments and communicate with teachers. Educators from the area
came to share their respective experience with technology in classrooms. We encouraged their discussion during the lesson plan development. Surveys were distributed after the workshop to gauge educator reception of the new content.

Results

The project’s results both aided our deliverables and showed areas of improvement for subsequent project teams. In each school nearly every student had smartphone access. The access to the technology allowed for creation of respective WhatsApp groups. However, educators and students often did not use the networks to their full potential. In instances like these, the team often intervened to encourage participation. With continuous drive from the team, students eventually used the chats to motivate each other to complete work.

The WhatsApp groups created the ability to promote use of technological resources. However, limited finances influenced what applications we introduced. As a result, the team turned its attention to applications with offline capability. This allowed students to augment their digital literacy with no additional personal or school costs. With an appropriate application for the class, the team would proceed to develop a lesson plan alongside the teacher. The lesson plan incorporated WhatsApp as the focal point of the lesson. Students would share work over the networks for help and corrections. Students used a separate app to review class topics.

The lesson plans served as the basis of our WhatsApp workshop, Uso Educativo de Tecnología. We successfully developed four WhatsApp groups, worked with ten teachers and spoke to six schools. The workshop held at Escuela Agricola had teachers share experiences with technology in the classroom. The team facilitated an open discussion among all educators. This discussion transitioned to lesson plan development involving WhatsApp. Feedback collected via surveys provided constructive criticism for future work.

Suggestions

The team recommends future work builds on the foundation we created.

1. From a technology standpoint teams should use WhatsApp, and offline resources to reinforce classroom objectives.
2. The WhatsApp groups should have clear objectives to generate frequent use.
3. Additionally, schools with WiFi can benefit further from Duolingo and Google Classroom.

4. Teams should use these methods alongside face to face meetings and focus on motivated teachers.

5. Workshops and certificates foster this motivation and serve as a capstone.
Resumen Ejecutivo

Antecedentes

Las escuelas y los colegios de Cerrito, Chaco tienen acceso limitado a recursos tecnológicos. Por lo tanto, para fomentar el cierre de la brecha digital causado por este acceso limitado, nuestro equipo promovió el uso de aplicaciones gratuitas en el ámbito educativo. Dichas aplicaciones pueden ayudar a los docentes y estudiantes del Chaco a desarrollar habilidades tecnológicas. Además, la introducción de tecnología en las aulas apoyará el fortalecimiento del alfabetismo digital de los estudiantes y docentes, y les dará acceso a herramientas educativas adicionales.

Metas del Proyecto

Nuestro equipo ayudó a los docentes y estudiantes participantes a conocer algunos de los usos educativos a los cuales se podría utilizar la aplicación WhatsApp. Por ejemplo, estudiantes que cuentan con acceso a un celular Smartphone podrán interactuar con sus profesores y compañeros sobre temas educativos fuera del horario de las clases.

Productos a Entregar

Nuestro equipo entregó los siguientes productos:

1. Planes de estudio que utilizan la tecnología que docentes podrán usar en sus clases.
2. Grupos de WhatsApp para cada clase que participó del proyecto para fortalecer la comunicación entre los docentes y los estudiantes.
3. Un taller que promovió conversaciones e intercambio de ideas entre los educadores de Cerrito sobre sus experiencias en el uso de recursos tecnológicos para enseñar.

Métodos

Para elaborar los planes de estudio, utilizamos una combinación de entrevistas con docentes y observaciones en cada uno de los ocho colegios que visitamos. Creamos grupos de Whatsapp para todos los profesores que demostraron interés en el tema. Los educadores utilizaron dichos grupos para compartir y distribuir sus planes de estudio. Además, los profesores usaron recursos del internet sobre una variedad de temas. Nuestro equipo creo
además redes entre educadores y sus estudiantes para entregar tareas y para que los estudiantes podrían hacer preguntas a sus maestros. Utilizamos también los grupos de Whatsapp para comunicar con los profesores para informarles sobre un taller que organizamos sobre el uso de WhatsApp y la tecnología en la enseñanza. Docentes de la zona participaron del taller para compartir sus experiencias sobre el uso de tecnología en las clases. Facilitamos una conversación entre los profesores participantes del mismo, y compartieron ideas sobre cómo se puede incorporar la tecnología en la enseñanza. Como tarea final del taller, los participantes desarrollaron un plan de estudio que podrían impartir a sus estudiantes utilizando Whatsapp. Finalmente, distribuimos una evaluación a los educadores participantes del taller para determinar si el taller les fue de utilidad.

Resultados

Los resultados de nuestro proyecto sirvieron de complemento a los productos a entregar. Además, nos hicieron ver algunas áreas de acción en las cuales futuros grupos de estudiantes de WPI podrían enfocar. En cada colegio que visitamos, casi todos los estudiantes contaban con un celular. El acceso a esta tecnología permitió la creación de grupos de WhatsApp. Sin embargo, los educadores y los estudiantes no siempre aprovechan todo el potencial de los grupos de WhatsApp. En estos casos, el equipo trataba de fomentar más participación. Con la ayuda del equipo, muchos estudiantes usaron eventualmente los grupos de Whatsapp para motivar a toda la clase a completar la tarea.

Encontramos que los grupos de WhatsApp aumentaron la capacidad de promover el uso de los recursos tecnológicos. Sin embargo, las finanzas limitadas de los colegios influyeron en las aplicaciones que podríamos introducir. Por lo tanto, nuestro equipo se enfocó en aplicaciones con capacidades de uso offline. Esto permitió a los estudiantes aumentar su nivel de alfabetización digital sin costos al estudiante ni al colegio. Con una aplicación apta para cada clase, el equipo empezó a desarrollar un plan de estudio junto con cada docente participante. El plan de estudio incorporó WhatsApp como el punto central de poder comunicar los conceptos de la lección. Los estudiantes compartían trabajos a través de las redes para pedir ayuda y para recibir retroalimentación de sus profesores. Los estudiantes usaron otra aplicación para repasar los temas de la clase.

Los planes de estudio sirvieron de base como para desarrollar nuestro taller de WhatsApp, *El Uso Educativo de la Tecnología*. Creamos con cuatro grupos de WhatsApp, trabajamos con diez docentes, y conversamos sobre el uso de la tecnología con seis colegios.
Los docentes compartieron sus experiencias con el uso de la tecnología en el aula durante del taller que se llevó a cabo en la Escuela Agrícola Cerrito. Además, el equipo facilitó una conversación abierta entre todos los educadores sobre el uso de la tecnología en la enseñanza. Después del intercambio de ideas, los docentes desarrollaron planes de estudio utilizando WhatsApp. La retroalimentación obtenida a través de las evaluaciones del taller proveyó sugerencias constructivas para el trabajo futuro de fomentar el uso de tecnologías en la enseñanza en Cerrito, Chaco

Recomendaciones

Nuestro equipo recomienda que el trabajo futuro para promover el uso de la tecnología en la enseñanza se construya sobre la base que hemos podido crear durante las últimas seis semanas. Concretamente, recomendamos que:

1. Los equipos de trabajo utilicen WhatsApp y recursos disponibles offline para ayudar a docentes a fortalecer su trabajo y lograr las metas de sus clases.
2. Los grupos de WhatsApp tengan objetivos claros para asegurar el uso frecuente de sus integrantes.
3. Los colegios con conexión a internet aprovechen las aplicaciones Duolingo y Google Classroom.
4. Los equipos de trabajo utilicen estos métodos (grupos de Whatsapp) como un complemento a reuniones en persona y que se enfoquen en trabajar con docentes motivados.
5. Se utilice talleres y certificados para motivar a docentes y como una manera tangible de demostrar la culminación del trabajo.
Abstract

There is a digital divide in Paraguay. We collaborated with the Fundación Paraguaya and teachers in Cerrito to promote technology in education. Our team first created networks with educators via WhatsApp. Interviews with educators provided feedback for the creation of further resources. We utilized these alongside the networks to refine lesson plans involving technological resources such as WhatsApp. These lesson plans and networks formed the basis of an educational technology workshop held at the Escuela Agricola. We ran the workshop alongside Fundación counterparts to promote discussions and ideas about educational technology. Our team additionally created a maintenance plan to encourage use of the networks and lesson plans. The Fundación and future WPI teams will continue this work.
Introduction

Paraguay’s education system faces language barriers and limited funding. These language and funding limitations result from the rural nature of Paraguay. The disparity of location and funding affects availability of resources. Like resources, languages vary based on region with Guaraní as the most popular, followed by Spanish and Qom. Spanish is the official language of Paraguayan curriculum, but some students only understand Guaraní or Qom. Because of this, educators teach lessons in multiple languages. A mere 40 km north of Asuncion, Cerrito confronts these same language and resource inconsistencies. Some schools have access to the internet and even a dedicated IT department. Other schools have little to no technology. Technologically adept faculty members are even less common. As a result, few faculty members have familiarity with the devices and their potential uses in the classroom. However, smartphones are a more consistent resource with high in-class potential. Almost every student either owns a smartphone or has access to one at home. Students generally have basic proficiency with this technology, but educators’ proficiency is often limited. Unfortunately, their lack of technical literacy means these technologies, like smartphones, are not used to their full potential.

These problems are not insurmountable. Technology integrations can make learning more effective. Smartphones are very powerful devices, especially when connected to the internet. The internet is a vast source of knowledge that can provide previously lacking resources to students and faculty alike. Widely used apps such as WhatsApp hold incredible educational potential. Furthermore, use of these tools and resources promotes digital literacy amongst students. We aim to use these tools to help classrooms in Cerrito overcome the challenges posed by the lack of resources.

Paraguayan schools look to reform technological integration in schools. Some schools have integrated technology, but limited mentorship means students cannot use resources optimally. The availability of these resources varies greatly from only blackboards to full computer labs. The disparity in resources compounds with lack of internet access. This lack of internet leads to limited educational resources and inhibits student growth. Peers are also an educational resource, and students can take full advantage of this with electronic
communication. Although students have the ability to communicate outside of class, complications arise from their inaccessibility.

Like students, educators usually do not use smartphones to their full potential in the classroom. Smartphones enable active learning and group communication to better Cerrito academics.

We aim to help educate Cerrito students and educators and enhance their use of technology. To do this we will work in conjunction with WPI and Fundacion Paraguaya. Initially, we will assess class interests and use that to present accessible and intuitive technologic resources. These resources will primarily be language friendly applications that will stimulate students’ interests. This will show educators and students the capability of media already in use as well. Existing social media will bolster connections between neighboring Cerrito schools. This will culminate in a demonstration of the benefits of educational technology. The technology at their disposal can not only advance education systems, but their society collectively.
Background

Introduction

Education creates opportunities to improve social status and achieve personal growth. Schools encourage their students to become lifelong learners as part of this development (McCombs 4, 2000). Education facilitates learning but cannot impart knowledge without motivated students. When students want to learn, it reinforces classroom lessons with real world experience. This experience creates a cycle of in-class participation, self-motivated learning, and interactions with others motivated to learn. The educators serve as a liaison in this cycle and create informed adults. These well-rounded students advance society and push their peers to do the same.

1. Goals of Education

Motivation

Motivation varies among students and requires educators to understand what drives students. McCombs states that “learning is most effective when differences in learners’ linguistic, cultural and social backgrounds are taken into account” (McCombs 6, 2000). Educators, faced with a need to understand their students, struggle to create engaging lessons. The increase in cultural diversity also makes it more challenging to motivate students. Beyond cultural issues, emotional and mental maturity of students provide additional challenge. Students in underserved areas confront these challenges daily.

Digital literacy

Digital literacy is not intuitive for those who lack technological exposure. It is even harder to achieve in a country where the education system needs reform. Paraguay’s lack of academic resources in rural schools does not allow for collaboration among students. María Pérez, a Spanish professor in educational styles in underserved areas, understands technological benefits. Pérez believes education should be a collaborative effort augmented with technology. “...escuelas rurales pueden sumergirse en una nueva dimensión de socialización, no sólo a nivel personal...” (Pérez, 2011). Translated, technology allows students to expand their social...
2. Economic Implications

In class finances

Our plan will aid students and provide educators with a more organized classroom. Once again, Maria Perez and her colleagues, consult current teachers in rural Spanish schools. Upon consultation, Perez discovered desire for technologically based curriculums. However, finances prevent the change. Of the educators surveyed, 52% said they would like technology in their classes. They also push for technology to give them better classroom resources. “...necesaria una política de inversiones para modernizar la educación a través de un mayor equipamiento,” (Perez et. al., 2014). Translated, there needs to be an investment policy to modernize education with better equipment. In reference to Paraguay, schools often have government funding. Thus, possible political attention needs to be brought to the lack of resources in the nations’ schools.

Modernizing Paraguay’s economy

Paraguay is a prime example where educational technology could be applied effectively. With its principal exports of meat, soybeans, and hydroelectricity, Paraguay has room for economic growth. Hebert Pastorino, engineer and director del Centro Virtual de la Universidad del Pacífico, shared his beliefs. Pastorino is native to Paraguay and recognizes the nation’s need to become digitally literate. “‘Si hoy no invertis en tecnología y desarrollo estás fuera del juego’” (Pastorino, 2014). Translated, Pastorino says, “If we do not invest in technology and develop, we’re out of the game.” The need has been established for societal education on these matters.

Paraguay’s largely agricultural economy today makes sense given Paraguay’s level of development and largely rural population. However, this does not mean Paraguay is destined to forever be this way. Pastorino sees current issues in Paraguay where its people could innovate and not only boost the economy, but also raise the standard of living in Paraguay. He argues that an issue like flooding can be resolved with technology. For example, he argues that a system that automatically adjusts the level of houses during flooding could be used to combat the damage and destruction caused by Paraguayan floods in some regions. However, the foundation of this technologic movement cannot be set without the proper background.
Economic motivations away from engineering

Most Paraguayans are not studying to become engineers, but rather to become farmers (Adam Knelman, 2018). Economic needs clearly impact these choices to a great extent. One study has shown that 19% of 12-year-olds who are out of school are already working to support their families (Patrinos et. al., 1995). This is a prime example of the economic impact on students’ decisions. Surprisingly, technological solutions may even help alleviate these economic stresses. NGOs like Kiva have already helped loan over $1 billion over the past 15 years (Thorpe, 2018). These loans come from individuals who wish to support small businesses, many of them farms, and to help them expand economically. Similarly, sites like GoFundMe help anybody raise money for any causes. While there is no guarantee of raising money or receiving a loan with any of these sites, it is hard to imagine the difference that these funding sources could make for small farms when many Paraguayans lack the 21st century skills in order to use these tools. In this case, it is not a problem of access—many Paraguayans have a mobile phone even when they do not have access to a computer. Since the necessary resources are already there, education is what stands between some farms and their ability to try to obtain one of these loans.

Broader horizons with technology

To better Paraguayan society, Escuela Agricola prides itself on the job placement of its students. Escuela Agricola was founded by Martín Burt, a native Paraguayan entrepreneur and humanitarian. The school was established to provide better education to Paraguayan youth. Graduates go on to improve family farms, work for agricultural companies, college, or hospitality jobs. The implementation of technology in this school particularly would provide students with broader horizons. This also would align with Pastorino’s aspiration for advancement of Paraguay’s technology skills. The opportunity to learn unique skills would encourage students to enroll and grow the school. Unique skills inspire motivated students who take full advantage of available opportunities. Implementation of technology in these schools achieves the goals of education and advance the country.
3. Students, Technology, and the Web in Education

Teachers leading digital push

To implement such a broad change, all parties must be active and educated. Teachers must first become technologically informed to pass the knowledge on to their classes. OEI, Organización de Estados Iberoamericanos, in their article, “Encuentro Virtual Educa”, clearly expressed this viewpoint. OEI is an international organization promoting science and technology in developing countries. “...es una tarea de los educadores, que seguirán haciendo lo que siempre hicieron: seleccionar información,” (OEI, 2010). Translated, it is the educators’ homework to do what they have always done: choose information. The ideology expressed is educators must choose what information to present to classes. In addition, educators now have the option as to how they will present information. To usher in the digital age into Paraguay, the movement must be led by example. A teacher is an excellent leader for students given the amount of time students share with them. If a teacher consistently used technology in the classroom, curiosity in the student would rise. This curiosity would lead to active engagement to better understand the devices surrounding them.

Getting excited about technology

However, this use of technology requires a shift in curriculum to make it effective. Currently technology is usually taught as work and technology in Paraguay (Casaco 82, n.d.). This spreads the content over numerous subjects and shifts the focus from technology. Additionally, the sequencing and timing of the technology classes reduces their effectiveness. Successfully implementing technology in Paraguay hinges on support from the curriculum. If courses like work and technology were more structured it would motivate use of technology. This motivation, as stated above, would increase participation and outside learning to boost education.

Student-mentorship

The introduction of technology in Paraguayan classrooms turns educators into students. Herbert Pastorino, previously noted as director of the Centro Virtual de la Universidad del Pacífico, details the process. He states “ahora somos maestros-aprendices y los alumnos son
estudiantes-maestros’”. In this he concedes the students become student-masters in regard to technology. Generally, children adopt cultural shifts like smartphones faster, but even they are not experts. This means teachers will learn alongside students and can use many of the same resources. The same networks used by students can be used by the teachers to exchange experience. This also creates a cultural shift towards technology as teachers use these networks.

Student interaction with technology

Students can then use the same tools to manage and complete homework. The use of technology for assignments improves the student’s technical literacy. Pérez and Martínez, education professors, explain the benefits of educational technology. They claim that “the student learns to manage different digital tools [to manage] information in multiple forms”. The use of educational technology for assignments also improves digital literacy in students. The introduction of assignment management technology saves teachers time, and further educates students. However, negatives will come with the transition.

Negatives of implementing technology

For successful technological implementation, systematic restructure is needed to foster the change. Brian Champness and Ian Young, two scholars dedicated to educational improvement, explore this concept. Their findings detail how a school must effectively change to allow for new curriculum. “... there must be more managers, network planners, programmers, media specialists and technicians (but not more teachers),” (Champness et. al., 1985). Creation of a technological environment requires formation of teams to do so. Managers must oversee curriculum changes and their execution among students. A network planner will purpose the service to meet the needs of the school. Programmers, media specialists, and technicians must work in unison. Their relationship ensures lessons can be done with the available technologies’ ability. However, Cerrito lacks funding. Rural Paraguayan schools do not have budgets comparable to municipal European or American schools.
4. Technological Tools for Success

Internet and tech issues in classrooms

The internet and technology in general pose unique challenges to educators and students. Porter, a researcher of mobile phone use in Africa, cautions of technology’s prevalence in classrooms. She explains, “It’s remarkably common for classes to be interrupted by both pupils’ and teachers’ phones”. Additionally, bullying and harassment spreads more quickly from the anonymity and speed of communication. Educators, adapting to the unknown, must learn to combat this while using the internet to enrich education. The scarcity of resources and training in developing countries makes implementation of educational technology difficult. However, teachers can use networks to exchange methods and materials that can overcome these challenges.

Online communities in education

The benefits of widespread technology usage in classrooms far outweigh the risks. One such benefit is a variety of resources that reduce the linguistic and cultural barriers. Numerous niche online communities provide concrete applications of subjects learned in class. Additionally, the readily accessible network of peers and diverse viewpoints amplifies the cycle of education. This challenges educators to use the internet to supplement coursework and encourage students’ personal growth. Brian Champness, a social psychologist, states that “the relationships between people […] are powerful factors affecting learning” (Champness, 1980). The internet connects people on a historically unmatched scale and can connect students as well. Collaboration and research via the internet enrich in-class lessons, and optimizes educator use of time.

Using Internet to find resources

Another benefit is the wealth of information and research regarding specialized fields. Economic challenges are not the only reason that so many students are continuing to farm like their families have done. There are many different types of engineering, but all require a sophisticated understanding of math and science. Unfortunately, not every teacher can be an expert in these fields, so even students who desire to study one of these subjects are unlikely to have the help they need. The internet is a path for students looking to supplement knowledge
gained in class as well for teachers looking to supplement subject material. Given the prevalence of mobile phones in Paraguay, the obstacle is the ability to find and evaluate content rather than a lack of internet connectivity. These valuable skills can be used by students to find websites that provide the information that they need. Additionally, teachers can find videos, sample problems, or explanations to share with their classes. This merely requires a higher level of digital literacy.

Paraguayan Technologic condition

In Paraguay, digital literacy can greatly vary among students. Certain schools have students develop basic computer skills. Other schools still use a blackboard and chalk as their main platform. This delves into the issue of accessibility to technology. In his study, Casco outlined one of the most predominant issues to be access to computers in schools. “Most public schools lack workshops or laboratories and the existing ones are in precarious conditions” (Casco 72, n.d.). In other words, despite some students’ exposure to technology, the device maintenance is poor. There is a need to create technological learning environments and knowledge on device maintenance. Device maintenance means students can make best use of their resources. Beyond the individual, maintained infrastructure can provide faster access to online materials. Internet connection also varies greatly between schools. With widespread access to smartphones only, the internet makes them far more effective. In addition, better internet connection translates to improved collaboration between schools. Students can then speak to their peers or teachers through known platforms.

5. Technology in Classrooms

Using technology to compensate for lack of resources

This faster communication also provides students and teachers with faster feedback. Without the difficulty of travel and long intervals between feedback, parents can motivate their children easily. The US Department of Education stresses the importance of the parent-teacher relationship fostered with technology. Its guidelines on assessments particularly explain how automatic analytics provide insight to parents and teachers. The guidelines state that “families can be more informed about what and how their children learned during the school day” with the use of such tools (“Reimagining the Role of Technology in Education”, 2017). This insight
provides parents with tools to create custom plans for their students. Customization engages students and motivates them to improve. Parents can use the feedback to motivate their children and create environments which facilitate learning. As a result, parents don’t need to travel long distances to receive feedback.

Just as technology promotes parent-student communication, it also promotes communication between students. As Maria Perez had stated, technology is a means to communicate among students. From an educators’ stand-point, technology also allows for collaborative projects. Familiar platforms such as Facebook and WhatsApp will let students communicate in and outside of class. A new platform such as Google Drive is usable for group effort in reports. With this accessibility, the internet allows students to explore interests easily. For example, a student can find game design while another can find online math help. Technology as a whole offers a variety of ways to keep students engaged and eager to learn.

Engagement and learning also hinge on well-made lessons. Under-resourced schools cannot create lessons that engage the entire classroom on their own. Kam, a PhD student, and expert in human-computer interaction describes technology’s effect on motivation. He states that “children were observed to be motivated and persistent in creating multimedia digital stories”. In his study, Kam (et. al, 2011) worked with students in rural India to implement educational technology and resources. The students engaged with creative software and developed stories regarding their studies. In Paraguay, teachers acknowledge the importance of educational technology but are challenged with limited outside support (Casco, 2007).

Student retention

The difficulties of limited support are compounded by student retention considerations. Paraguayan students leave school around 13 years old according to Harry Patrinos and George Psacharopoulos. The two men are British scholars who examine educational trends in underdeveloped countries. They state “…it was found that 28% of those 12 years of age are already out of school,” (Patrinos et. al., 1995). Later stated in article, of that 28%, 19% were already formally working to aid family income. To better retain students, the curriculum must find a way to keep students engaged.

Use of surveys to gauge interest

The predominant question currently is: how do we stimulate students’ engagement? The new curriculum developed has to be able to gauge students’ retention of lessons. With the aid of
technology, teachers can administer small quizzes or surveys to test comprehension. Platforms such as Google Surveys or Poll Everywhere, a mobile friendly application, can be useful. OEI again touches on the ability for more engaged learning with technology. “…puede evaluar a los alumnos online, lo que le permitirá saber si aprendieron y se puede desarrollar otro contenido,” (OEI, 2010). Translated, a teacher can evaluate students online. This will allow them to see what students understand and what content to introduce next.

Automated Homework grading

The same tools educators use to gauge in class participation can be used to review homework. Educators use homework to determine student progress, but it requires they analyze each student’s assignments. Additionally, the Paraguayan Ministry of Education (MEC) explains the challenge for educators. The MEC points out that “students are accustomed to finding information faster than [educators] provide it”. Students can only track improvement as quickly as feedback becomes available. Educators can generate and provide assignment feedback faster through the use of technology. This provides educators more time to prepare lessons and materials that cannot be automated and gives students feedback and at greater speed.

Social learning

Educators can even use resources like WhatsApp to provide rapid feedback and encourage creativity. WhatsApp allows educators to respond to students and grade assignments quickly. Educators can use this to encourage technical literacy through use of this platform. We seek to teach digital literacy with student interaction. Furthermore, group content is visible to anyone in the group, not just the teacher. The U.S. Department of Education created an updated lesson guide on technology implementation in classrooms. The most repeated point is social learning. Social learning encourages student to learn together. Group lessons allow students to grow personally as well as intellectually. “Games such as Ripple Effects and The Social Express use virtual environments, storytelling, and interactive experiences to assess a student’s social skill competencies and provide opportunities to practice,” (“Reimagining the Role of Technology in Education”, 2017). While WhatsApp is not a creative application inherently, the use of stickers, emojis, and photographs within the group can foster a creative environment. However, WhatsApp is undoubtedly a social tool and can provide opportunities that paper assignments would not. For example, students can learn from each other’s mistakes.
by seeing corrections given to other students. The implications of such a social tool must be carefully considered, but WhatsApp and tools like it hold many possibilities for collaboration.

6. Prior Work

The previous year’s IQP team worked closely with the schools in the Benjamín Aceval area. The previous team focused on an inventory of the current student and teacher technological capabilities. The inventory found “that most of the instructors and students had access to smartphones either at school or home” (McDermott et. al. 11, 2018). This means a focus on mobile applications would benefit a majority of students. This prevalence of smartphones also facilitates networks between students and teachers.

With the assessment, the previous team proceeded to create tutorials. “The team also created guided tutorials for five applications: Khan Academy, Toba Qom application, Facebook, WhatsApp, and Microsoft Office” (McDermott et. al. 16, 2018). The Facebook and Khan Academy tutorials will serve future work well. With the focus on self-motivated learning and networking, students can achieve the goals of education.

Methodology

Introduction

The increase of technology in Paraguayan classrooms can provide incredible opportunities to students. The use of free applications that use existing hardware limited costs to educators. This made it easier for educators and students. As a result, we promoted a cost-effective plan where we worked closely with educators. The platforms we introduced or used were free, adding no additional cost to the school. In addition, to reduce complications, we did not completely restructure class lessons. Rather, we assessed the curriculum with faculty and used technology to further in-class opportunities.

Our upgrade depended on four interdependent components. We first created networks between educators and classes to facilitate communication. We used these networks to schedule interviews with educators and determine needs as our second component. Once we understood needs, we created our lesson plan as the third component. Finally, we used the lesson plan as a basis for our workshop. This workshop was the fourth and most important
component of our methodology. Through these components we created a foundation for
technology in classrooms. Our timeline (Figure 1), shows how we organized our time during the
project.

Figure 1: Project Timeline

Network Between Schools

We began by creating networks for educators. We visited schools to introduce our team
and the work we planned on doing. These visits provided us with contacts of educators
interested in working with our team. We created networks with these interested educators and
used them to send out invites to our meetings and workshop. Through use of our networks we
demonstrated their intended usage. We also used this professional usage to exemplify
WhatsApp’s potential as an educational tool.

We decided to create three different types of networks. The first type was between
students and their educators. This provided educators with the ability to send assignments and
class material. It also allowed students to interact with the teacher and each other outside of
class.

The second type of network was between educators of the same schools. These
educators have similar classes and can provide more specialized advice. We created this
network to streamline the exchange of advice. This advice served as another example of
WhatsApp’s use for education.

The third type of network was between educators of all schools we worked with. This
was our hub for detailing work done with local teachers. We also used it to send out invitations
to our workshop and request advice.
Educator Perspectives

We then used these networks to better understand educators’ views on technology. We visited each of the eight schools we were working with to speak with faculty members. When possible, we asked to see a class in action and to speak with a teacher, not just a principal. In these semi-structured interviews, we asked teachers about the resources available to their classrooms and their students. We also asked about current knowledge and usage of technological resources. This information would allow us to understand where technology might fit into these classrooms. Depending on the available resources and knowledge, different approaches of introducing technology may have been appropriate.

These interviews also served to build a basic level of rapport with the teachers. After reaching this basic level of rapport, we extended an invitation to a group meeting of educators. The teachers were encouraged to bring others from their institution. The purpose of this meeting was to further understand the needs of the teachers, and to introduce them to the idea that technology is not only interesting but could also save them time.

Like the semi-structured interviews (see Appendix for example), this meeting also served as a gauge of which educators might most want to work with us. We focused on the teachers who were open to the idea of trying out technology.

Lesson Plans

Our understanding of educators’ perspective on technology heavily influenced our lesson plans. We decided to work alongside one teacher for our pilot lesson plan. The creation involved three main parts. The first part was familiarization with the process of making lesson plans. Once we understood lesson plans, we developed ours iteratively with the teacher. We then executed this plan and received feedback from the teacher. This process made sure we had a concrete and effective example of a lesson plan for our workshop.

We first reviewed sample lesson plans to familiarize ourselves with the format and purpose. We focused on lesson plans from local educators and general lesson plans involving technology. With this knowledge base we created the first iteration of our lesson plan. We then used our network to send it to the teacher and the other educators. The resultant feedback from
both groups continued to refine the plan. Once we had an optimal lesson plan (See figure 2), we visited the school to implement it.

Figure 2: English Lesson Plan

<table>
<thead>
<tr>
<th>Meta</th>
<th>Confirmación</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Comprender las expresiones para formular preguntas sobre cantidades y tipos de alimentos</td>
<td>Para lograr ambos objetivos, estudiantes harán un sketch. El sketch será sobre un cliente que quiere comprar frutas de un vendedor.</td>
</tr>
<tr>
<td>2. Crear preguntas sobre cantidades y tipos de alimentos</td>
<td></td>
</tr>
</tbody>
</table>
2. Después de aprender todo, los estudiantes harán la prueba. Cuando alcanzan una nota suficientemente alta, sacarán un screenshot. (Esta nota debe ser entre 90% y 100%).  
3. Mandarán el screenshot al grupo. |
| 4. Describir las cantidades de alimentos y expresar cuando no hay comida | Cada estudiante sacará una foto de frutas (o encontrarla en la red) y describiría las cantidades que hay. Los estudiantes mandarán las descripciones al grupo. |

We centered our plan around WhatsApp and had the students use our network with Baha’i to submit their assignments. Baha’i is a private technical school that seeks to increase student engagement through technology. At Baha’i, we graded assignments as we received them. After the lesson we interviewed Professor Giménez to go over the successes and struggles with our lesson plan. He then used this example to create his own educational technology lesson plan. Our co-created lesson plan then served as a significant talking point in our workshop.
Workshop

After we gained experience introducing technology into classrooms, we organized a workshop to help teachers do the same. We consulted locals and chose an optimal date for teacher availability. We then made use of our WhatsApp networks to spread the word about our workshop. We created our agenda to promote discussion between professors and our team. We wanted to ensure that educators would hear about experiences with technology from their peers. Two teachers who worked closely with our technology initiative facilitated this. We then asked these educators to speak about how they have been using WhatsApp. We also scheduled time to talk about the various useful features of WhatsApp to educators. We highlighted one other application, Simple Flashcards that we used in Professor Claudio Giménez’s classroom. We hoped this introduction would encourage educators to use additional technological resources.

We also scheduled an activity for the educators after the presentations. This activity would give them a chance to apply what they had learned. We asked educators to work together to develop lesson plans with technology for their own classes. Our group walked around to ensure educators understood the activity. We provided support and ideas as needed. We wanted educators to be familiar with the process of developing plans based on technology. Furthermore, educators could start their own with minimal support with the plan developed at the workshop.

At the end of the workshop, we asked educators to complete evaluations about the activities. These surveys would allow us to understand how to improve similar future workshops. We knew this would be the last workshop we organized here. However, feedback would be valuable to Paraguay Educa, an NGO working to close the digital divide in Paraguay. Next year’s team could also utilize this maintenance plan. These evaluations also served to evaluate how effective the workshop is and whether it helped us achieve our goals (See Figure 6).

After the workshop, we gave certificates to the teachers who attended. A local volunteer informed us that certificates are an important part of the culture for teachers. We wanted these certificates in order to encourage educators to attend future events.
Project Evaluation

After our workshop we will examine whether educators use the interschool network, and for what purposes. This will allow us to determine whether teachers actively use technology in the classrooms and if they feel it is helpful. It will also gauge if faculty were sufficiently interested to seek ideas from other educators (see Figure 3 for evaluation criteria). The use of social media will allow faculty to reach out to us in the United States with additional questions. Hence, students and teachers can still contact us, and we can measure growth after our departure. These status updates can aid future IQP groups on areas for improvement.

Confidentiality Statement

All participants in interviews and surveys will be informed that participation is voluntary and confidential. We will obtain permission prior to use of any personally identifying information. All participants will be allowed to review quotes or descriptions of them to be published. Upon request of the interviewee, a copy of write-up in another language will be provided. All identifying data will be stored securely during the course of the study and will be destroyed afterwards.

Figure 3: Chat rankings

<table>
<thead>
<tr>
<th>Chat rankings:</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top Tier:</strong></td>
<td>The chat is being used with limited to no interaction from the team. Use contributes to the class</td>
</tr>
<tr>
<td><strong>Middle Tier:</strong></td>
<td>The chat use is driven by participation from the team. Use is generally infrequent</td>
</tr>
<tr>
<td><strong>Bottom Tier:</strong></td>
<td>The chat is unused despite efforts from the team</td>
</tr>
</tbody>
</table>
Results

Introduction

Through project deliverables, our team increased the usage of technology for educational purposes. These helps continue the immense task of closing the digital divide in Cerrito. Our team provided three main deliverables to this end. We created an English lesson with WhatsApp for a local teacher and ran a technology workshop. We also created educational networks for educators using WhatsApp. A maintenance plan provided to Paraguay Educa further supports the longevity of these deliverables. We evaluated their effectiveness based on feedback and our observations of their usage.

Inter-educator Networks

Our first task was the creation of multiple networks for educators in Cerrito. In total, we created 4 WhatsApp groups with 10 teachers across 6 schools. We created a WhatsApp group for every interested educator. We created other networks for each school respectively. Each network saw different levels of success for a variety of reasons. We gauge this success using three tiers: bottom, middle, and top tier.

A bottom tier network is virtually unused despite repeated efforts from the team. A middle tier network sees usage driven by our team. Usage beyond this is infrequent. A top tier network is used regularly with limited team prompting. Additionally, we define usage as a quantity of messages sent across a network that relate to the course. This could be questions about the lesson or homework submissions. We define “usage driven by the team” as messages sent as a direct response to something we posted.

The first network we created was an inter-school network named “Aprendamos con WhatsApp”. We created this network to be a hub for educators of all schools to ask questions and send recommendations for lessons. It also serves as a professional development network. Currently educators use the network for coordinating events and certain lesson plans with our team. During the creation of our lesson plan for Professor Giménez we used the network for
recommendations and suggested edits. Once we finished the lesson plan, we sent it to the network as an example for educators. Our lesson plan received limited responses from educators. The workshop information and materials we sent received limited responses as well. Because the network saw at least infrequent use mostly driven by the team, we ranked this chat as middle tier.

We also created three group chats for Rosarino Qom, Padre Domingo, and Baha’i, respectively. These are schools in the Benjamin Aceval area that serve as primary and secondary schools. The Rosarino Qom group consists of educators from the school and us. The educators only used the group twice, once after we created it, and before the workshop. The educators seemed uninterested in using WhatsApp educationally. Due to this extremely limited use despite efforts from our team, we ranked this chat as bottom tier.

The Padre Domingo group was more interested in WhatsApp and engaged our group more. They would provide thoughtful feedback to our questions. However, they did not use the group outside of interactions with our group. Because of this limited participation we ranked this chat as middle tier.

Our most effective intra-school network was at Baha’i. The group “Clase de ingles” saw frequent use, even without interaction from our group. The group consists of Professor Giménez and students in his English class. The teacher uses the group to send assignments, receive homework, and provide feedback. The class used the network for everything from homework submissions to questions about course material. We ranked this chat as top tier based on its widespread and frequent use. The teacher encouraged usage with his interest and participation from the class. This usage made the network optimal for a pilot run of our technology driven lesson plan.

English Lesson

We created this lesson alongside Professor Claudio Giménez to teach clothing in English with WhatsApp. From our interviews, we determined what students were familiar with and used WhatsApp frequently. We optimized our lesson plan for WhatsApp due to this preference. Our lesson had three goals for the students. The first was they memorize words and
phrases about clothing. The second was the ability to write about clothing confidently. The last goal was that they could use WhatsApp to coordinate a small project.

Students used WhatsApp alongside another app (Learn Clothes in English) to memorize words and phrases. Learn Clothes in English provides pictures and pronunciations of each item in English. The students must then take a short quiz on the clothing they learned before progressing to the next section. This allowed students to memorize the English words for clothing. It also encouraged students to practice and understand the vocabulary. Once the quiz was completed, they submitted pictures of their notes and advanced to the next step.

Students accomplished the next goal of confident writing by creating a skit involving clothing. The skits contained four questions and responses about clothing. Students then sent a picture of the script to the group for the class for corrections. We worked alongside the teacher to reply to the group with the corrections. We demonstrated different ways to send corrections as shown in figure 4.

Figure 4: Sample Corrections for English Assignment

Simple corrections only required a WhatsApp message that detailed grammar or spelling fixes. WhatsApp text messages rely on nothing more than a smartphone and provide sufficient
feedback. For more complex corrections, we demonstrated free software to markup student responses. Most educators have access to laptops and can utilize this method effectively.

Corrections posted in the group chat meant other students could learn from errors their classmates made. The use of WhatsApp for this purpose gave students readily accessible feedback. We were also able to grade them remotely. This was especially useful during rain when the school was closed. These corrections promoted student engagement outside of classroom. These corrections prompted additional discussions and student interaction outside of classroom hours. This engagement and rapid feedback motivated students in ways that would not be possible without WhatsApp.

These interactions were fostered by ground rules set on the creation of the group. These rules stated the chat was for educational use only. This meant any banter or off-topic comments should be relegated to another group. Students followed this to an extent, but off topic remarks derailed constructive discussions at times. Fortunately, the teacher reigned in this chatter keeping the chats productive. Additionally, the somewhat impersonal nature of WhatsApp affected punctuality of submissions. Students sometimes submitted assignments via WhatsApp a few days after their due date. However, as the class became accustomed to the use of WhatsApp, submissions became more consistent.

For the final part of the lesson, students submitted a recording of their skit after practicing pronunciations in class. This satisfied the last goal that required students to manage a small project with WhatsApp. Students paired up with one another and submitted the recording to the group or directly to the teacher. Upon completion of this step, students used all major features of WhatsApp for educational purposes. This began a process of WhatsApp’s introduction as a professional development tool. Professor Giménez continued this process through creation of an additional lesson plan. This served a basis for educational uses of WhatsApp. These lesson plans served the focal point of our workshop.
Workshop

Once we completed our lesson plan with Professor Giménez, invitations were sent for an educational technology workshop. The workshop served three main goals. The first was a demonstration of successful educational applications of WhatsApp. The second provided functional technologically influenced lesson plans to each educator. The final goal encouraged teacher collaboration to broaden comprehension of technological resources. The workshop goals allowed teachers to acclimate to the use of technology in the classroom.

We opened our workshop with Professor Gimenez’s discussion of his WhatsApp lesson plan. He touted the ability to give and receive rapid feedback from his students. He further explained this helped him to use in class time more effectively. He detailed resource issues that further hindered adoption of technology in the classroom. His explanation and analysis of his lesson plan promoted discussion amongst the educators. This provided a baseline for educators to create their lesson plan.

The lesson plan could involve WhatsApp and/or other technological resources discussed during the workshop. The teachers worked in groups to promote additional conversation of innovative resources and applications of technology. We provided insight into potential benefits and drawbacks of the educators’ lessons. This insight developed more conversations amongst teachers and the team. The collaborative effort created connections between technologically motivated teachers.

We fostered these connections to make technology in classrooms more approachable. We focused on leadership by example and encouraged peer mentorship between teachers. We grew this mentorship by adding the teachers to the “Aprendamos con WhatsApp” group. This allowed educators to continue their discussions at their convenience. Their variable schedules make formalized workshops and meetings difficult, so educators can make better use of these chats. WhatsApp’s professional use in this situation further exemplifies its capabilities for professional and student development.
Educators saw this potential in their warm responses to our post-workshop questionnaires. We coded the responses and determined the most common feedback, both positive and negative. The educators liked the innovative approaches showcased during the workshop. Educators also saw the opportunity for more class participation using the interactive features of WhatsApp. However, educators were concerned students would not respect the rules of the chat. This disrespect of rules could also make the chat an additional distraction. Overall, educators had a positive outlook on the use of WhatsApp and technology in general in the classroom (see Figure 5).

**Figure 5: Workshop survey response summary**

<table>
<thead>
<tr>
<th>Positives</th>
<th>Negatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Teachers who attended all had plans for educational technology</td>
<td>● It is easy to abuse the classroom WhatsApp group.</td>
</tr>
<tr>
<td>● Of the 7 responses, 5 stated they want to use the plan</td>
<td>● Smartphones can distract students and detract from lessons.</td>
</tr>
<tr>
<td>● Teachers appreciate the dynamic and interactive nature of educational technology</td>
<td>● Lack of internet connectivity precludes use of WhatsApp.</td>
</tr>
</tbody>
</table>

**Maintenance Plan**

Our group worked to develop a maintenance plan to be used after we are gone. We hope that this will help foster the use of technology even without a group actively pushing for this. A member of our group met with representatives from Paraguay Educa. This organization exists to promote the use of technology in education and provide resources to schools. In our short time in Cerrito, they were not able to provide resources to local schools. However, they agreed to help with the upkeep of our projects with use of our maintenance plan. Our plan included suggestions for having future teacher workshops as well as advice about specific technology that we used successfully. Now that there are at least a few teachers successfully using technology, we hope that ideas about it can be organically spread around Cerrito.
Discussion

English Lesson

Our decision to pursue these three deliverables were driven by several different factors. We focused on a foundation for the use of educational technology. We developed this foundation alongside local teachers to garner credibility with the community. Our lesson with Professor Giménez provided invaluable experience with technology in Cerrito classrooms. The networks created alongside this lesson facilitated the flow of ideas amongst schools. Finally, our workshop served as our capstone and a starting point for next year’s team.

We chose to work with Professor Giménez as he had the most enthusiasm at our initial meeting. He initially questioned our motivations for the introduction of technology. Through our work with him, we demonstrated our desire to streamline classes and assist educators here. His initial reluctance evolved into an appreciation of the capabilities of WhatsApp. This change in perspective made him the perfect spokesperson for technology in classrooms. He could understand other educator’s trepidation about implementation and exemplify its advantages.

We met and spoke with Professor Giménez on multiple occasions to determine the best implementation of WhatsApp and his class’s reception to its use. Every student in his class had access to his smartphone and understood how to use WhatsApp. However, they had little exposure to WhatsApp as a professional development tool. WhatsApp is optimized for use as a social platform, so its use for education appears outlandish at first. However, Professor Giménez’s clear ground rules and lesson plan eased this acclimation and improved its effectiveness.

Through our research we determined the dynamics of an educational network define this effectiveness. We used this pilot lesson to see how students make use of such a network. Students learned the format for submission and feedback through examples from ourselves and classmates. Our examples also provided a baseline for the expectation of behavior in the chat. Students respected these guidelines and used the network for its intended purpose.
The teacher also adapted to the format of the chat very quickly with our help. The example feedback we provided to other students exemplified the versatility of the technology. The teacher used the chat mainly to track submissions and ensure students were practicing the lessons outside of class. The other app “Learn clothes in English” facilitated the outside of class learning further. The teacher saved in class time with these apps. This meant he focused in class time on lesson enrichment activities.

Overall Professor Giménez's lesson provided us with critical experience with local educators. We learned effective ways to set up a classroom WhatsApp group and how to keep it on topic. We also determined how to mesh WhatsApp with additional apps to reduce educator workload. This provided a basis of experience we used to develop our workshop and promote conversations in our educational networks.

WhatsApp Networks

We created these networks to encourage educational technology and show WhatsApp’s potential as a professional tool. We explained the purpose of the chats as forums for the exchange of lessons and other pertinent information. We also monitored these networks to gauge reception to our lesson plans and events. Next year’s team can also make use of these networks.

Purpose

We created the networks to connect educators to each other and our team. During the creation of our lesson plan for Professor Giménez we consulted with our first (and only group at the time). We asked for any educational technology resources they had for our English lesson plan. We received limited responses from the group, but we sent the completed lesson plan template to the group. We also sent out multiple invites and meeting requests with these networks. This generated further use in certain cases and attracted a larger audience to our events. The difference in usage stems for the purpose of the chats.

Usage Difference Explanation

We wanted to see how educators would use the chats and left the purpose broad. As our team engaged with the chats more, the purpose became clearer and usage increased.
From our interviews Professor Giménez’s group exemplifies this trend. Its narrowly defined focus and repeated engagement by our team generated thoughtful discussion. These discussions continued unprompted by the team. However, the inter-school chat lacked a clearly defined purpose. We mainly used it to send invites and example lessons. These generated discussions, but the network did not see the self-sufficient usage of the other chat. Additionally 3 of the 5 teachers we interviewed had limited WhatsApp or thought it was distracting. These limitations can dissuade teachers from using these networks further. However, schools were receptive to the idea, and further work can increase usage.

Contributions to Workshop

Finally, these chats served a twofold purpose to the workshop. We used the various school networks to send the invites. We also explained the educators can use the chats to develop their workshop lesson plans further. The repeated use of WhatsApp for professional purposes facilitates its introduction in classes. Educators with firsthand examples of these networks can recreate them more easily in their classrooms. As admins in these chats we used similar concepts outlined in our workshop to run them.

Workshop

For our first deliverable we created educational WhatsApp networks for educators. We created them to facilitate communication and spread of ideas between educators. The limited use stems from cultural attitudes towards WhatsApp, because it specializes as a social tool. Furthermore, educators prefer face-to-face meetings. This preference makes impersonal substitutes such as WhatsApp less effective. However, these groups facilitate discussion and questions outside of class.

We also assisted educators with setup of groups for their classes. Educators were enthusiastic to use these new networks. However, students think of WhatsApp as a social application and they struggle to see it as an educational resource. This generated late and off-topic messages in these groups. Students may just need time to acclimate to the change in
purpose. However, the excitement that was shown by educators and students alike is promising. The use of new tools in the classroom is exciting. The challenge is to ensure that this energy is channeled into something productive.

Our second deliverable was a workshop on the use of educational technology, focused on WhatsApp. Prof. Traver and Prof. Wolf suggested educators do the majority of the talking. This worked well because as teachers are interested in concrete results and experience. This focus on educator discussion generated questions and excitement. Overall, educators preferred to discuss ideas amongst themselves, with us as moderators. This will become easier as the number of educators using technology grows.

Our workshop grew this network of educators using technology. The development of a lesson plan as an activity during the workshop was also effective. This received positive feedback, as teachers were able to apply what they learned. Furthermore, teachers left the workshop with a concrete plan of what they could do in their classrooms.

The major issue that we ran into during the workshop was time constraints. We scheduled the workshop to be two and a half hours, but this turned out to be insufficient. We started our workshop 30 minutes late because almost everybody was late to it, and as a result we ran low on time at the end. In the future, it may be helpful to have a more concrete schedule that can be given out to the teachers to keep the workshop on a more rigid timeline.

Another deliverable was the development of lesson plans alongside educators. The primary challenge was that every educator structured lesson plan differently. As a result, it was hard to come up with a lesson plan that worked for a variety of educators. Instead, we focused on working closely with a smaller number, which was effective. Many educators move between institutions and classes sometimes happen only on a weekly basis. As a result, the process of
lesson plan implementation is arduous. However, we were able to see visible homework progress in the WhatsApp group. These factors are innate to the circumstances of these lesson plans and we anticipated the delays. Additionally, the time educators invested into our lesson plans shows their enthusiasm for the initiative.

Ultimately, many educators showed interest in the use of educational technology. However, credibility when introducing this technology to educators is critical. We garnered this credibility through work with educators who already used technology. These educators then shared their experience with others to motivate them to explore technology further.

Recommendations

Our team's work on this project has given us insight into what works well. We have compiled our ideas so that future teams can work more effectively. These suggestions relate to technology, culture, and methods to best bolster our initiative of technology in the classroom.

Technology

Our group focused on WhatsApp, because of its wide use in Paraguay. Many cellular plans allow free usage of WhatsApp. Because almost everyone had WhatsApp already installed, the upfront time and learning investment was manageable. The groups we helped create to facilitate learning both inside and outside of the class were mostly successful. Inter-educator networks were also well-received. For this reason, we recommend future groups continue the approach of using WhatsApp to connect educators to each other and their students. A key area to focus is helping educators create lesson plans that make use of these groups.

Outside of the Escuela Agricola San Francisco, the schools did not have student accessible WiFi. We suggest that if teams decide to pursue other apps, these apps have significant offline functionality and small download sizes. iPhones are almost unheard of in Paraguay, especially among students, apps must be available for Android. However, future groups might consider
other ways of downloading apps, videos, websites, and other resources without access to the internet. For example, with funding from the Fundación Paraguaya, wirelessly accessible hard drives are viable. These provide offline resources and periodic updates would provide resources in areas without internet. Additionally, educators go to somewhere like the Escuela Agricola to download resources for themselves.

At the Escuela Agricola where there is WiFi, there are more resources available. Two in particular that piqued educator interests were Duolingo and Google Classroom. Duolingo is a language learning platform that also allows educators to assign pre-made tasks and assess students' progress. These lessons are high quality and make a difference to both the students and the teachers. Google Classroom is a platform where educators can set up a classroom for his or her students, share information and collect assignments. While the same can be achieved with tools like WhatsApp, Google Classroom is specialized for educators. As a result, it is more suited to these tasks. However, this is only an option for schools that have the resources to provide WiFi.

Culture

In our experience, face-to-face conversations were more effective than phone calls or WhatsApp messages. However, a balance is necessary because teachers often switch between schools. Moreover, their classes at a given institution may happen infrequently. We suggest the team develops lesson plans as early as possible. This gives the team a buffer if classes are cancelled or moved. These classes are delayed due to rain, or absences, and can push schedules back a week.

Some teachers seemed warm in initial meetings but did not follow up for further meetings. The educators we worked with became valuable resources to other educators looking to do the same.
Methods

A large part of our project was the teacher workshop where educators presented to each other how they were using technology in the classroom with minimal presentation from us. We found that this format was very effective. Teachers were more likely to listen to other teachers who had already successfully implemented some of these ideas. These presentations often sparked questions and had teachers asking each other how best to start. It was also helpful to include an activity in the workshop so that teachers could leave with at least a concrete plan of what they could do with technology. In our case, we asked teachers to work together to develop lesson plans. We believe it would have been helpful to have the teachers each present their plans, but time did not permit this at our workshop. We were also advised by a Peace Corps volunteer that certificates were very important in Paraguay. We then designed and printed them for the workshop.

Our experience creating group chats for educators and classrooms showed us how to optimize usage. One of the big factors we noticed was the purpose of a group. When we created a group to encourage networking, educators scarcely used it. We thought participants either did not understand its usage or did not want to use it. However, a defined purpose, such as a project or lesson, focuses and increases usage. We suggest the group ensures every chat created has a purpose that promotes frequent usage.

We would also suggest working more closely with the Escuela Agricola. Because of its close proximity to the cabañas and access to resources, work is more impactful. However, we still made significant progress with other schools. As such we recommend groups continue to work with other schools to strengthen the network.
Appendix

Interview Example
Hello, we are the educational technology team working on behalf of the Fundación Paraguay. We're working to gauge the use of educational technology in the classroom. As such, we want to learn more about your classroom and use of educational technology, if any. Please note responses will be anonymous.

So how many students do you have in your class?

Out of those students how many have smartphones?

Do you use technology in the classroom at all?

If so, how?

What is your opinion on educational technology? Is it more distracting or helpful?

Would you be open to further utilization of technology in the classroom?

Are there any questions you have for us regarding technology in classrooms?

Thank you for sharing your time and thoughts with us. If you have any questions about how we will use this information, please do not hesitate to contact us. We look forward to working with you further!
Bibliography


