



Changing 3rd World Lives Through STEM Education in Honduras

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Abstract

During the summer of 2018, faculty members traveled to the country of Honduras to help install four shipping containers that had been converted into STEM classrooms (labs). Instantaneously, an entire town was granted the opportunity to alter the cycle of poverty gripping their communities for generations. Being part of a delegation of educators and students including those representing SKY (Skilled Knowledgeable Youth) (a 501c3 non-profit organization) [5], they delivered and installed the labs in the town of Belfante, Honduras. The converted containers were the product of year-long STEM projects completed by four high schools in Alabama. The four containers were converted into a computer lab, a welding lab, a woodshop, and an engine repair lab.

This paper chronicles this and other amazing efforts of a national/international award-winning STEM educator and the impact made on young people on two continents. It continues with a discussion about the immediate and far-reaching impact that could be achieved through this on-going container/classroom initiative. With a multitude of existing projects and installations in Honduras, political/industry connections made and logistical strategies charted, the momentum of this initiative is primed to invite collegiate involvement in the form of senior design projects, web-based collaborative learning environments, educator field experiences or even study abroad opportunities for American students. The paper thus concludes with a call to engineering universities across the country to adopt a “Sister School” and commit to applying energy and resources to it via service-based initiatives providing sustainable, world-view experiences for their students while at the same time profoundly changing lives.

Introduction

Honduras is a Central American country with bordering the Caribbean Sea, between Guatemala and Nicaragua and bordering the Gulf of Fonseca (North Pacific Ocean), between El Salvador and Nicaragua [1]. Honduras' total area is 112,090 sq. km slightly larger than Tennessee. Honduras' population is 9,182,766. Honduran primary language is Spanish. Honduras is one of the poorest countries in Latin America and has one of the world's highest murder rates. More than half of the population lives in poverty and per capita income is one of the lowest in the region. Poverty rates are higher among rural and indigenous people and in the south, west, and along the eastern border than in the north and central areas. Honduras' industries and infrastructure are concentrated on north and central areas [1].

Honduras' population growth rate has nearly 2% annually since the 1990s because of the birth rate averages approximately three children per woman and more among rural, indigenous, and poor women. Its fast-growing population has an extremely low purchasing power parity, 50% of the population lives in poverty, inflation rates are high, and the economy is still largely based on agricultural exports [2]. Prospects worsened after a major natural disaster, caused by the extreme rainfall that accompanied hurricane on different years like Mitch in 1998. Population growth and

limited job prospects outside of agriculture will continue to drive emigration [3]. Remittances represent about a fifth of GDP. Hondurans are desperate to immigrate into the USA and it is always news in Central America, the US and throughout the world. Recently in 2018, there was a migrant caravan from Honduras and it was big news throughout the world [4]. According to flash news [4], a) migrants are leaving in the hope of building a better future for themselves and their families; b) Some say they have been threatened or extorted by criminal gangs operating; c) they hope to get jobs abroad which pay enough for them to send money to their relatives who stayed behind.

Background

During the summer of 2018, two faculty members from the Engineering Technology dept. at Indiana University Purdue University Indianapolis (IUPUI) traveled to the country of Honduras to help install four shipping containers that had been converted into STEM classrooms. Instantaneously, an entire town was granted the opportunity to alter the cycle of poverty gripping their communities for generations. As part of a delegation of educators and students from Alabama, including those representing SKY - Skilled Knowledgeable Youth (a 501c3 non-profit organization) [5], the authors delivered and installed the labs in the town of Belfante, Honduras. The converted containers were the product of year-long STEM projects completed by four high schools in Alabama. Many corporate sponsors donated new professional-grade equipment for the labs and others provided hardware and supplies for on-going projects. The four containers were converted into a computer lab, welding lab, woodshop, and an engine repair lab.

As mentioned previously, entire communities have relied on sustenance living for their inhabitants who have been caught by a never-ending, seemingly hopeless quality of life. Education can change that. Specifically, in developing nations, practical, and skills-related STEM education. Having the knowledge and ability to operate a computer, build wood components, repair an engine, weld or create CAD drawings offers the potential for employment within more populous areas (cities), thus changing the destiny of entire families. There are no cursory educational requirements in the mountainous, rural, remote areas of Honduras. Educational facilities in these regions (if they exist at all) are generally single-room, open-air cinder block structures lacking the most basic of educational tools (books, chalkboards, desks, etc.). Any equipment, tools or technology is simply out of the question. These “schools” usually cater only to grade school-age children, leaving Jr. and Sr. high school-aged children without any direction or options for a prosperous life.

This paper chronicles the amazing efforts of a national/international award-winning STEM educator and the impact he has made on young people on two continents. It continues with a discussion about the immediate and far-reaching impact that could be achieved through this on-going initiative. Even with regards to the high crime rate in Honduras, a nationally-implemented program of this sort would most certainly tip the scales if young people had educational opportunities that enabled gainful, legal employment. With a multitude of existing projects and installations in Honduras, political/industry connections made and logistical strategies charted, the momentum of this initiative is primed to invite collegiate involvement in the form of senior design projects, web-based collaborative learning environments, educator field experiences or even study abroad opportunities for American students. The paper thus concludes with a call to engineering

universities across the country to adopt a “Sister School” and commit to applying energy and resources to it via service-based initiatives providing sustainable, world-view experiences for their students while at the same time profoundly changing lives.

Education Status in Honduras

The education system in Honduras begins in pre-school, elementary school (1st-9th grade), secondary school (10th or 12th grade), then the university years. There is free public education available in Honduras and also coexist with private education. Although primary-school enrollment is near 100%, educational quality is poor, the drop-out rate and grade repetition remain high, and teacher and school accountability are low [6]. According to the World Bank report, In Honduras, schools were open 114 days of the official 200 [7]. Students’ attendance in rural schools is much lower and it contributes to school dropout. In Honduras, low-quality teachers or school resources reduce the expected gains from attending school, which may result in spotty school attendance and consequently lead to repetition and desertion [8].

Education is the key out of poverty. Honduras was chosen for this project, for it is the second poorest county in the northern hemisphere and has been nicknamed the “Murder Capital of the World”. Sky team traveled Honduras in 2012, 2013, 2014, 2016, 2017 and 2018 [5]. During a class field trip to Honduras in 2012, Sky team discovered a community celebrating the graduation of their very first high school student. In 2013, Sky team students raised the funds to build a two-room middle/high school next to their elementary school, which now has 105 middle/high school students in Honduras. In 2014, the Sky team noted some inadequacies that could help with it. First, their teachers are required to teach the English language, none of their teachers spoke English. Secondly, they had four computers, which only one of them worked, and none of them could access the internet. In 2016, Sky team returned to Honduras bringing refurbished computers, which was used to set up 3 computer labs in three different Honduran schools. These activities gave birth to the Global Sister School project.

The United Nations Education, Science, and Cultural Organization (UNESCO) has issued statistics revealing that 69 million new teachers are needed to provide quality universal primary and secondary education by 2030, the deadline of the UN Sustainability Development Goals (SDG’s)[9]. Considering future education, Oxford University researchers predict that in the next 20 years 47 percent of at USA jobs will be automated [10]. If this report holds true around, then there is potential for separating classes. Those that are highly trained and employed those that are lacking training and are unemployed. In the USA most students have access to formal and informal training and can prepare for the future of atomization. What about developing countries who lack basic educational needs and resources.

Long Term Objectives of STEM projects

- Engage faculty and students in completing challenging real-world assignments.
- Allow students to choose accelerated learning options to earn relevant industry credentials.
- Combine a college-career ready academic core with challenging technical studies that will prepare students to live and work in a global workforce and marketplace.
- To impact the health and wealth of the students and community that services through sister schools in Balfate, Honduras.
- To conduct international professional development, teacher-to-teacher via Zoom. Introduce the Global Sister Schools

STEM Projects involvement

The Global Sister School project was developed to connect schools with similar time zones. For example, in the USA as our primary students are learning to speak read and write the English language the teacher can turn on a web camera making their classroom a global classroom sharing their lessons. This is something that can be done in all subject areas, allowing teachers to collaborate and share their areas of expertise. This innovative approach to education can radically change the education and lives of all that are involved. Sky Education Program is collaborating work on Global Sister School projects. Sky – Skilled Knowledgeable Youth program (501c3) exposes youth to Science, Technology, Engineering, and Math (STEM) project that will enhance their abilities through challenging projects that interest them in engineering and skilled trade jobs. These activities may be conducted in-school, after school and/or on weekend classes. The participants will be middle and/or high school students developing hands-on skills in a variety of activities that simulate industry practices to include academic skills and job readiness/employability skills when the projects(s) are completed. SKY has been the catalyst in the promotion and development of engineering projects for the Calera High School engineering program to include creating career paths. Because of the success at Calera, SKY is expanding its mission to encompass other schools throughout Alabama.

The summer of 2017 tour was given by their Mayor Dannel Gaverette on Belfate, Honduras. It was impressed that this mayor kept the local school open seven days a week. During the weekday the local towns people (students) attend the school where on the weekends he sends trucks into the mountains to pick up students who have no or little access to education so they can attend school. The school taught basic subject material but lacked skilled trades training.

This was an eye-opening moment for what opportunities will these students have to live and thrive in the year 2030 and beyond. Armed with this information **SKY** ventured out to make a difference in the training needs of the kids in this community. SKY launched a project that would convert and recycle shipping containers into skilled trades laboratories (Figure 1). Recruiting three Alabama schools, SKY committed to supplying the community of Belfate, Honduras with four container classrooms. These classrooms consist of (Figure 2):

- | | |
|--|---|
| a) Welding Laboratory | Built by the SKY organization |
| b) Woodworking/Construction Laboratory | Built by Eufaula City Schools |
| c) Small Engine/Auto Mechanics Academy | Built by the Bibb County Career Academy |
| d) Computer Laboratory | Built by Satsuma High School |

These containers make for an instant setup up and secure buildings/classrooms. Essentially these labs will be placed side by side, and once the double doors are open on each of the containers we have built the Belfate community an instant Skilled Trades School. This school coupled with SKY's Sister School project can provide this community with the skills training that they will need to thrive in a world of automation.

The Sister School Project will provide good teachers to students around the world thus helping meet the Sustainability Development Goal set by the United Nations. Sister School connections and networks will support, strengthen and supplement classrooms around the world.



Figure 1: Conversion of recycling shipping containers into skilled trade laboratories



a) Welding Laboratory



b) Woodworking/Construction Laboratory



c) Small Engine/Auto Mechanics



d) Computer Laboratory

Figure 2: Container classrooms (Inside)

Preparation of container classroom

Shipping container size of 40X10 ft is used to prepare a fully equipped classroom. The classroom needs to be equipped with walls, insulation, electricity, & equipment. Funds and donations are needed to equip the classroom. High schools students are involved to prepare a fully equipped classrooms. Container shipped to Honduras mid-April, 2018. Figure 3 shows arriving sea-worthy shipping containers, inspection, and preparation to design the classroom.



a) Sea-worthy shipping container



b) Inspection



c) Students measuring container

Figure 3: Sea-worthy shipping container, inspection, and preparation to design classroom

High school Engineering Students involved preparing a fully equipped classrooms by following tasks.

- Create the Gantt Chart
- Research the equipment needed and create supply lists
- Create the floorplan for the classroom
- Create the framing plan for the walls and ceiling
- Create the electrical plan

Students will participate in framing the walls, wiring the electrical, installing the insulation, drywall, classroom counter construction, counter installation and all equipment installation. Participating in this phase will help the students see the practical application of their designs.

Conclusion and Future Engagement

Being part of a delegation of educators and students, it was a great opportunity to deliver and install the labs in the town of Belfante, Honduras. The converted containers were the product of year-long STEM projects completed by four high schools. The four containers were converted into a computer lab, a welding lab, a woodshop, and an engine repair lab. The impact made on young people of Honduras through STEM education, was the immediate and far-reaching to achieve through this on-going container/classroom initiative. With a multitude of existing projects and installations in Honduras, political/industry connections made and logistical strategies charted, the momentum of this initiative is primed to invite collegiate involvement in the form of senior design projects, web-based collaborative learning environments, educator field experiences or even study abroad opportunities for American students. The paper thus concludes with a call to engineering universities across the country to adopt a “Sister School” and commit to applying energy and resources to it via service-based initiatives providing sustainable, world-view experiences for their students while at the same time profoundly changing lives. Future engagement on changing Honduras lives through a STEM education by installing self-sustaining, solar-powered units inserted as shown in Figure 4.



Figure 4: Installment self-sustaining, solar powered units

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3. Ten members of amazing group of Life Changers visiting Belfate, Honduras to set up our container classrooms



4. Maria Antonia Rivera the Vice President of Honduras met with the team to discuss Global Sister Schools project.

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