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The McMaster Journal

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FROM THE OFFICE
OF THE PRESIDENT
Dr. Richanne C. Mankey.....4

ADVANCING HUMANITY IN:

BELIZE 6

CAMBODIA..... 48

LOCAL AREA 72

PANAMA..... 78

THE McMASTER SCHOOL FOR ADVANCING HUMANITY

The McMaster School for Advancing Humanity was founded to serve as a focal point for teaching, service, scholarship, and action to improve the human condition worldwide. The mission of the McMaster School is:

- ◆ To educate students for responsible citizenship;
- ◆ To produce committed global citizens and leaders who understand the importance of individual liberties in improving the human condition worldwide; and
- ◆ To encourage graduates to take an active role in addressing these issues in whatever professions they may choose.

The School serves as a catalyst for innovative, interdisciplinary, community-based work by creating and supporting opportunities for teams of faculty, students, and staff to use their academic and professional skills to address a community need.

The founding goals of the McMaster School are:

1. To critically examine the root causes of human suffering through community-based research that addresses systemic factors that impede human progress;
2. To give students the knowledge and capacities to be active world citizens and to view themselves as members of the world community;
3. To contribute actively through sponsored scholarship and service to the improvement of the human condition worldwide;
4. To exchange, create, and disseminate knowledge about successful models of active citizenship and public service; and
5. To create at Defiance College one of the nation's premier undergraduate educational programs with a focus on scholarship and service, with a special emphasis on developing an innovative approach to teaching.

THE FOUNDING DONORS

The McMaster family has been an instrumental force in business, industry, and civic involvement in northwest Ohio for many years. Harold and Helen McMaster together with their sons and daughters – Ronald McMaster, Jeanine Sandwisch Dunn, Nancy Cobie, and Alan McMaster – established the School through a generous endowment to Defiance College in 2002. Although Harold McMaster died in 2003, his legacy – a belief in an individual's potential to positively impact humanity through scholarship, leadership and service – lives on through the McMaster School for Advancing Humanity.

DEFIANCE COLLEGE MISSION

Defiance College graduates students to lead distinctive lives in their chosen professions through a spirit of service by preparing them To Know, To Understand, To Lead, and To Serve.

TO KNOW

We believe that the liberal arts form a broad basis for all learning. We affirm that academic excellence demands a committed search for truth, competency in research and other problem-solving methods, the ability to synthesize knowledge from many sources, and a capacity for self-directed learning.

TO UNDERSTAND

We provide opportunities for students to perceive and make connections between the intellectual realm and the world. We strive to develop awareness of and sensitivity to global interdependence and diverse cultures.

TO LEAD

We are committed to the betterment of the community, the nation, and the world through the development of leadership skills and abilities. We create opportunities for students to initiate and facilitate beneficial action in and out of the classroom and encourage self-reflection on the role of the dedicated leader.

TO SERVE

We encourage our students to be of service to their fellow students, their chosen fields of study, their communities and the world. We provide opportunities for students to transform society through civic engagement along with application of their knowledge and understanding to service.

DEFIANCE COLLEGE VISION

Defiance College will be the college of choice for students who aspire to enrich the lives of others through their professional endeavors. Through our engaged and dedicated faculty and staff, Defiance College will be recognized for its distinctive academic programs, transformative student learning, servant leadership and vibrant campus experiences.

FROM THE OFFICE OF THE PRESIDENT



Learning at Defiance College is transformative. It is so because faculty engage students in learning, action, and reflection. Through this engagement students gain a better understanding of the subject matter, the experience, and also of themselves. The McMaster School for Advancing Humanity is an experiential program, generously endowed by Helen and Harold McMaster that engages students to recognize world issues and make an effort to address them. McMaster community-based projects are the result of a year-long effort by faculty Fellows and student Scholars to research problems and then implement solutions in collaboration with international, domestic, or local community partners. McMaster teams work critically with their community partners to truly understand the needs and challenges these communities face. It is a matter of values and perspective – when we work with community members to understand their needs, we are trying to look through their lenses to contextually understand their world.

As we celebrate more than 15 years of serving humanity, our students are not only learning about other cultures and issues outside of the scope of their own lives, they are also engaging in servant leadership. Servant leadership, as described by Robert Greenleaf (1977) is, literally, serving others through listening, healing, awareness, persuasion, conceptualization, foresight, stewardship, commitment to growth of people, building community, having a calling, and nurturing the spirit. In our service to others, we lead while also learning more about ourselves.

At a February 2018 event in Toledo, the 16th president of Defiance College, James T. Harris III, told this story:

“... a local banker in 1904 decided to create a scholarship fund at a local college. His gift was \$500, and he would never know how impactful his giving truly was. That scholarship fund was for students who were unable to pay for college. In 1934, a young man from Deshler, Ohio, enrolled in the college and when he graduated, he went on to work in the glass industry in Toledo. After he made some money off his early patents, he gave back to the college that had given him that scholarship from the banker... By the time of his death in 2003, he had more than 100 patents to his name, and Life Fortune Magazine named him a ‘glass genius’ and called him ‘the grandfather of solar energy.’”

The grandfather of solar energy is Harold McMaster. He and his wife, Helen, gave back in numerous ways for which Defiance College is very grateful. The gift to establish The McMaster School for Advancing Humanity was, at the time, the largest gift ever given to an institution of higher learning in northwestern Ohio.

Jim Harris continued that, “The McMaster School promotes the exchange of ideas across the globe and has provided incredible learning experiences for hundreds of students.”

“Think about it. One \$500 gift made in 1904 by a local banker helped take a young man off a farm and provide him with an education that later would help create the field of solar energy, relieving suffering and misery around the world through clean energy.”

“One gift.”

As the reader peruses this journal, it will be clear that the McMaster gift has transformed the lives of our students and those with whom they have interacted. Our work is *with* people so that their most urgent needs are satisfied. Our work goes well beyond the concepts of community service or service learning – it is engaged community – based research and service. It is a distinction Defiance College is glad to have nurtured. As those who work alongside people in local, national, and international locations, we are fulfilled in ways that we couldn’t even imagine. It is also interesting to note that students who participate in the McMaster programs at Defiance College persist to graduation at a rate of 95.6%; and 91.9% graduate on-time in four years.

The pillars of our mission - To Know, To Understand, To Lead, and To Serve - are upheld because we do our work TOGETHER!

Dr. Richanne C. Mankey, President
Defiance College



Drs. Harold and Helen McMaster

ADVANCING HUMANITY in BELIZE

2016-2017 Learning Community

Mary Ann Studer, M.S., McMaster Fellow
Rena Rager, McMaster Associate Fellow
Madeline Homan, McMaster Scholar
Catlyn Pavel, McMaster Scholar
Zackary Reed, McMaster Scholar
Zachary Roush, McMaster Scholar

2017-2018 Learning Community

Mary Ann Studer, M.S., McMaster Fellow
Brad Harsha, M.B.O.L., McMaster Associate Fellow
Matthew Lundin, Ph.D., McMaster Associate Fellow
Rena Rager, McMaster Associate Fellow
Corey Davis, McMaster Scholar
Mackenzie Durdak, McMaster Scholar
Taylor Gillig, McMaster Scholar
Elyzabeth King, McMaster Scholar
Nicholas Kleptz, McMaster Scholar
Kaitlyn Kuhn, McMaster Scholar
Kassandra Memmer, McMaster Scholar
Blake Newman, McMaster Scholar
Logan Scott, McMaster Scholar
Alyson Seibert, McMaster Scholar



WORKING IN BELIZE TO IMPROVE THE HUMAN CONDITION

Mary Ann Studer, M.S., McMaster Fellow 2016-2018

The teams in May 2017 (4 scholars) and December 2017 (10 scholars) were the smallest and largest teams respectively that I have worked with in Belize. The accomplishments of both groups were notable.

The May 2017 team worked each day in temperatures above 100 degrees, typical of that time of year in Belize. Even at night, the temperatures remained above 85 degrees, and the cold showers that we usually complain about were the only source of relief. We melted each day, and our clothes hung on us as the combination of heat and humidity (always high in the jungle) stretched the fabric. Despite the conditions, we laughed a lot and not only was each individual community-based project completed but the team conducted visual acuity screenings for 1190 children in response to a request from the Belize Council for the Visually Impaired.

The December 2017 initiative was a mass of moving parts, complicated but never chaotic. I tallied the amount of work accomplished to give a concrete definition to the team so that they could recognize their accomplishments. Here is what happened in 14 days while we were on-site in Belize.

- 13 foresters were trained in snake bite management
- 16 women were provided small business training
- 18 women participated in exercise training to improve balance and back strength
- 23 women were educated on proper nutrition
- 25 ophthalmoscope screenings were completed
- 25 households were surveyed to assess poverty levels
- 33 women were educated on breast health
- 35 children and adults were trained in CPR, Heimlich maneuver
- 41 children and adults were taught about head trauma/concussions
- 43 men and women engaged in a SWOT analysis to reach a consensus on sustainable community development
- 53 educators participated in workshops on Universal Design for Learning and assessment
- 58 students completed exercises to improve functional literacy
- 252 tests were completed on 42 potable water sources to determine water quality
- 323 students participated in a day-long science camp
- 702 tests were completed on 156 environmental waterway sites to assess water quality
- 1012 visual acuity screenings were completed

You will read about these projects in the pages that follow. However, this is only part of the story. The McMaster teams are focused on improving the human condition, but because of the inherent nature of community-based research, the impact of this experience is multiplied. The collaborations that engage each of us, while we are working with our community partners allow all of us to develop relationships that ignore cultural, economic, and geographic boundaries. As a result of these initiatives our understanding of our connection to humanity expands to include those different from ourselves and tightens as we form close bonds with the Belizeans with whom we work. The year-long learning community that is foundational to all McMaster initiatives has once again proven by the work of these two teams to be valuable in supporting research and preparing students to be flexible, effective, and responsive to the changing needs of our community partners.

EXPANDING PARTNERSHIPS

Mary Ann Studer, M.S., McMaster Fellow 2016-2018

Analysis of Visual Acuity Screenings Partnering with Belize Council for the Visually Impaired

In August 2016 Rena Rager, McMaster Associate Fellow and I traveled to Belize to complete the delivery of a retinal camera that had been donated by ProMedica to the McMaster School for use by one of our community partners. Connecting with BCVI in December 2015 I learned that they had just expanded their services to include diabetic retinopathy detection and treatment to meet a critical need within the country. BCVI was using a portable retinal camera to provide services in their various locations. However what is considered to be portable in a developed country doesn't always hold true in a country, such as Belize because of its underdeveloped infrastructure. The rough roads between even urban locations wreaked havoc with the equipment. BCVI was excited to receive an additional retinal camera that could be utilized at their clinic in Belize City and remain stationary. While meeting with them, BCVI personnel articulated two challenges that perhaps the McMaster School Belize teams could address. The first challenge was their lack of staff to conduct comprehensive visual acuity screenings in the more remote areas of Belize. Secondly, BCVI struggles to get people to their clinics throughout the country. It was immediately clear that addressing at least the first challenge was something that the McMaster Belize Fellows and Scholars could take on.

In May 2017, the McMaster Belize team spent their first morning on-site at the BCVI facility in Orange Walk and completed training to conduct visual acuity screenings. We conducted all the visual acuity screenings using the Snellen chart at a distance of 20 feet (pictures or shapes were used for younger children, numbers were used for Infant II and older). We worked with the BCVI Orange Walk coordinator to complete visual acuity screening at four schools in the Orange Walk District. The BCVI coordinator assigned us schools in San Felipe (St. Michael's Roman Catholic), Guinea Grass (Guinea Grass Pentecostal), Carmelita (Government School), and August Pine Ridge (Roman Catholic). These villages all border the town of Orange Walk and have access to public bus transportation to the BCVI Clinic there, which would allow for students to seek additional eye care if needed. What surprised us the most about these schools was their size; we are accustomed to working in very small communities with schools with enrollments of approximately 50 students. BCVI chose these schools because their enrollment was 300-400 students. The McMaster Belize team could screen an entire school in one day as compared with 1-2 of the BCVI staff working an entire week or more to do the same. During the May 2017 initiative the McMaster Belize team was able to screen 1190 students in the four schools named above and in the schools in San Carlos and Rancho Dolores where we were working as well. Out of the nearly 1200 students screened, 187 were referred to BCVI for further evaluation. May 2017 was the first time that this McMaster initiative has taken on a group project in addition to each fellow's and scholars' individual research projects.



In December 2017 we once again coordinated with BCVI's office in Orange Walk to complete visual acuity screenings at four schools in the Corozal District – Caledonia (Roman Catholic), San Narciso (Roman Catholic), Santa Clara (Seventh Day Adventist), and Santa Clara (Roman Catholic). The McMaster Belize team was able to screen 1012 students in just two days.

In May and December 2017, after we had completed the visual acuity screenings in each of the schools, I completed a report for BCVI that broke down the data by gender and age. In addition, BCVI was given a completed School Program Record Sheet that listed each student and their visual acuity screening results for both the left and right eyes. Pre-school children with scores 20/80 or less in either eye or school-age children with scores 20/40 or less in either eye were referred for a follow-up appointment at BCVI's Orange Walk Clinic. Students who needed a follow-up appointment were each given a letter to take home with a pre-scheduled appointment date and time.

Post-trip I have analyzed the data acquired from both the May and December 2017 screenings, specifically to look for correlations between grade level and visual acuity scores. This analysis implemented, as much as feasible, the World Health Organization protocols for the *Assessment of the Prevalence of Visual Impairment Attributable to Refractive Error or Other Causes in School Children* (World Health Organization, 2007) and was requested by BCVI to aid in their development of protocols that would target visual acuity screenings for primary school children. BCVI, with limited staff and resources, needs to design a national protocol that would allow for targeted visual acuity screenings that would effectively reach the population of children most in need of eye care.

Combined data from May 2017 and December 2017.

Grade Level	Age Range	Percentage Referred May 2017	Percentage Referred December 2017	Total Students Screened	Total Students Referred	Average Percentage Students Referred
Pre-School	4yr-5yr	60.6%	0%	53	20	37.7%
Infant I	4yr-8yr	25.4%	9.2%	257	46	17.9%
Infant II	6yr-10yr	26.5%	8.8%	245	45	18.4%
Standard I	7yr-10yr	17.2%	6.3%	260	31	11.9%
Standard II	7yr-12yr	14.3%	5.4%	311	33	10.6%
Standard III	9yr-13yr	10.6%	2.1%	310	21	6.8%
Standard IV	10yr-14yr	10.2%	4.3%	285	21	7.4%
Standard V	11yr-15yr	6.9%	4.5%	241	14	5.8%
Standard VI	12yr-16yr	4.9%	6.0%	240	13	5.0%
Totals				2202	244	11%

An overall average of 11% of those screened needed further testing by the optometrist at BCVI. Eliminating the possible skew of the pre-school children, the proportion of those school-aged children tested requiring referral drops to 10.4% (224/2149). It is necessary to look at the high rate of referrals among preschoolers with skepticism given that many of these children were just shy or frightened.

However conducting visual acuity screenings for preschoolers is vital because amblyopia (lazy eye) and strabismus (misalignment of the eyes) affects between 2-6% of children six years of age and under (The Multi-Ethnic Pediatric Eye Disease Study Group, 2013). Myopia (nearsightedness) affects 4% of children six years old and under (The Multi-Ethnic Pediatric Eye Disease Study Group, 2013). Hyperopia (farsightedness) affects 21% of children six years old and under (The Multi-Ethnic Pediatric Eye Disease Study Group, 2013). In the U.S. it is recommended that children have their vision tested at least once between the ages of three and five years (U.S. Preventative Service Task Force, 2011). Failure to screen those children in preschool or Infant I would allow these visual impairments to go undetected.

The data collected through the visual acuity screenings conducted to date aligns with the research done by the Collaborative Longitudinal Evaluation of Ethnicity and Refractive Error (CLEERE) study (Jones-Jordan, et al., 2014). The CLEERE study reports that the prevalence of myopia averages 9% in children 5-17 years and 13.2% in Hispanic children (in the U.S.) in the same age group (Jones-Jordan, et al., 2014). Hyperopia is seen at a rate of 13% in children 5-17 years old in the CLEERE

study (Jones-Jordan, et al., 2014). Astigmatism, an irregular shaped cornea or lens is found to be present in 15%-18% of the children between the ages of 5 years and 17 years (The Multi-Ethnic Pediatric Eye Disease Study Group, 2013). While the visual acuity screenings we conduct don't explicitly identify visual impairments, they do inform students, the vast majority of which have never been screened, and their parents that follow-up is necessary to ensure good vision.

I have returned my analyses from both trips to BCVI. BCVI will use this data in consultation with a visiting pediatric ophthalmologist to set goals for the coming year – specifically to either conduct as much comprehensive screening as absolutely possible or to target certain grade levels for screening over a broader geographic area. The McMaster School Belize teams are committed to continue conducting visual acuity screenings in partnership with BCVI. The more data points that contribute to this ongoing analysis the more confident BCVI can be that they are effectively utilizing their resources.

The low response rates of those referred to the BCVI clinic as a result of the above screenings is discouraging. It is suspected that the lack of follow through on the part of the parents is attributable to economic factors or lack of education about the importance of accurate vision to a child's ability to be successful in school.

BCVI works with international organizations such as the Lions Club to reduce the cost of glasses as much as possible. Corrective lenses are ground locally in Belize, so even with donated frames, glasses for children are still \$25 USD per pair. Even at that cost, \$25 (\$50 Belize dollars) would be hard to manage for some. In May 2017 we referred 187 children to the clinic. In December 2017 we referred 57 children to the clinic. If each of those children benefited from corrective lenses, we would be looking at \$6100 for the entire group. That seems like a small amount to provide 244 children with the ability to see clearly.

There is another issue here. BCVI will do everything that they can to ensure that children have the corrective lenses that they need by offering various payment opportunities, etc. Often the problem is that families are not willing to indicate their need. Some parents do not bring their children into the clinic for further testing assuming that they won't be able to afford glasses. Figuring out a solution to provide children with corrective lenses and preserving the dignity of their families is an ongoing challenge. In Latin America, there are estimated 170 million people in need of eyeglasses, and only 3.4 million glasses have been distributed (EYElliance, 2016). Addressing this problem starts with the children.

Assay of Subsurface Nitrate and Dissolved Oxygen Levels: New River and New River Lagoon Partnering with Friends of the New River and Programme for Belize

Nitrates

In 2010 through 2012 sources of drinking water in the village of San Carlos showed both high nitrate levels and the presence of E.coli bacteria (Studer T., 2012). While the surface water of the New River Lagoon showed elevated levels of nitrates – the water sampled from various depths did not (Studer M., Community-Based Research in Northern Belize, 2012).

In April 2011 I tested surface nitrate levels and sampled at depth at all previous sites to maintain data continuity with the testing implemented during the December initiatives. At the surface, water tested showed higher than normal levels (ranges between 9.24mg/L – 11.44mg/L) at several springs that feed the New River Lagoon, in both Harry Jones, Ram Goat, and Lemonal tributaries, and at the north end of the Lagoon at the mouth of the New River. Also, the sub-surface testing at the suspected sites of the feeder springs indicated higher than normal nitrate levels (ranges between 11.00mg/L – 14.08 mg/L). This data coupled with the note of significant marsh fires during the 2010 and 2011 dry seasons preliminarily supports the concept that the nitrates might be resulting from marsh fire residue that has moved into the groundwater or that the runoff from marshlands carries nitrate loaded ash into the waterway. Camargo and Alonso support the correlation between nitrate levels in environmental water and biomass burning; specifically, they cite biomass burning (including marsh fires) and land clearing as nonpoint sources for the infusion of inorganic nitrogen in aquatic ecosystems (Camargo & Alonso, 2006). The dry seasons that preceded our testing in December of 2010 and December 2011 were significant regarding fires in the region including substantial marsh fires that I witnessed in April 2011. There haven't been significant marsh or savanna fires since the spring of 2011 subsequent analysis of the nitrate levels for water tested in and since December 2012 were lower as well (Studer M. A., Research Coming Together to Effect Change in Northern Belize, 2014).

The results of nitrate assays in the New River Lagoon subsurface water, conducted since December 2012, showed that the nitrate levels at even minimal depths of 1.5 meters were almost consistently below the EPA cap of 10mg/L for safe levels (US Environmental Protection Agency, 2016) (Studer M., Community-Based Research in Northern Belize, 2012) (Studer M., Research Coming Together to Effect Change in Northern Belize, 2014) (Studer M., The Sustainability of Collaborative Community-Based Research, 2016).

Methodology

All sites tested are marked using GPS (Global Positioning System) latitude/longitude coordinates. Nitrate levels are assessed using a *Hach* Pocket Colorimeter II device and nitrate testing protocol (*cadmium reduction method*) to determine nitrate levels digitally.

Results

The data gathered in May 2017 showed subsurface water nitrate levels ranging from 1.32mg/L – 15.84mg/L at the 37 sites tested in the New River Lagoon and its tributaries. The highest level (15.84mg/L) and only site that had a level above the EPA standard (10mg/L) was in front of a newly constructed resort on Lemonal Creek. This creek directly empties into the New River Lagoon. The data collected in December 2017 showed subsurface water nitrate levels ranging from 0.44mg/L – 20.12mg/L at the 30 sites tested for nitrates in the New River Lagoon and its tributaries. The highest and only place that had a level above the EPA standard was the Outpost Lodge, another resort that sits on the shore of the Lagoon. Both of these spiked levels are associated with human activity on the Lagoon and will need further monitoring. I am still of the belief that there are probably multiple sources of nitrate contamination. We are just trying to identify or rule out sources one at a time. Critical to this project's focus is to determine what the levels of chemical contaminants are at depth relative to the surface waters because it is foundational to understanding whether or not the Lagoon will continue to be a viable source of water (needing only treatment for biological contamination) for the people that live on its shores.

Dissolved Oxygen

The New River Lagoon (the most extensive freshwater body in Belize) flows north into the New River and then into the Bay of Corozal. Programme for Belize asked that we continue to assess the water quality in the New River Lagoon and the New River at Orange Walk Town since there have been reported fish kills where the New River flows near Orange Walk in the past two years.

Dissolved Oxygen (DO) supports all forms of marine life including fish, invertebrates, bacteria, and plants. While all of these organisms require dissolved oxygen the amount of DO they need varies from species to species. Bottom feeders need a minimal amount of oxygen (1-6 mg/L). Shallow water fish need levels 4-15mg/L. Bacteria and other microbes also need DO to decompose organic material (Fondriest, 2016). Just four days after a recent fish kill in the New River in Orange Walk, July 2017, the Sarteneja Alliance for Conservation and Development, Corozal District tested DO, temperature, and turbidity at nine sites upriver from the fish kill site. Their testing indicated surface levels of DO between 0.05 mg/L – 3.76 mg/L (Sarteneja Alliance for Conservation and Development, 2017). The classification and description of the oxygen regime they reported was according to the International Environmental Statistics Standards, United Nations (United Nations Economic Commission for Europe, 1993). All sites tested by the Sarteneja Alliance were in Class IV or V.

The classification description is as follows (United Nations Economic Commission for Europe, 1993).

Class I – DO >7mg/L

Constant near-saturation of oxygen content and the insignificant presence of oxygen-demanding substances for aquatic life.

Class II – DO 7-6mg/L

The oxygen saturation of water is good. Oxygen-demanding substances do generally not disturb oxygen saturation.

Class III – DO 6-4mg/L

Oxygen deficiencies may occur in the hypolimnion. The presence of oxygen-demanding substances sometimes risks considerable negative impacts on aquatic life through the reduction of oxygen content.

Class IV – DO 4-3mg/L

Oversaturation of oxygen deficiency occurs in the epilimnion and oxygen deficiencies are frequent in the hypolimnion, possible owing to chronic problems with the presence of oxygen-demanding substances.

Class V – DO <3mg/L

Acute problems occur in oxygen regime, i.e., oversaturation or oxygen deficiency in the epilimnion and oxygen deficiency leading to anaerobic conditions in the hypolimnion. The high level or presence of oxygen-demanding substances may equally cause acute deficiencies.

(United Nations Economic Commission for Europe, 1993)

These classifications are merely descriptors of the point in time conditions. They do not reflect the overall characterization of 'normal' conditions in the context of any specific site. So while they offer insight, a much larger data set is necessary to determine causality concerning the fish kills. For this project and other water testing done as part of the McMaster Belize

initiative data collected over time at specific locations repeatedly will provide a much more accurate picture of conditions that may or may not be detrimental to aquatic life.

There is some terminology in the classifications that may need further explanation relative to the stratification of the water column in freshwater lakes (The New River Lagoon). The uppermost layer, the epilimnion is defined by temperature and dissolved substances – salt and oxygen. This layer remains near 100% saturation of DO due to the potential for aeration and photosynthesis.

The metalimnion, below the epilimnion, is a transitional layer that fluctuates in thickness and temperature. Two possible conditions that can occur in the metalimnion. First, if the turbidity is low and light can penetrate beyond the thermocline then DO levels will be high. Secondly, in nutrient-rich water, the respiration of organisms can deplete the amount of DO through respiration.

Below the metalimnion is the hypolimnion. If the hypolimnion is deep enough to never mix with the upper layers, it is called a monimolimnion. In the hypolimnion, bacteria and other organisms used dissolved oxygen to decompose organic material that results from dead algae and other organisms that sink to the bottom. DO that is used in decomposition is not replaceable. If the New River Lagoon is holomictic – able to vertically mix, all the layers will mix at least once per year when the strata temperatures align. This turnover redistributes the dissolved oxygen throughout all the layers. At first survey of the data collected in May 2017, this layer seems to be just below 10m in the various areas of the New River Lagoon.

Dissolved oxygen and temperature are inversely correlated. The higher the temperature, the less oxygen the water can hold in solution. Also the deeper the water, the more hydrostatic pressure there is contributing to higher levels of dissolved oxygen. While all of these as individual parameters are easy to understand when in synthesis the conditions that occur are dependent on which of the factors are limiting in a specific location or context.

Methodology

All sites were marked using GPS (Global Positioning System) latitude/longitude coordinates. pH, temperature, dissolved oxygen were assessed at depth using Hach HQd Digital Meter, pHC101 gel-filled pH probe, and LDO101 dissolved oxygen probe.

Results

In May 2017 subsurface water assays showed that there was a definite drop in DO levels at greater depths and lower temperatures. 53.8% (21/39) of the sites tested were Class I, indicating constant near oxygen saturation levels. These samples were taken at depths ranging from 1 meter to 7.5 meters. 2.6% (1/39) of the sites tested were Class II, indicating an adequate oxygen supply for most marine life. 7.7% (3/39) of the sites were either Class III or Class IV, indicating the likelihood of oxygen deficiencies. 35.9% (14/39) of the sites were Class V – signifying acute problems in the available oxygen supply. All the samples that indicated levels below 3mg/L (Class V) were from depths of 10 meters or greater. This condition may or may not be normal for the subsurface ecosystem and the time of year. Thus is it critical that testing continues at other times of the year to better characterize the DO levels documented as normal or anomalies.

In December 2017 subsurface water assays showed that the DO levels within the New River Lagoon were much improved. Note that in December the rainy season is just ending as compared to May when the dry season has just ended. The levels of water in the Lagoon are significantly higher in December. Of the 57 subsurface samples taken (at depths from 1 meter to 10 meters), the DO levels ranged from 3.89mg/L to 8.83mg/L. 49% (28/57) of the samples taken indicated Class I; all of these samples were taken from depths less than 10 meters. 24.6% (14/57) of the samples taken indicated Class II, signifying a good supply of dissolved oxygen for marine life. 24.6% (14/57) of the samples were Class III, suggesting a potential for oxygen deficiencies and only one sample indicated Class IV – a potential for frequent oxygen deficiencies. These results were much different than those collected in December 2015 in which 73.7% (14/19) of the sites (subsurface) tested indicated Class III. Only one location in December 2015 tested at a high enough level to be classified as Class I. In the 13 years that I have been working in Belize, I can say that the weather is different each year. More data will need to be collected to better understand the condition of the New River Lagoon since dissolved oxygen, temperature, and depth are all correlated.

In addition to the New River Lagoon, testing in the New River as it flows near and through Orange Walk has become critical. Friends of the New River, a community organization in Orange Walk Town requested that we test the New River at points where industrial entities are releasing effluent. This request is in response to periodic fish kills, the latest of which I have mentioned above. In December 2017 we were given a boat and the opportunity to sample water on the New River behind several industrial sites including a sugar mill, rum factory, lumber yard, and tortilla factory. December isn't typically the

time of year when fish kills occur but collecting data during December may provide a better understanding of data at the time of crisis.

The data collected in December 2017 included 16 sites upriver from and at Orange Walk Town. The depth of samples ranged from the surface to 8 meters. 93.8% (15/16) of the sites showed DO levels between 3.56mg/L - 4.29mg/L placing them in Class III and Class IV. This data indicates that even at the end of the rainy season this section of the New River has the potential for oxygen deficiencies and or acute oxygen problems. In December temperatures are lower and water levels higher, generally. The levels of DO would be predicted to drop in the summer months as temperature rise. If the data collected in December 2017 is an accurate baseline, then the potential for fish kills in this area is high in the hotter months of the year aligning with reports of these events. When we were collecting samples on the New River, the sugar mill and the rum factory were just beginning operations for the season that same morning. Therefore as their activities ramp up there would be runoff from those processes entering the New River; potentially degrading the water further.

The Friends of the New River are an extension of our long-standing partnership with Programme for Belize. This community group is concerned about the condition of the New River because they own restaurants, hotels, and conduct tours on this waterway. Business suffers if the river is contaminated therefore improving the health of the New River has become a priority, and subsequently, they are supportive of our efforts to determine the type, level, and cause of the contamination.



Professional Development for Educators: Rubric and Assessment Workshop Partnering the Orange Walk District Education Office

As a result of the workshop completed by McMaster Scholar Catlyn Pavel in May 2017, the Orange Walk District Education Office had requested that we provide continuing education to the teachers in this District. I designed a day-long workshop on Rubrics and Assessment as requested by Ms. Carla Alvarez and Ms. Lisa Carillo, both of the Orange Walk District Education Office. In addition to myself the workshop presenters included Associate Fellow Matt Lundin, and Scholars, Corey Davis, Kaitlyn Kuhn, and Taylor Gillig.

The goal of the workshop was to improve the participants' understanding of the utilization of rubrics to inform teaching and enhance student learning. The workshop included an introduction to various types of rubrics and their use, guidelines for creating useful rubrics, an overview and examples of both general and task-specific rubrics, guidelines for creating proficiency-based rubrics, and guidelines for using rubrics for formative and summative assessment. The twenty participants received continuing education credits from the University of Belize for their attendance. Feedback assessments indicated that the workshop was most helpful in providing practical examples of various types of rubrics – specifically analytic and holistic rubrics, providing resources / hand-outs, and introducing them to innovative assessment techniques.

This workshop was a challenge for me personally. My familiarity with rubrics and assessments is mainly at the post-secondary level. McMaster Scholars, listed above, all education majors were critical to fully engaging the Belizean participants, all of whom taught at the primary level. The McMaster Scholars, Davis, Kuhn, and Gillig, were able to not only relate to these educators but show innovative techniques to assess students learning.

Expanding Partnerships

After working in Belize since 2005 I have noted the shifting and expansion of partnerships and their respective priorities. My first projects involved working with farmers to better understand their natural capital – the soil. I conducted soil nutrient analyses to help minimize their application of fertilizers and maintain optimal yields. This continued to a point where the farmers had built a knowledge base relative to crop varieties and optimal fertilization that proved to be sustainable and in fact profit generating. Water testing in the New River Lagoon has been at the heart of the efforts of McMaster Scholars since this initiative started but I was drawn to subsurface testing in order to respond to the need of a village of 200 people for a

water source not contaminated with nitrates. Although this critical point in time has passed, Programme for Belize and a community group have other concerns about both the New River Lagoon and the New River focused on dissolved oxygen levels and chemical contaminants. Our work in education in the Orange Walk District has expanded from modeling active pedagogies in classrooms in remote village schools to providing professional development that is responsive to the needs of education professionals in the country. Through more than a decade of collaboration, responsive research, and trust the McMaster Belize teams have been adaptive and dedicated to the direction and needs of the people living in north central Belize. The impact of these partnerships on me has been profound.

REFERENCES

- Camargo, J. A., & Alonso, A. (2006). Ecological and toxicological effects of inorganic nitrogen pollution in aquatic ecosystems: A global assessment. *Environment International*, 831-849.
- EYEliance. (2016). *Eyeglasses for Global Development: Bridging the Visual Divide*. World Economic Forum.
- Fondriest. (2016). *Fundamentals of Environmental Measurements*. Retrieved from Fondriest: <http://www.fondriest.com/environmental-measurements>
- Jones-Jordan, L. A., Sinnott, L. T., Graham, N. D., Cotter, S. A., Kleinstein, R. N., Manny, R. E., . . . Zadnik, K. (2014). The Collaborative Longitudinal Evaluation of Ethnicity and Refractive Error (CLEERE) Study. *Investigative Ophthalmology and Visual Science*, 6333-6339.
- Sarteneja Alliance for Conservation and Development. (2017). *New River Water Quality Assessment after Fish Kill Event*. Sarteneja Village, Corozal District.
- Studer, M. (2012). Community-Based Research in Northern Belize. *The McMaster School for Advancing Humanity Journal*, 16-17.
- Studer, M. (2014). Research Coming Together to Effect Change in Northern Belize. *The McMaster School for Advancing Humanity Journal*, 7-13.
- Studer, M. (2016). The Sustainability of Collaborative Community-Based Research. *The McMaster School for Advancing Humanity Journal*, 9-15.
- Studer, T. (2012, 2 11). Results of December 2011 Water Testing - Nitrates. (M. Studer, Interviewer)
- The Multi-Ethnic Pediatric Eye Disease Study Group. (2013). Prevalence of Amblyopia and Strabismus in African American and Hispanic Children Ages 6 to 72 months: Multi-Ethnic Pediatric Eye Disease Study. *Ophthalmology*, 1129-1236.
- U.S. Preventative Service Task Force. (2011). Vision Screening For Children 1 to 5 Years Of Age: U.S. Preventative Service Task Force Recommendation. *Pediatrics*, 340-346.
- United Nations Economic Commission for Europe. (1993). Standard Statistical Classification of Surface Freshwater Quality for the Maintenance of Aquatic Life. *Readings in International Environmental Statistics* (pp. 53-64). New York and Geneva: United Nations.
- US Environmental Protection Agency. (2016, August 3). *Estimated Nitrate Concentrations in Ground Water Used for Drinking*. Retrieved from Nutrient Policy and Data: <https://www.epa.gov/nutrient-policy-data/estimated-nitrate-concentrations-groundwater-used-drinking>
- World Health Organization. (2007, November). *National Institutes of Health*. Retrieved from Assessment of the Prevalence of Visual Impairment Attributable to Refractive Error or Other Causes in School Children: <http://www.who.int/blindness/causes/RESCProtocol.pdf?ua=1>

CRITICAL WATER ANALYSIS IN THE NEW RIVER AND NEW RIVER LAGOON

Madeline Homan, McMaster Scholar, Belize 2016-2017

In this research project, I analyzed the water quality of both the environmental water of the New River Lagoon and the potable water sources in the villages adjacent to the Rio Bravo Conservation and Management Area to contribute to the data collected over the past decade and convey the results to the village communities and Programme for Belize. The tests that were performed analyzed the bacterial contaminant, nitrate nitrogen, phosphorus, dissolved oxygen, pH, free chlorine, and ammonia levels. These analyses allowed for improved access to safe drinking water for Belizeans who live in this area, and; worked to monitor the environmental water to preserve its viability for aquatic life.

The New River Lagoon is the largest body of fresh water in Belize. This body of water supports a variety of aquatic and bird life and serves as a source of food and water (in the dry season) for the surrounding villages. The data that the McMaster Scholars have been collecting for over a decade has shown intermittent high levels of nitrates in both potable and environmental water and harmful bacteria in potable water in the village of San Carlos. With this year's trip being in May (at the end of the dry season) instead of December (generally at the end of the rainy season), we had the opportunity to develop new baseline data for a different time of year.

In past years data collected by former McMaster Scholars evidenced that the majority of the wells in San Carlos that were tested contained bacterial contaminants in the water. Bacteria contamination in well water is a recurring issue in Belize because most wells are open at the surface and lack water-tight caps or casings. When there is a significant amount of bacteria in drinking water, a variety of illnesses can occur, including intestinal infections, dysentery, hepatitis, cholera, and typhoid fever. Coliform bacteria found in drinking water are indicators of pathogenic organisms that cause the diseases listed above. The majority of the children in this village are placed on de-wormers on a regular basis due to the contamination of the waters in which they swim, bathe, and drink. The best way to eliminate bacterial contaminants is to boil the water for several minutes before using it (Disinfecting Drinking Water). However, boiling water is not always a viable option if there are chemical contaminants, such as nitrates, also present in the water.



In past visits to Belize, McMaster Scholars have found high levels of nitrate nitrogen in most of the potable water that was tested (Alexander, 2014). According to Oram, “excessive concentrations of nitrate nitrogen or nitrite nitrogen can be hazardous to health, especially in infants and pregnant women” (Oram). Because nitrate nitrogen is colorless, odorless, and tasteless, people are not likely to recognize the presence of high nitrate levels. Some health effects that may occur from ingesting nitrate-contaminated water include digestive system problems and blue baby syndrome. Nitrites in the blood oxidize the iron in hemoglobin, subsequently forming methemoglobin which lacks the oxygen-carrying ability of hemoglobin (Self, 2013). According to the EPA, the standard for nitrate-nitrogen concentrations in water is 10mg/L and the standard is 1mg/L in regulated water systems. The methods for removing nitrates include reverse osmosis, ion exchange, and distillation; however, these methods are complicated

and couldn't be done on site in Belize (What are Nitrates?). Nitrates also affect aquatic life because the amount of nitrates in the water determines the number of plants and algae that can grow in those areas (What are Nitrates?). Overall, the most feasible way of accessing water without elevated nitrates is to find a new source of water.

Phosphorous, or phosphates, in high concentrations above 0.1 mg/L, can also accelerate plant growth, and algal blooms. Both nitrates and phosphorous have the potential to cause unstable amounts of dissolved oxygen in environmental waterways. Unstable low quantities of dissolved oxygen cause stressful conditions for the fish, negatively affecting reproduction, forcing relocation, and contributing to aquatic die-offs. When meeting with Programme for Belize in December 2015, they expressed concern for the fish kills occurring in the New River near Orange Walk. Fish kills typically occur from the lack of dissolved oxygen in the water, especially when dissolved oxygen levels decrease drastically, making it insufficient for marine life to survive. Reduced dissolved oxygen levels can occur due to several factors, or a combination of factors including, specific weather patterns, temperature, the amount of plant growth, the fish community structure of that area, and the presence of viruses and bacteria (Causes and Prevention of Fish Kills, 2016).

According to the Water System Council, acceptable pH levels in drinking water should be between 6.5 and 8.5 (Wellcare® Information for you About PH in Drinking Water, 2007). Though high alkalinity does not pose health risks, aesthetic problems such as sour taste can occur (Wellcare® Information for you about PH in your Drinking Water, 2007). In environmental waterways, deviations from these levels can have damaging effects on the aquatic life in those environments that can lead to the death of the organisms. According to recorded data in the past, pH levels have not been a problem, but they are still important to continuing testing because they can fluctuate and cause adverse effects.

In an agricultural country such as Belize, fertilizers and animal feed products contain ammonia in their products. High levels of ammonia disturb glucose intolerance which reduces the body's tissue sensitivity to insulin and irritates the eyes, nose, and throat. Ammonia is also detrimental to aquatic life when concentrations are high (Saskatchewan Ministry of the Environment, 1997).

Chlorine is added to drinking water as a disinfectant to reduce the chances of typhoid, cholera, hepatitis A, and other diarrheal diseases (World Health Organization). The water I am testing in Belize has not been treated with chlorine. The data from the last 11 years shows that free chlorine has not been a significant issue; however, due to the effects that could occur, free chlorine will continue to be tested.

Temperature has a significant influence on biological activity and growth in environmental water. It affects the water chemistry, such as increasing the chemical reactions that occur as the temperature increases. Temperature affects dissolved oxygen levels. When the water temperature increases, it holds less dissolved oxygen, which results in insufficient levels of oxygen for the survival of some aquatic life.

Because our trip was moved from December to May, we had to keep in mind that though weather and water conditions aren't extremely different, even a small difference may play a role in the chemical conditions and how they are affecting the aquatic life.

While in Belize in May 2017 I collected and tested potable water samples from 29 sites in several villages. This water was sourced from wells, rain catches (cisterns), and in San Carlos water piped to the village from an underground source. I also collected and analyzed samples from 41 environmental water sites within the New River Lagoon, its tributaries and a several outflows of the lagoon into the New River just offshore in Orange Walk. All sites were marked with GPS latitude-longitude coordinates and analyzed using the Hach Pocket Colorimeter 2 device, the Hach Surface Water Testing kit, Hach pathogen screen, and the Apera PH20 Value pH tester.

After analyzing the data, 18 out of 29 sites of potable water contained bacterial contaminants. Out of these, only two sites contained nitrates that were above acceptable levels. When discussing these results with the people in the villages, our findings showed that most of the sites that were contaminated were only being used for washing clothes and that they were using bottled water for drinking, washing fruits and vegetables, and cooking. On this trip, the water piped into San Carlos from Indian Church was working. This source from Indian Church provided water to outside faucets at each house. However, many of these sources were contaminated with bacteria. When talking to the people about this problem, we discussed running the water for a minute before using and to regularly bleach the cloths they used to cover the faucets to prevent contamination.

When reviewing the results from the environmental water sites, it was noted that the levels of dissolved oxygen were very low (2.49mg/L) around the tortilla factory and sugar mill in Orange Walk. DO levels at all the sites tested in the New River Lagoon indicated of an adequate supply of dissolved oxygen to support aquatic life. When analyzing the rest of the data, the

levels of the other chemicals tested were normal, safe levels and were very similar results compared to the water analysis performed in December 2015.

When all the samples were collected and tested, I compiled all of my data and distributed my findings to our community partners - Programme for Belize and the communities of San Carlos and Rancho Dolores through either a village meeting or through working with individuals on site.

REFERENCES

- Alexander, M. (2014). WATER QUALITY ANALYSIS IN RURAL BELIZE. *The McMaster School for Advancing Humanity Journal*, 8, 27.
- Causes and Prevention of Fish Kills. (2016, October 24). Retrieved from Florida Fish and Wildlife Conservation Commission: <http://myfwc.com/conservation/you- conserve/recreation/pond-management/fish-kills/>
- Disinfecting Drinking Water. (n.d.). Retrieved October 17, 2015, from Health Link BC: <https://www.healthlinkbc.ca/healthlinkbc-files/disinfecting-drinking-water>
- Oram, B. (n.d.). Nitrates and Nitrites in Drinking Water Groundwater and Surface Waters. Retrieved 2015 4, April, from Water Research Center: <http://www.water-research.net/index.php/nitrate>
- Saskatchewan Ministry of Environment. (1997). *Water Security Agency*. Retrieved from EPB431-Ammonia Fact Sheet: www.saskh20.ca/DWBinder/epb431.pdf
- Self, J. &. (2013, November). Nitrates in Drinking Water. Retrieved April 4, 2015, from Colorado State University Extension: <http://extension.colostate.edu/topic-areas/agriculture/nitrates-in-drinking-water-0-517/>
- United States Environmental Protection Agency. (2015, October 21). Chapter 5 Water Quality Conditions. Retrieved from EPA: <https://archive.epa.gov/water/archive/web/html/vms50.html>
- Wellcare® Systems Council. (2007). Wellcare® Information for you About PH in Drinking Water. Retrieved 2015 4, April, from https://www.watersystemscouncil.org/download/wellcare_information_sheets/potential_groundwater_contaminant_information_sheets/9709284pH_Update_September_2007.pdf
- What are Nitrates? (n.d.). Retrieved October 17, 2015, from Benton Franklin Health District: <http://www.bfhd.wa.gov/info/nitrate-nitrite.php>
- World Health Organization. (n.d.). Fact Sheet 2.31. Retrieved November 11, 2015, from World Health Organization: http://www.who.int/water_sanitation_health/hygiene/emergencies/fs_31.pdf

UNIVERSAL DESIGN FOR LEARNING APPLIED TO MULTI-GRADE CLASSROOMS IN BELIZE

Catlyn Pavel, McMaster Scholar, Belize 2016-2017

This research project provided information and strategies about Universal Design for Learning (UDL) to educators in the Orange Walk District of Belize so they can use a variety of testing methods to reach all learners in their classrooms. Belize is a developing country and has limited resources, limited teacher training, and limited opportunities for struggling students. Students are being held back and not progressing in their education. Introducing UDL strategies will help the teachers have a variety of approaches to use to help students learn. According to Katz (Katz, 2013), UDL recognizes the need for inclusion of diverse learners and seeks ways to access the social and academic life of the classroom for all learners by providing access to the curriculum and a variety of instructional activities.

To be effective, teachers need to use a variety of strategies that engage students in the learning process. The core principles of UDL can be summarized as multiple means of representation, multiple means of engagement, and multiple means of expression. Spencer (Spencer, 2011) writes that representation is how you teach the content and make it accessible by using a variety of different methods like videos, websites, pictures, or objects from everyday situations. Multiple means of representation are associated with the “what” of learning. Teachers pull from the students’ prior knowledge as well as learning styles to help make connections between the new information and the previous knowledge and experience the student has (Evans, 2010). Multiple means of engagement deals with the “why” piece of learning. Teachers want to promote student interest and motivation by connecting education to real life, but this component also deals with the social aspects and interactions with peers while they learn (Evans, 2010). A way one can empower students is by providing choices,



reducing anxiety and rewarding effort. This way educators can develop motivating and accessible instruction that will increase the participation of all learners, including those with special needs (Spencer, 2011). Another core principle is multiple means of expression which focuses on how the students will show what they are learning by providing students with a variety of options where they can demonstrate their knowledge (Spencer, 2011). The proactive nature of UDL helps to provide flexibility and accessibility to decrease barriers students with disabilities face and eliminate most of the need for accommodations by the teachers after their lessons have been designed (Spencer, 2011). Universal Design for Learning introduces the idea that teachers

can plan instructional supports while writing their lesson plans instead of modifying instruction and materials as an afterthought (Spooner, 2007).

In Belize, primary education is required to age fourteen, but secondary education (high school) and tertiary (post-high) schools cost to attend. In the Orange Walk District, they have multi-grade classrooms and are seeking ways to help struggling learners. The teachers are currently using the same methods for teaching all students. Universal Design for Learning could help teachers utilize more strategies and to reach the variety of students in their multi-grade classroom. According to Ms. Carla Alvarez, the Orange Walk District Education Officer, they have found significant problems with students not being able to understand the material, therefore, failing the class and then those students are presented with the content again using the same methods the following year. Ms. Alvarez also noted that the Orange Walk District has the highest number of Infant 1 students being held back compared to other districts in Belize (Studer, 2016).

Universal Design for Learning can be incorporated in multi-grade classrooms. In fact, multi-grade teachers use parts of UDL according to Vincent (Vincent, 1999) when they recognize that whole-class instruction needs to revolve around open-task activities so all students can be engaged. The teachers differentiate the material to teach the different knowledge levels that are in their classroom. In using the principles of UDL to present the content in different ways and incorporating different strategies to help engage and share their knowledge, teachers can help students to have a deeper understanding of the material and help enhance student motivation.

According to Wery and Thomson (Wery, 2013) teachers can improve struggling students' motivation in a variety of ways such as believing that all students can learn, connecting the learning to the real world, and helping students find the fun and exciting aspects of tasks while also getting them involved in the learning process.

While in Belize I conducted workshops for principals and teachers in the Orange Walk district on the core components of Universal Design for Learning and provided a variety of strategies to help the learners in their classrooms to understand the content. The presentation went well. Thirty educators participated in the interactive workshop. Twenty-five teachers completed pre and post surveys. All but three teachers teach in a multi-grade classroom, with the majority teaching 16 to 20 students. The most common way teachers reported helping students who struggle is providing one on one support, in the classroom or after school, or through extra classes. All twenty-five teachers said that they use pictures and visuals, and link lessons to previous lessons taught. Twenty-two teachers (88%) reported that they provide information out loud and in writing, use objects, break information into smaller pieces, use age-appropriate content, and show different approaches that students can use. Twenty-one teachers (84%) implemented classroom routines. Nineteen teachers (76%) stated that they use prompts allow students to stop to think about and explain their work. The same number reported that they allowed for different ways for students to respond in both writing and verbally and for students to organize information. Eighteen teachers (72%) stated they provide choices and highlight patterns for their students. The strategies that they use less often are different text sizes, which twelve teachers (48%) use, fifteen teachers (60%) provide socially relevant connections,

and seventeen teachers (68%) stated that they provide checklists and vary time to complete tasks. The most significant challenges that the teachers reported was lack of materials as well as having the ability and know how to help students of different skills, abilities, and needs. Another big challenge that they face is language barriers, with many students speaking Spanish at home and the English at school. The students struggle most in language arts and are unable to express themselves in effectively in writing and or verbally. Teachers identified that many students struggle with reading comprehension. Functional literacy has been a continuing focus of the McMaster teams for years working in schools in various rural villages. I also learned that there are only two schools in Belize that are specifically for individuals with disabilities both in urban areas.

Before learning about Universal Design for Learning strategies teachers reported using some components and strategies of UDL. The strategy most commonly used to help students who were struggling was extra support either one on one or through additional classes. The biggest challenge that the teachers reported facing was knowing how to help different students with various needs and abilities during actual class sessions, as well as having a lack of resources, both materials and time. The feedback for the workshop showed that teachers found the workshop components helpful with the definition of UDL and its core principles as well as having the opportunity to plan using UDL. The other part that teachers found most helpful was having the opportunity to discuss and come to a consensus about the challenges and issues that they face. Teachers would have liked more time and further instruction on incorporating Universal Design for Learning into lessons. Having a workshop where teachers could continue exploring Universal Design for Learning strategies and collaborate with one another to see how UDL can be applied in their classrooms could be a focus in the future. Another workshop that was requested was one on assessment.

Belizean teachers in the Orange Walk District are dedicated to their students and are anxious to learn about effective teaching strategies. While currently incorporating some UDL strategies they were excited to learn about additional pedagogies they could utilize. The problem still exists that current demands on their time, whether administrative duties or long commutes, may be prohibitive to widespread incorporation of these strategies in their teaching. Belizean teachers rarely share lesson plans, something that is common in the U.S. This may be due to cultural factors, limited internet access, or remote proximity to each other, but doing so could facilitate more significant incorporation of UDL strategies and feedback about implementation specific to multi-grade classrooms in Belize.

REFERENCES

- Evans, C. W. (2010). Modeling, Guided Instruction and Application on UDL in a Rural Special Education Teacher Preparation Program. *Rural Special Education Quarterly*, 29(4), 41-48.
- Katz, J. (2013). The Three Block Model of Universal Design for Learning (UDL): Engaging Students in Inclusive Education. *Canadian Journal of Education*, 36(1), 153-194.
- Spencer, S. A. (2011). Universal Design for Learning: Assistance for Teachers in Today's Inclusive Classrooms. *Interdisciplinary Journal of Teaching & Learning*, 1(1), 10-22.
- Spooner, F. B.-D. (2007). Effects of Training in Universal Design for Learning on Lesson Plan Development. *Remedial & Special Education*, 28(2), 108-116.
- Studer, M. A. (2016, Fall). Dean of the McMaster School for Advancing Humanity. (C. Pavel, Interviewer)
- Vincent, S. (1999). *The Multigrade Classroom: A Resource Handbook for Small, Rural Schools. Book 1: Review of the Research on Multigrade Instruction*. Portland, OR: Northwest Regional Educational Lab.
- Wery, J. &. (2013). Motivational Strategies to Enhance Effective Learning in Teaching Struggling Students. *British Journal of Learning Support*, 28(3), 103-108. doi:10.1111/1467-9604.12027

WORKING TOWARD BETTER HEALTH THROUGH BETTER NUTRITION

Zackary Reed, McMaster Scholar, Belize 2016-2017

Coronary heart disease (CHD) and diabetes are two leading causes of death in Belize. In the communities of Rancho Dolores and San Carlos, where my project took place, there is a significant lack of knowledge about the connection between these diseases and the food they consume.

The prevalence of coronary heart disease is often linked to obesity, a concern in the U.S. and Belize. Coronary heart disease is the buildup of plaque in the arteries. Causes of CHD are physical inactivity, unhealthy weight gain, and having a lack of a well-balanced diet (American Heart Association, 2015). In conversations in our learning community with former scholars and fellows, I learned that CHD is a serious concern for the people of Rancho Dolores and San Carlos.

Diabetes is the second leading cause of death in Belize. According to the American Diabetes Association, there are two types of diabetes, Type I and Type II diabetes. In Type I diabetes, the body does not produce insulin. The body breaks down the food we eat into glucose. Insulin is the hormone that the body needs to get glucose from the bloodstream to the cells in our body. Type II diabetes is when your body does not produce or use insulin properly. Over time, the body will not be able to make enough insulin to keep the glucose levels normal (American Diabetes Association). In Belize, people have mentioned that others know they have diabetes, but are unsure how to live with it. Access to regular medical care and information is limited in these remote areas, and often people receive a diagnosis from a doctor only to then receive treatment from a traditional medicine healer because the latter is more accessible and affordable.

My project worked to inform Belizeans about these diseases and how they can improve their nutrition to lessen their chances of getting CHD or diabetes. I focused my discussions about nutrition in these communities on portion control, a balanced diet, and limiting intake of sugary drinks. I had a lengthy conversation with the women of both villages. Also, I taught lessons on healthy eating to all the grade levels in San Carlos School.



According to the Ministry of Health, Belizeans should incorporate six essential nutrients in their daily meals. In Belize, rice is included in the majority of meals. Rice is an excellent source of carbohydrates. The problem with eating too much rice is the body is going to begin to store those carbohydrates as fat and use it as energy. Having energy is a good thing, but over time the body is going to keep using the new carbs that are being eaten and not use the carbs that have already been stored. Proteins are a critical part of a healthy diet. Limited resources often force the protein in these communities to consist of beans, fish, and occasionally chicken. I also discussed the importance of fats, vitamins, minerals, and water. I utilized the Belize nutritional guidelines produced by the Ministry of Health (FiWeBelize, 2012); a document that people in these communities didn't previously have access to because it is available only online.

Portion control is a significant issue. After eating in the villages, I noted that the amount of beans and rice served at the noon meal is about 3-4 times what one would typically consider a single serving. I didn't have the opportunity to observe multiple meals in the same location, but in talking to the women of the village, I

understood that breakfast consisted of tortillas and beans, and dinner consisted of beans and rice and tortillas. Vegetables such as onions, peppers, carrots, and cabbage are grown in the village of San Carlos and are utilized in these meals as well. Fruits such as melon, bananas, oranges, mangos, and papaya are eaten as snacks and not considered part of a meal. There are several small stores in people's homes in the villages – all of which sell soda, chips, etc. The children and adults of these villages consume these unhealthy snacks daily without the knowledge of how these products may affect their overall health.

I thought my project was successful. I was encouraged by the questions that the women in both villages asked, specifically related to the components of a balanced diet. I think this was because I was showing Belizean (not the U.S.) nutritional standards. I'm less certain that discussions about portion size were successful. It is a culturally accepted norm to serve rice and beans at every meal in unlimited quantities, and it is an affordable means to satisfy hunger. It is my hope that working with the children in the village of San Carlos and teaching them about healthy eating will cause the next generation to change to a new healthier norm.

REFERENCES

- American Diabetes Association. (n.d.). *Type 2*. Retrieved March 13, 2017, from American Diabetes Association: <http://www.diabetes.org/diabetes-basics/type-2/>
- American Heart Association. (2015, July). *Coronary Artery Disease - Coronary Heart Disease*. Retrieved from American Heart Association: http://www.heart.org/HEARTORG/Conditions/More/MyHeartandStrokeNews/Coronary-Artery-Disease---The-ABCs-of-CAD_UCM_436416_Article.jsp#.W0Xpe9VKiUk
- FiWeBelize. (2012). *2012 Food-Based Dietary Guidelines for Belize – Ministry of Health*. Retrieved from FiWeBelize: <http://fiwebelize.com/2012-food-based-dietary-guidelines-for-belize-ministry-of-health/>

TECHNOLOGY TRAINING AND ASSESSMENTS IN RURAL BELIZE

Zachary Roush, McMaster Scholar, Belize 2016-2017

In the last two years that I have been in Belize, I have collected data regarding people's knowledge about and access to technology. In December 2015 I learned that the women in Rancho Dolores wanted to learn about computers and genuinely wanted to better their technological skills because some of the villagers have personal computers, but they may not know how to use them to their full potential and how to prevent problems. In May 2017 I provided the women of Rancho Dolores with a resource manual that I developed that will aid with troubleshooting computer problems. Ms. Tucker, the Warden at the school in Rancho Dolores, has stayed in email contact with me and reported that they have been able to use aspects of the manual to help them through computer issues.

One thing that I have noticed over the past two years of traveling to Belize is that these communities may not have access to a reliable source of clean water, or access to good education, but many seem to have access to cell phones. Whether they are smartphones or feature phones, they have them. Another goal of this project was to assess the use and pricing of these cellular devices because as they advance, many cellphones have the features that up to this point we may have only seen on computers and tablets. Improving the knowledge of technology within these communities so that they can use these skills to help their children and secure jobs would be a significant outcome.

Over the last two decades, the world has seen an increase in the advancement of technology, from the development of portable computers to the development of storage devices that are the size of a postage stamp or smaller, and even the creation of a telephone that functions like a computer and fits in the palm of one's hand. This advancement in technology has led to more developments in the field of technology and made it much more affordable. Cellphones can also facilitate access to the internet in remote locations that don't have computer access to the internet.

I did see that many of the women of San Carlos have cell phones, and they use them for the same things that we would use them for in the United States, including Facebook. When you consider how much we utilize social media to stay in touch, it isn't surprising that in more isolated areas this is just as, if not more important. For developing countries like Belize, it is,

in fact, more affordable to forgo telephone landline installation and move directly to installing cell phone towers. Granted the cell phone capabilities are spotty in the remote areas and villages where we were the local people know exactly where to go and where stand to get the best reception, and they are much more tolerant of poor reception than we are in the U.S.

I also researched cell service cost. One of the service providers in Belize for cell phone plans is DigiCell. DigiCell offers plans ranging from \$89 Belize (\$44.50 USD)/month with 4GB of data, to a plan that costs \$249 Belize (\$124.50 USD)/month with 18GB of data (DigiCell, 2017). The price of the phones is separate from the plan itself. The cost of mobile phones seems to range from \$139 Belize (\$69.50 USD) to \$1529 BZE (\$764.50 USD) (DigiCell, 2017). The other company that provides cellphone service in Belize is smart!. smart! offers multiple plans from a prepaid plan to one suitable for businesses with up to 40 lines at \$1500 Belize (\$750 USD)/month (smart!, 2017).

Cell phones in Belize are quickly becoming the norm. Computers and internet access are unfortunately still not usual in the schools in these villages. This disparity in access to technology perpetuates a gap in educational access that continues to play out regarding careers and employment in these remote areas. Working with the women in Rancho Dolores as computers begin to become part of their lives was rewarding, but this small step is only an indication of how far technology has to move to provide access for those villages like San Carlos in order to bring parity in the access to technology with schools in urban areas.



REFERENCES

- DigiCell. (2017). *Postpaid Data Basic Plans*. Retrieved from DigiCell: <https://www.digicell.bz/digiservices/postpaid/postpaid-data-basic-plan>
- smart! (2017). *Plans*. Retrieved from smart! Bringing People Together: <https://smart-bz.com/plans/>

INNOVATIVE LESSON PLANNING FOR FULL-INCLUSION WITH THE USE OF UNIVERSAL DESIGN FOR LEARNING

Corey Davis, McMaster Scholar, Belize 2017-2018

In both developed and developing countries education is continuously evolving. Education policies and governmental policies change from one election to the next. This ongoing change has hampered Belize's development from a macro-perspective. The 2016 Human Development Report Index (HDRI), concluded that Belize ranked 103rd out of 188 countries in 2015 on its scale based on the country's achievement relative to longevity, knowledge, education, and economic standard of living. This rating indicates that Belize may be struggling in the four categories assessed in the index (United Nations Development Programme, 2016).

Graduation rates in Belize are lower than in neighboring countries in Central America. In 2009, 83 percent of Belizean youth aged 15 to 19 years had completed primary education while the Latin America and the Caribbean (LAC) region reported an average primary completion rate of 88 percent among their 15 to 19-year-olds and 95 percent of the youth in the same age group completed this level in Costa Rica, Mexico, and Panama. Primary school graduation rates for Belizean youth living in rural areas and those in the lowest income quintile is only 76 percent compared with 91 percent of those in urban areas (Martin, Alonzo, & Näslund-Hadley, 2013).



Lack of teacher training and low graduation rates are the primary reasons why Ms. Carla Alvarez, the District Education Officer of Orange Walk, requested continuing education in Universal Design for Learning (UDL) for the teachers in her district.

The goal of this project was to provide teachers of the Orange Walk District with the knowledge and skills necessary to create a more inclusive classroom through the use of Universal Design for Learning (UDL), expanding the initial introduction to UDL by McMaster Scholar Catlyn Pavel in May 2017. The framework of UDL can be separated into three categories: multiple means of representation, various methods of engagement, and multiple means of expression; thus allowing all students to see, use, and express what they are learning in a variety of ways. The research found through the University of Vanderbilt's Center for Teaching concluded that educators who understand and use the teaching styles of active learning, cooperative learning, team-based learning, and visual learning, are more likely to engage their students in the process of learning (Universal Design for Learning Theory and Practice, 2014).

Pre-trip I researched the Vanderbilt Center for Teaching and *Universal Design for Learning Theory and Practice* by Meyer, Rose, and Gordon. I also utilized the Belizean Science and Mathematics Curriculum along with a Belizean lesson planning template to design multiple lessons that incorporated the UDL into the framework of the content standards. My pre-trip research was documented in a resource binder that was provided to Orange Walk District Education Office to be copied and distributed as needed. The resource binders included sections of educational resources, additional UDL information, assessment options, and

examples of Belizean lessons that incorporate UDL.

While on site I conducted a full day interactive workshop on UDL lesson planning at the Orange Walk District Education Center. The 24 teachers attending the workshop received continuing education credits from the University of Belize. The first half of the workshop provided both UDL theory and practical information about the incorporation of UDL into the classroom. The second half of the workshop facilitated lesson planning and lesson demonstrations. One of the major barriers to the integration of UDL in the classroom is the time needed to develop the lessons. As a result of the workshop, each teacher completed one lesson plan that could be implemented immediately and the opportunity to expand their capabilities by sharing UDL lesson plans as appropriate with other educators in attendance. A survey was conducted at the completion of the workshop that indicated these educators gained knowledge about UDL strategies, understood the potential for UDL to improve student learning, and felt empowered to develop lessons that included UDL components. That being said, the short and long-term effects of the UDL workshop I conducted will likely remain ambiguous, since many changes in an educator's style take several years to learn, implement correctly, and assess.

Even though the result of the workshop may remain unclear, a vast amount of knowledge on the Belizean Education System was acquired. Ms. Alvarez supplied us with a complete copy of the current Belizean Education Standards, which is beneficial for future McMaster education-based projects. We learned more about the formalized assessments used by the Ministry of Education, such as the Belize Junior Achievement Test (BJAT) administered after the completion of Standard III and the Primary School Examination (PSE) is administered after the completion of standard VI. The PSE tests Belizean students' abilities in English, mathematics, science, and social studies. This test is used in determining, who moves from primary to secondary education and is considered a national examination (Carrillo & Mendez, 2017). Also, the workshop allowed the McMaster School to understand better how Belizean teachers evaluate students' progress inside their classroom. Belizean teachers have been trained to follow the structure as follows: write objectives, subtopic, and development, assessment, and evaluation (reflection). Measuring students' progress in this prescriptive manner can inhibit students' progress as well according to educators at the workshop. Ms. Lisa Carrillo and Ms. Doña Mendez, Orange Walk District Education Officers, acknowledged that teachers get moved around from school to school often. "This chronic change can place both parties (students and teachers) out of their comfort zone." (Carrillo & Mendez, 2017) Additionally, the teachers in the workshop discussed how many schools lack the necessary resources to function on a day to day basis, since the Belizean Government pays only the teachers' salaries in schools. Supplies and clothing are left up to and supplied by the students' parents or family. Lastly, the educators believe that stigmas associated with disabilities, cultural expectations, and government policies all contribute to students' success or lack of success in their academic experience. Societal views of disabilities and the desire to mainstream students with disabilities have been difficult to achieve in the United States. This process of inclusion in Belize seems to be ahead in development out of necessity. There are only a limited number of schools dedicated to working with students with disabilities and those schools only exist in larger urban areas.

Research showed that teacher training in Belize varies significantly from one individual to the next, some have no formal training, while others have acquired a master's degree in teaching (Armstrong, 2011). However, on the ground, I learned that the Ministry of Education altered its requirements for teachers training and obtaining a license to teach in Belize. The new requirements for getting a teaching license are a bachelor's degree, a 15-week internship, and 120 hours of continuing education every five years. With an associate's degree, one is considered pre-service and can serve as assistants in the classroom (Carrillo & Mendez, 2017). Many of those currently employed as teachers without these requirements are hurrying to meet the new requirements, or they will lose their jobs.

The long-term implication of this project has the potential to change the teaching style of Belizean educators, which subsequently influences every single student. The teachers who take away and implement several pieces of UDL will provide an advantage to students with varying capabilities.

Even though this particular project may have initially only impacted education within the Orange Walk District; it is possible that in due time it will have further reaching effects in Belize by creating a better-educated society. Teacher workshops have been a significant part of the McMaster School's efforts to improve access to education in the Orange Walk District of Belize over the last several years. These teachers indicated that in the future they would like to see workshops on instructional technology in the classroom and a variety of lessons plans that focus on the areas across the Belizean Curriculum.

REFERENCES

- (2014). In A. Meyer, D. H. Rose, & D. Gordon, *Universal Design for Learning Theory and Practice* (pp. 28-29,91,99,102). Wakefield, MA: CAST Professional Publishing, an imprint of CAST, Inc. Retrieved October 10, 2017
- Armstrong, C. J. (2011). *Belizean primary school teachers' understanding of assessment; assessment practices, and use of student assessment data*. Ph.D. Thesis, Graduate College of the Oklahoma State University. Retrieved September 26, 2017
- Carrillo, L., & Mendez, D. (2017, December 6). Discussion After UDL Workshop. (K. K. Corey Davis, Interviewer) Orange Walk, Belize.
- Martin, D., Alonzo, M., & Näslund-Hadley, E. (2013). *Challenges and Opportunities in the Belize Education Sector*. Inter-American Development Bank, Education Division. Retrieved October 17, 2017, from <https://publications.iadb.org/bitstream/handle/11319/5926/Challenges%20and%20Opportunities%20in%20the%20Belize%20Education%20Sector.pdf?sequence=1&isAllowed=y>
- United Nations Development Programme. (2016). *Human Development Index*. Retrieved from <http://hdr.undp.org/en/indicators/137506#>

ASSESSING THE QUALITY OF DRINKING WATER IN RURAL BELIZE

Mackenzie Durdak, McMaster Scholar, Belize 2017-2018



In 2005, the McMaster School for Advancing Humanity began community-based research in Belize to test the potable water quality of rural villages. While on site in Belize in December 2017 I tested potable water sources for pH, nitrates, ammonia, chlorine, phosphorous, and bacterial levels.

Each of these chemical and bacterial components has different effects on the human body. A lower pH represents a higher acidity, and a higher pH represents higher basicity in the substance. The pH of drinking water plays a significant role in the human body and should remain between 6 and 8.5 (Oram B. , *The pH of Water*, 2014).

Nitrogen is an inorganic molecule that is formed from a variety of environmental conditions (McCasland, Trautmann, & Porter, 2012). Nitrogen is found in a wide range of products, with fertilizers being a common source. When consumed in levels over 10 mg/L, nitrogen can have adverse effects on humans. Nitrogen combined with oxygen forms nitrite in the body, which “oxidizes the iron in the hemoglobin of the red blood cells to form methemoglobin, that lacks the oxygen-carrying ability of hemoglobin” (Oram B. , *Nitrates and Nitrites in Drinking Water Groundwater and Surface Waters*, 2014). When a buildup of

methemoglobin occurs, the human body does not receive enough oxygen to thrive and as a result, victims suffer from headaches, shortness of breath, lack of energy, and muscle weakness (Denshaw-Burke, 2017) to even more severe cases such as cancer, disruption of the thyroid, birth defects, and even death (McCasland, Trautmann, & Porter, 2012). Infants are most susceptible to methemoglobin build up. To prevent these symptoms from occurring, the nitrate/nitrite level in potable water should be below a maximum of 10 mg/L (Oram B. , Nitrates and Nitrites in Drinking Water Groundwater and Surface Waters, 2014).

Higher ammonia levels can cause a variety of health problems when consumed in potable water sources above .2mg/L. Issues that may result from high ammonia levels include the development of lung edema, nervous system dysfunction, acidosis, kidney damage, and increased blood pressure (World Health Organization). Sources of ammonia are often from agricultural practices or by-products (i.e., fertilizer or livestock waste), atmospheric deposition (i.e., rainwater), or from the burning of waste (Oram B. , Ammonia in groundwater, runoff, and streams, 2014).

Chlorine can be found in drinking water, absorbed through the skin from water, and by breathing in the fumes of chlorine. The health risks associated with chlorine consumption are asthma, cancer, heart attacks, and strokes (Global Healing Center). To prevent these health risks as much as possible, chlorine found in potable water should remain under 4 ppm (or .2 mg/L) (Wiant, 2010).

Phosphates are molecules that form from natural, environmental processes as well as from human-made products such as fertilizers and untreated sewage. In high concentrations, phosphates have been known to cause digestive problems in humans (Oram B. , 2014). To prevent phosphate induced problems, it is suggested that the concentrations of phosphate are kept under .1 mg/L (Office of Space Science Education at the Space Science and Engineering Center University of Wisconsin - Madison, 1997).

Common sources of biological contaminants include bacteria, viruses, protozoa, and algae. Viruses and protozoa are commonly found in fecal matter that can contaminate water sources through contact. The level of contact increases during the rainy season where the increased amount of water agitates bed sediments and picks up additional contaminants from the soil (WHO). Bacteria have the potential to cause a wide variety of illnesses, but the most common are fevers and diarrhea. In extreme cases, death can occur. Since pathogens can survive up to 400 days in groundwater, it is likely that more illnesses would occur during the rainy season (Pandey, Kass, Soupir, Biswas, & Singh, 2014). Many of the sources for water in the rural villages in Belize are uncased wells, thus are extremely at risk for contamination from groundwater. The potable water in Belize was tested for the presence of hydrogen sulfide producing bacteria such as Salmonella, Citrobacter, Proteus, Edwardsiella, and Klebsiella (Hach Company, 2016).

Rainwater should be stored in a non-toxic container (WHO, n.d.). In Belize, rotoplas containers or concrete cisterns are commonly used to store water and cleaning water storage containers is critical. According to conversations with Belizeans living in San Carlos, cisterns and rotoplas are cleaned during the rainy season when they can easily replace the lost water.

A total of fifty samples were collected in two villages – San Carlos and Rancho Dolores. Each sample was labeled using GPS coordinates as well as a description of the location. The samples were then tested for nitrates, phosphates, ammonia, free chlorine, bacteria, and pH using the Hach Pocket Colorimeter 2 device, the Hach Surface Water Testing kit, Hach pathogen screen, and the Apera PH20 Value pH tester, respectively. The results were then recorded and analyzed. These results were reported back to the households in both San Carlos and Rancho Dolores.

The water collected from homes in San Carlos and Rancho Dolores showed different levels of chemical and bacterial contamination. In San Carlos, 4.65% (2/43) of the samples contained pH measurements outside of the 6 – 8.5 range, recommended as safe. In Rancho Dolores, 28.57% (2/7) of their samples contained pH measurements that were outside that range.

Unfortunately, the number of samples contaminated with high nitrate levels were much higher. San Carlos had 41.86% (18/43) of their samples measure above the 10 mg/L limit for nitrates in the water. These sources came from potable water sources used daily. None (0/7) of the samples in Rancho Dolores measured above the threshold. Without further testing, it would be impossible to determine the source of the nitrates. However, San Carlos is a large agricultural village, and the use of fertilizers could increase the nitrate levels in the village.

In San Carlos, 18.6% (8/43) of the samples tested indicated phosphates at or over .1 mg/L from sources that were used by households for potable water. In Rancho Dolores, 14.29% (1/7) of the samples tested above the phosphate limit.

In December of 2017, four of the 50 samples tested over the .2 mg/L limit for chlorine. Three samples came from Rancho Dolores for a total of 42.86% (3/7) over the limit for chlorine. In San Carlos, the village had 2.33% (1/43) of their samples over the limit.

Ammonia levels should be kept under .2 mg/L for safe consumption. In San Carlos, 13.95% (6/43) of the samples contained levels of ammonia at or higher than .2 mg/L. None (0/7) of the sources in Rancho Dolores contained ammonia levels above .2 mg/L.

In December of 2017, 53.49% (23/43) of samples taken from San Carlos tested positive for the presence of bacteria. Samples were collected from water piped water sources into the village from Indian Church both immediately as the water was turned on and collected again after the water had run for approximately a minute. These results showed that running the water for roughly a minute reduced the level of bacteria in the water significantly. Based on observations and questions, I discovered that some (7/20) living in San Carlos cleaned their water by placing layers of cloth over spigots. Some households reported using Clorox or chlorinated tablets within large containers of water. A single tablet is dropped in and has a similar effect to adding two drops of bleach to 1 liter of water.

Belizeans living in San Carlos pay \$10 a month for 2500 gallons of water piped from Indian Church. Each person who was asked said that they never come close to going over the 2500 gallons, but if they were to, it would cost them 1 cent per gallon over. Despite having the additional water from Indian Church, during the rainy season, most Belizeans drink the rainwater they collect.

The households in San Carlos informed me that they only use rainwater from their wells and cisterns for drinking. However, the water from Indian Church was less likely to be contaminated by bacteria than their rainwater. I was able to convey the results back to both communities – San Carlos and Rancho Dolores and explain methods of remediating contamination where possible. Assessing and recording drinking water quality for these communities is essential for the health and well-being of these rural inhabitants.

REFERENCES

- Denshaw-Burke, M. D. (2017). *Methemoglobinemia*. Retrieved October 1, 2017, from Medscape: <https://emedicine.medscape.com/article/204178-overview>
- Global Healing Center. (n.d.). *How Does Chlorine in Water Affect my Health?* Retrieved from <http://www.bioray.com/content/Chlorine.pdf>
- Hach Company. (2016). *Bacteria, Hydrogen Sulfide Producing*. Retrieved April 17, 2018, from Hach Company: <file:///C:/downloads/DOC316.53.01197.pdf>
- McCasland, M., Trautmann, N., & Porter, K. (2012). *Nitrate: Health Effects in Drinking Water*. Retrieved September 16, 2017, from Cornell University Cooperative Extension: <http://psep.cce.cornell.edu/facts-slides-self/facts/nit-heef-grw85.aspx>
- Office of Space Science Education at the Space Science and Engineering Center University of Wisconsin - Madison. (1997). *Black Earth Creek & Limnology Minifacts & Analysis Sheet 2 Phosphorus*. Retrieved from Information on Phosphorus Amounts and Water Quality: http://osse.ssec.wisc.edu/curriculum/earth/Minifact2_Phosphorus.pdf
- Oram, B. (2014). *Ammonia in groundwater, runoff, and streams*. Retrieved September 16, 2017, from Water Research Center: water-research.net/index.php/ammonia-in-groundwater-runoff-and-streams
- Oram, B. (2014). *Nitrates and Nitrites in Drinking Water Groundwater and Surface Waters*. Retrieved from Water Research Center: <https://www.water-research.net/index.php/nitrate>
- Oram, B. (2014). *Phosphate in Water*. Retrieved October 11, 2017, from Water Research Center: www.water-research.net/index.php/phosphate-in-water
- Oram, B. (2014). *The pH of Water*. Retrieved September 16, 2017, from Water Research Center: water-research.net/index.php/ph
- Pandey, P., Kass, P., Soupir, M., Biswas, S., & Singh, V. (2014, June 28). Contamination of water resources by pathogenic bacteria. *AMB Express*.
- WHO. (n.d.). *Rainwater Harvesting*. Retrieved September 16, 2017, from World Health Organization: who.int/water_sanitation_health/gdwqrevision/rainwater.pdf
- Wiant, C. (2010, March 30). *CHLORINE IN TAP WATER IS SAFE TO DRINK*. Retrieved from Water Quality and Health Council: <https://waterandhealth.org/safe-drinking-water/drinking-water/chlorine-in-tap-water-is-safe-to-drink/>
- World Health Organization. (n.d.). *Background document for the development of WHO Guidelines for Drinking-water*: http://www.who.int/water_sanitation_health/dwq/ammonia.pdf

IMPROVING FUNCTIONAL LITERACY IN BELIZE

Taylor Gillig, McMaster Scholar, Belize 2017-2018

The primary goal of this project was to focus on increasing the functional literacy for students in the villages of San Carlos and Rancho Dolores, Belize. The term 'functional literacy' was defined in the 1960s when literacy experts became concerned that literacy education in developing countries focused on words or skills rather than understanding or practice (Comings, 2011). In Belize, the official language of the country is English but not the native language in most rural areas. In Belize, 62.9% of the population speaks English, 56.6% speak Spanish, 44.6% speak Creole, and 6% speak Mayan (World Atlas, 2018). For many students in these villages English is not spoken at home, but rather Spanish, Creole, or Mayan yet English is taught in San Carlos when students enter Infant I.

To diminish the language barrier, a pre-school was started by a previous McMaster scholar in the library with the librarian agreeing to teach half of the day. Throughout the years, other scholars have provided lessons to the preschool and to the moms who would then teach the lessons to assist the librarian. While teaching the lessons, the mothers are improving their English and family involvement in the school. Students benefit in numerous ways when there is family involvement in the schools (Henderson, 1994). I created four lesson plans for the pre-school which focused on letters, numbers, daily vocabulary words, and reading and writing skills.



Functional literacy is when a person can engage in all activities which require being able to read and write (OECD, 2001). Being functionally literate is essential for these students because it allows them to participate in all the content being taught and activities being implemented in the classroom (Persson, 1994). By being functional literate, you can read, write, and build on already learned skills to partake in today's world of education, technology, and socialization. Lower education, less demanding jobs, and lower salaries are all associated with lower literacy levels (Rabušicová, 2010). By including functional literacy in the early educational classrooms, the students will have a greater chance of getting a job in the future.

The goal of this project was to increase students' functional literacy by completing an 'All About Me' activity to get students excited about reading and writing. In the 'All about Me' activity, the students were prompted with questions about their interests, family, life outside of school, and their career goals. By having students answer prompts that were relative to themselves, they were fully engaged in practicing reading and writing in English. In San Carlos and Rancho Dolores, there are posters in English displayed in and outside of the classroom that depict colors, the alphabet, countries, numbers, health/ rules, etc. These displays help to improve functional literacy, but students still cannot easily transition their thoughts in their first language to English words. The students still need to practice implementing those English literacy skills into their daily lives through reading and writing because of the emphasis on English throughout the country in education, business, politics, and employment.

REFERENCES

- Comings, J. (2011, February 23). *Functional Literacy*. doi:10.1093/OBO/9780199756797-0032
- Henderson, A. T. (1994). *A New Generation of Evidence: The Family is Critical*. U.S.A.: National Committee for Citizens in Education. Retrieved from <https://files.eric.ed.gov/fulltext/ED375968.pdf>
- OECD. (2001, September 25). *Literate, Functionality*. Retrieved from OECD: <https://stats.oecd.org/glossary/detail.asp?ID=1536>
- Persson, U. B. (1994). *The Importance of Functional Literacy Skills in a*. Retrieved from <https://files.eric.ed.gov/fulltext/ED381772.pdf>
- Rabušicová, M. &. (2010). Functional Literacy in People's Lives. *Journal of Pedagogy*, 29-51. doi:10.2478/v10159-010-0008-3
- World Atlas. (2018). *What Languages are Spoken in Belize?* Retrieved from World Atlas: <http://www.worldatlas.com/articles/what-languages-are-spoken-in-belize.html>

SMALL COLLECTIVE BUSINESS DEVELOPMENT WITH HUGE ECONOMIC IMPACT POTENTIAL

Elyzabeth King, McMaster Scholar, Belize 2017-2018

The population of Belize is approximately 360,000 people (World Factbook, 2017). The community of Rancho Dolores has under 300 people within 75 households. The average Gross Domestic Product (GDP) per capita in Belize in 2016 was \$8,400 (World Factbook, 2017). However, there is a significant gap between the rich and the poor and the more remote Belizean villages often make far less than the country's average. Women in the Rancho Dolores discussed with me possible business opportunities and challenges that apply directly to them. Learning in this context, from the women first-hand, allowed me to provide the best analysis and application of business practices to fit their needs.

Studies suggest that tourism is one of the fastest growing industries in the world and this is especially true in Belize. In 2008, tourism brought in an estimated BZ\$563 billion to Belize. In 2016 tourism brought in nearly BZ\$819 billion, growing by over 45% in the last nine years (Harrison, 2017). The women in the village of Rancho Dolores sell handcrafted goods, many made from recyclable materials. These women make dolls, clothing, baskets, sewing projects, and similar products. Also, several of the women will make and sell food out of their homes. For the women of Rancho Dolores to be able to sell their products in the tourist areas, they would have to go closer to the coast and popular sites that tourists visit. Over 729,000 passengers on 255 cruise ships are expected to dock in Belize City during 2018 where tourists are encouraged to spend time in the area (Cruise Port Insider, 2018). This location is one of the closest docking stations to the village of Rancho Dolores, yet still more than one hour away by bus or car. The other option the women have is to use the opportunities available nearby to bring tourists to them. Currently, most of the women rarely sell their products, simply because they cannot access the market. The few women who do sell their products now, sell to those living in their village out of their homes.

The women in Rancho Dolores have been trying to organize a collective to sell their products and improve their economic status. Pre-trip I looked at research published about community dynamics and the matriarchal structure in the villages in Belize. I found that due to the remote locations of villages in Belize, such as Rancho Dolores and the lack of infrastructure, the economy is severely limited within the villages. Employment for women outside of their village is often not feasible (Studer, 2012). I was able to provide the women with a starting point to develop a women's group, similar to the women's group that former McMaster teams were able to help start in San Carlos.

Many factors need to be taken into consideration for the women to be able to make reliable incomes from the products they make. The time and expense of traveling to the tourist areas were evaluated and discussed. We discovered that the most cost-effective opportunity would be to use the Wildlife Sanctuary right in the village that the government is upgrading as a tourist attraction. The government already has plans in place to not only revamp the Sanctuary but to also add a restaurant and gift shop. I provided the women with guidelines on developing a business plan and organizing a collective. They were anxious to begin meeting and setting up their business plan that would allow them to work together and sell their products in the restaurant and gift shop at the Sanctuary.



An essential aspect of running any business is pricing the products correctly. There are several methods of product pricing applicable for the products that the women in the village of Rancho Dolores sell. The first method is customer value-based pricing. Value-based pricing is when you set the price based on the value that the buyer sees the product having instead of cost (Armstrong, 2017). For example, if a tourist saw the value of a handcrafted doll as \$15, then this method would suggest pricing the doll at \$15. Another type is cost-based pricing – “...setting prices based on the costs of producing, distributing, and selling the product plus a fair rate of return for effort and risk” (Armstrong, 2017). Take the total costs and add the desired profit to determine the product’s price. Another method of pricing is competition-based pricing. Competition-based pricing is when prices are set “based on competitors’ strategies, prices, costs, and market offerings” (Armstrong, 2017). To relate this to the women in Rancho Dolores, it would mean that if a vendor in the tourist area sells a similar doll for only \$10, then the women in the village of Rancho Dolores should price their doll around \$10 to compete with the competitor’s prices. In my discussion with the women in the village of Rancho Dolores was able to hear from some of the women about how they currently price their products. One woman, in particular, sells tamales out of her home pricing them similar to a cost-based method. While this individual did not include in the cost of her time and labor to make the tamales, she did recognize that she sells her tamales for slightly more than the other women in the village. She explained that people knew that her tamales were better so that they were willing to pay more; thus value-based pricing.

During the meeting with the women of Rancho Dolores, we discussed the best methods of how to design a business plan that would fit their needs and the importance of effective communication, including active listening, stating facts and not opinions, and clearly expressing expectations within the co-operative (Bovè, 2015). Factors of production and defining resources regarding natural and human capital, entrepreneurship, and knowledge were also discussed. The women were anxious to learn and even asked questions to clarify.

I was able to discuss strategic planning as an overall outline of long-term goals and plans of action to reach those goals. The overall goal the women wanted to achieve was to form a collective women’s group and work together to sell their products. We discussed leadership, team building, management, and the decision-making process. Overall, being able to talk about the critical aspects of a co-operative business with the women in the village of Rancho Dolores was beneficial for the women as it created a better understanding and provided them the option to apply the information we discussed to their practices.

This project has helped set the women up with a business strategy to be successful with the resources available. During the discussion, the women stated their goals would include reviving the Wildlife Sanctuary that is six miles down the road from the Baboon Sanctuary, an already thriving tourist stop, as well as form a women’s group to create a restaurant and gift shop at the Sanctuary. The women told me that the tourism board in Belize is having an expo in March 2018 in Bermuda Landing, so we strategized about how to use this opportunity to draw more awareness to their products as well as receive more information about upcoming plans the tourism board has.

The biggest takeaway for the women in Rancho Dolores is that they now have the concrete knowledge to use as they form their women’s group and price their products. This project gave the women effective strategies to start them in the right direction. By the end of the meeting with the women of Rancho Dolores, they had the knowledge and goals to begin forming their women’s group as well as plans for the creation of the restaurant and gift shop. In the future, this emerging collective will need education, bookkeeping, and marketing strategies.

REFERENCES

- Armstrong, G. K. (2017). *Marketing: An Introduction - 13th Edition*. Toronto: Pearson.
- Bovè, C. &. (2015). *Business in Action*. Boston: Pearson.
- Cruise Port Insider. (2018). *Belize City Basics - Belize City Cruise Port Schedules*. From Cruise Port Insider: <http://www.cruiseportinsider.com/belize.html>
- Harrison, R. (2017, October 23). *Belize~ Analysis of Belize Tourism Report 2016*. From BBN - Breaking Belize News: <https://www.breakingbelizenews.com/2017/10/23/belize-analysis-belize-tourism-report-2016/>
- Studer, M. A. (2012). Community-Based Research in Belize 2010-2012. *McMaster School for Advancing Humanity*, 7, 9-10.
- World Factbook. (2017). *Central America and Caribbean: Belize*. From World Factbook: https://www.cia.gov/library/publications/the-world-factbook/geos/print_bh.html

IMPROVING HEALTH IN NORTHERN BELIZEAN VILLAGES

Nicholas Kleptz, McMaster Scholar, 2017-2018

A common problem for remote villages in Belize is that they are unable to easily or speedily access professional emergency care. This project worked to train communities on emergency response and snakebite management. Additionally, I explored the communities' knowledge and prevention of mosquito-borne disease.

Studies have shown that only 10% of people who go into cardiac arrest survive, but performing CPR on the person can increase the chance of survival for the victim (American Heart Association, 2018). Choking victims survive 70-86% of the time when the Heimlich maneuver is administered correctly. According to the World Health Center, even general knowledge of the procedures can help to increase the chance of survival. While on-site in Belize I taught both children and adults, in villages of San Carlos and Rancho Dolores, CPR and Heimlich maneuver – refreshing the skills they had learned from former McMaster teams. Knowing these procedures could help to save a life if the situation ever arises.

Snakebite management training is also critical in these remote areas and especially for the foresters working deep in the jungle in the Rio Bravo Conservation and Management Area. There are eight venomous snake species in Belize but the information that is needed for rapid response is not focused on the snake or what the venom does to the body, but how to react if a snake were to bite someone. Whether the bite is venomous or not (you always assume that it is initially), one must use the snake bite kit to slow down the potential spread of venom via the lymphatic system. The snake bite kits I provided included an elastic bandage and splinting material to provide compression and retard the flow of venom through the lymphatic system, thus lengthening the amount of time the bite victim has to get to a hospital to receive the correct anti-venom. In remote areas, time is essential in giving the victim of snake bite the best chance of survival. I was able to conduct snake bite management training with a new group of foresters that work for our community partner, Programme for Belize (PFB). A PFB forester was bitten by a venomous snake several years ago when he was conducting a stock survey

about 4 miles into the jungle. Training conducted by a former McMaster Scholar was instrumental in his survival. Hearing this story, this new group of rangers was grateful for the training.

A huge concern for the people of Belize is mosquito-borne diseases. The climate of Belize creates the perfect atmosphere for mosquitoes to breed, increasing the chances that a Belizean will contract one of five mosquito-borne diseases known to exist in the area. Walking through the villages that we work in, you would see that almost every house has an open doorway and lacks screens or window coverings. While an open house is critical to maintaining comfortable temperatures within the home, it also allows mosquitoes to enter. Many of the people of San Carlos rely on burning coils made from a dried paste of pyrethrum powder to ward off mosquitoes in their home. Studies have shown that burning one of these coils in a closed room emits particulate matter and potential carcinogens equivalent to smoking 50 to over 100



cigarettes depending on the exact type of coil (Liu, 2003). Standing water is inevitable during the rainy season thus creating the perfect breeding ground for mosquitoes to lay their eggs. Some preventative steps that can be taken as suggested by the Center for Disease Control include – eliminating sites of standing water, wearing long sleeves and long pants (not generally feasible in the higher temperatures in Belize), using mosquito repellent that contains DEET (not generally affordable), and sleeping under a bed net if possible (Centers for Disease Control and Prevention, 2018). In San Carlos, I conducted a lesson on mosquito-borne diseases and ways to prevent mosquito bites, followed by a walk around the village with the students to spot standing water.

I surveyed 21 of the 35 houses in San Carlos and of the houses surveyed, 2 (9.5%) had screens, one home had panel windows, and 18 (85.7%) of the homes lacked any window or door covering. The average household size was six, with an average of four beds per house. Only 5 (23.8%) homes had mosquito netting, and only four of those households had it over every bed in the house. As stated previously, the primary way of preventing mosquitoes in San Carlos is to light a coil. After speaking to community members about how mosquito netting works, and how useful it can be, many residents said they would use mosquito netting if it were available. I learned from the women of San Carlos that people from the Peace Corps that came to the village and offered mosquito netting but did not provide information on how it helped, so the people opted not to take it. With the data from the survey, I hope that another McMaster Scholar will be able to take mosquito netting to distribute and provide additional information on its effectiveness. In talking with the women in the village also learned that the Belizean government comes to the villages and sprays insecticide at the beginning and middle of the dry season and every 2 or 3 months during the rainy season.

Relative to emergency response, I learned that once educated on the proper techniques for both Heimlich and CPR, the information seemed to stick. People trained by former McMaster Scholars still knew the basic techniques. Because of the critical nature of the snake bite management training, it needs to be delivered to anyone who will listen. The chance of getting bitten by a venomous snake while in the forest is high, and those working in that environment should know about handling a snake bite that may buy them enough time to reach a hospital. Through my on-site assay of the knowledge of mosquito-borne disease and prevention I realized that while the local people had some idea of how the mosquitoes transfer diseases, they lacked critical knowledge relative to prevention.

REFERENCES

- American Heart Association. (2018). *CPR Facts and Stats*. From American Heart Association: https://cpr.heart.org/AHA/ECC/CPRAndECC/AboutCPRECC/CPRFactsAndStats/UCM_475748_CPR-Facts-and-Stats.jsp
- Centers for Disease Control and Prevention. (2018, February). *Prevent Mosquito Bites*. From Centers for Disease Control and Prevention: <https://www.cdc.gov/zika/prevention/prevent-mosquito-bites.html>
- Liu, W. e. (2003). Mosquito Coil Emissions and Health Implications. *Environmental Health Perspectives*, 111(12), 1454-1460.

SCIENCE IN ACTION: TEACHING STUDENTS AND TEACHERS IN BELIZE

Kaitlyn Kuhn, McMaster Scholar, Belize 2017-2018

'Best Practice' is a term education professionals hear a lot when working within a school. The term truly does not have a clear-cut definition or an answer to what is best practice. The answer differs from year to year, teacher to teacher, and classroom to classroom. 'Best Practice' is determined by how each child learns best, how the classroom functions most efficiently, and what is going to be the most beneficial overall experience for a child while they are at school. When speaking with Ms. Lisa Carillo, Education Officer, Orange Walk District Education Department, it was clear that she understood that students all learn differently. Ms. Carillo wants her teachers to be open and on board for new ideas and new strategies that will benefit all the students.

As we try to answer the question of best practice, there are many ways to look at the big picture of best practice in a general education classroom. Mary Howard says it best in her book, *Good to Great Teaching*:

- "Bad Work is anything that saps the time and energy needed for good work and great work. Bad work has little to no payoff, so it's a frivolous time-wasting event that usurps precious minutes that many students ill afford." (Howard M., 2012)
- "Good work is good by definition. We need good work since it benefits students (how we determine the value of our work)." (Howard M., 2012)
- "Great work is the most challenging to define; I suspect you don't need an explanation if you've experienced it. Great work takes our teaching to the highest level and offers the most benefit to our students." (Howard M., 2012)



As educators, we strive for great work all the time. Does excellent work happen within a days' work? No, most likely not. There is always going to be bad work that turns into good work and eventually turns into great work, but it takes time, and that is fine. Our students continue to progress every day, and as teachers, we need to maintain and improve, consistently work at being the best teacher we can be as well as being lifelong learners.

When it comes to being lifelong learners, teachers are continually trying to learn and incorporate differentiated pedagogies. Differentiated instruction is tailoring instruction to individual needs (Tomlinson, 2000). For the most beneficial learning experience, students need to be constantly engaged, and curious about the material. Students need to be encouraged to ask questions, and take ownership of learning. Using different styles of teaching can keep a classroom fun, light, engaging, and can create the best learning environment for students. Having a hands-on learning experience allows students to experiment and explore new topics.

Hands-on learning is knowledge gained by doing something rather than learning about it from books or lectures. Most of the time, students who are actively and personally engaged in their learning will be able to retain more information than students who are not partaking in hands-on activities. Ms. Carillo stated that she wants to see teachers implementing hands-on learning in their classrooms. Having a hands-on science and math class that connect to real life situations will benefit the students most because it is something they can personally relate to.

The advantage of using differentiated instruction and hands-on learning outweigh the disadvantages drastically. In a classroom, all the styles of teaching usually are represented in some way; it is the responsibility of the teachers to lead their students to have the best possible learning experience every hour of the day.

Teachers play a significant role in a student's life. "The Ministry of Education believes that every Belizean student deserves a caring, competent, and highly qualified teacher and tasks the Teacher Education and Development Services to work diligently to make a difference in the quality of teaching and teacher preparation today, tomorrow, and for the next century" (Ministry of Education). In Belize, teachers design up to thirteen lessons a week and teach nine subjects throughout the school day in an early childhood classroom.

The Belizean government is working to improve the educational requirements for teachers. The government's goals require 25% of all early childhood educators, 75% of all primary teachers, and 50% of all secondary teachers to be fully licensed (Näslund Hadley, 2013). Teachers are now receiving even more training and more schooling to become a certified teacher. The Orange Walk District Education Office is particularly interested in ongoing teacher education that has the potential to benefit its students. McMaster Belize Fellows and Scholars have responded to this request, and my project, in particular, was designed to both teach teachers about differentiated instruction and hands-on learning and excite students about science.

Science is where all the differentiated teaching instructions can come to life and be most useful. According to the Belize Primary School Science Curriculum, "science is a body of knowledge about our world, including the theories, facts, principles, and methods used to investigate our world. Science informs us and will help Belize produce educated citizens who have the knowledge skills and attitudes to lead us into the future in a sustainable way. Science education is imperative." (Primary School Science Curriculum, 2012). To address this critical tenant of Belize's national curriculum, I designed a day-long science camp for the August Pine Ridge Roman Catholic School of 325 children from pre-school to Standard Six (14-year-olds). The science camp consisted of five stations, each exhibiting a different pedagogy and science exploration topic. I collaborated with the teachers at August Pine Ridge School to determine which grades would visit which stations, depending on our ability to scale the activity and level of understanding to each group. All of the hands-on stations also modeled various teaching strategies as so that the teachers accompanying their classes to the stations could see different ways of teaching first hand. The 'learning chromatography' station utilized direct instruction as students witnessed the separation of color on coffee filters. The lesson on surface tension modeled inquiry-based learning; students developed their estimation and prediction skills. Don't rock the boat, a lesson on buoyancy, was an example of cooperative learning requiring teams to build aluminum foil boats. Exploring various soil textures served as an example of discovery learning. It was interesting that students were more hesitant to speak about the characteristics of soil (collected elsewhere) that was not the sandy soil found in throughout August Pine Ridge.

I developed a microscope station equipped with six microscopes. Our team taught the students the parts of the microscope, how to use a microscope, and how to view and make slides. Thanks to a donation from a former McMaster Scholar we were able to leave the microscopes and the school thus providing ongoing opportunities for science exploration. The students at August Pine Ridge were so enthusiastic about learning. This enthusiasm was shared by the teachers and two representatives from the Orange Walk District Education Office who came to the village to see the science camp in action.

My project went above and beyond all of the expectations that I had. Each of the experiments was enjoyed by the students and teachers, my teammates executed their jobs flawlessly, and the feedback from everyone we worked with was all overly positive. So much so that it was requested that this be an annual event at August Pine Ridge and through the encouragement of the Orange Walk District Education Office an expanding offering at other schools in the District. Each year as a team we should come up with experiments that will be interactive for the students and be adaptable to many different grade levels. I believe that we should continue to take a binder additional experiments that the teachers could easily implement in their classrooms.

In addition to my primary project, I worked with others on the team to conduct two day-long teacher workshops on Universal Design for Learning and Rubrics and Assessments. The opportunity to present and discuss educational theory and practice with these Belizean professionals was so rewarding and I learned so much.

REFERENCES

- Howard, M. (2012). *Good to Great Teaching*. Portsmouth: Heinemann.
- Näslund-Hadley, E. A. (2013). *Challenges and Opportunities in the Belize Education Sector - See more at: <https://publications.iadb.org/handle/11319/5926#sthash.eAvnpCqx.dpuf>*. Retrieved from IDB: <https://publications.iadb.org/handle/11319/5926>
- Primary School Science Curriculum. (2012). *Ministry of Education*, 1-90. Retrieved from <https://sites.google.com/site/lwtbelizeaugust2012/home/curriculum-resources>
- Tomlinson, C. A. (2000, August). *What Is Differentiated Instruction?*. Retrieved from Reading Rockets: <http://www.readingrockets.org/article/what-differentiated-instruction>

IMPROVING EYE HEALTH AND CONCUSSION AWARENESS

Kassandra Memmer, McMaster Scholar, Belize 2017-2018

Eye Health

Eye health is a crucial element of overall wellbeing. Without adequate access to medical attention it is a challenge to get primary health care, and without proper medical aid, eye health can be easily overlooked. Eye health can slowly deteriorate, and people don't realize that they may be losing their sight until it is too late (CDC, 2016). Another issue is that many eye diseases such as glaucoma and diabetic eye disease can be present with no warning signs (CDC, 2016). One of the McMaster Belize team's ongoing partnerships in Belize is with the Belize Council for the Visually Impaired (BCVI). Eye care in Belize is not easily accessible. The BCVI has locations in Orange Walk as well as Belize City. However, this means those who live in smaller villages have to travel to the city for eye appointments and transportation not readily accessible or affordable. That is why our team was working to bridge this disconnect and help in recognizing problems, and telling someone where to go for help. The team works to conduct visual acuity screenings for primary school children; my project worked in conjunction with this team effort to further examine the eye health of some of the children tested.

Glaucoma is a condition that needs medical attention because it affects the optic nerve, and is caused by unusually high pressure in the eye (Mayo Clinic, 2018). Glaucoma is a disease that can affect all populations; from babies to the elderly (Glaucoma Research Foundation, 2016). In fact, it is one of the top seven leading causes of vision impairment in children along with cataracts, cortical vision impairment, and retinopathy of prematurity (Hunt & Marshall, 2012). Vision loss due to glaucoma cannot be recovered and typically occurs without any warning signs (Mayo Clinic, 2018). Cataracts are another disease that raises concern for the BCVI, as it is the most common cause of treatable blindness in children in developing countries (Boston Children's Hospital, n.d.). The lack of primary eye care can result in cataracts not being detected early enough, and then visual acuity is compromised (Gilbert & Muhit, 2012). As the McMaster Belize team visited schools to test visual acuity, I followed up with select students using an ophthalmoscope to assess for early signs of any problems including redness, vascularity differences, and any other abnormalities shown in one eye but not the other.

An ophthalmoscope is used to view the interior of the eye to detect any abnormalities in the retina or optic nerve. An eye health exam would show a yellowing of the lens, or white opacities in the eye (Turner, 2017). Ophthalmoscope exams were performed on children who had some form of visual impairment, diagnosed through the visual acuity screenings that the McMaster team conducted. If a student scored more than a twenty-point difference between their eyes (ex. right eye -20/20, left eye - 20/60), then they were sent to me for an ophthalmoscope screening.

A routine exam with the ophthalmoscope should show a disc with sharp margins, that is a yellowish orange to creamy pink color and is round or oval (Chandrasekhar). The vessels would have no arterial light reflex and the fundus will be red or purplish and should not show any hemorrhage (Chandrasekhar). The macula should be slightly pigmented and should not have any vessels surrounding it (Chandrasekhar, n.d.). Abnormalities could include a misshapen disc, discoloration in the eye, or enlarged vessels. The documented abnormalities marked the children for a referral to an ophthalmologist through the BCVI.

Visual acuity screenings were conducted on over 1,000 children; twenty-six children were examined with the ophthalmoscope. Four students showed signs of cloudiness in at least one eye. The most common symptom displayed was an increase in vascularization in one or both eyes; this was the case in eleven of the students examined. Another five students showed a grey wash, through the sclera in one or both eyes. One student was a unique case as his eye was completely fogged over. He was unable to see out of this eye and there were dark shadows behind his iris. Three students



had brown pigmentation in their sclera, and the remaining three displayed no abnormal symptoms.

This was the first extension of the visual acuity screenings that has been done, and overall I believe it was beneficial. In some instances, children who were able to pass their acuity screenings voiced that they experience other issues with their eyes. Having the ophthalmoscope allowed me to look at their eyes and refer them to BCVI as needed. These are children who would not have received a referral otherwise, based on their acuity scores.

For the future, I believe that this project should be continued. As long as the team is doing eye screenings, someone should be there with an ophthalmoscope. To improve this project for the future notecards with an image of the eye could be used to identify the issues seen in the eye when looking through the ophthalmoscope. These notecards would improve communication with the BCVI, who might find this easier than reading notes. Also, the criteria for being assessed with the ophthalmoscope should be adjusted, to allow for more children to be seen to maximize our ability to help.

Concussion Awareness

Concussions have been in the spotlight in the United States due to the risk associated with sports. Often though, concussions are not talked about in an everyday setting, where knowledge about their symptoms and management can be crucial to someone's health. Head injuries are very serious but are often overlooked. A traumatic brain injury (TBI) can be caused by a bump, blow, or jolt to the head (CDC, 2017). Of all traumatic brain injuries, falls were the leading cause of these injuries. Falls accounted for 47% of TBIs, which are more likely to happen to youth and elderly individuals (CDC, 2017). Recognizing the symptoms of a TBI can be a challenge because sometimes the symptoms do not present themselves right away. Up to 50% of concussions go unrecognized or unreported (Starkey & Brown, S.D., 2015). Symptoms include but are not limited to headaches, dizziness, light sensitivity, and nausea. While implementing this project, I found out that most of the people I talked to in Belize had never heard of the concussions making this project's effort to inform even more critical.

Understanding the symptoms of a concussion is a valuable first step; next how to manage and treat concussions becomes essential. The best thing to do when these symptoms are present is to rest. However, an increase in symptoms such as a headache that gets extremely worse, weakness or numbness, vomiting or slurred speech can all be indicators of a more severe condition. For younger children, who may not be able to articulate how they feel, it is important to monitor them for a change in appetite and continuous crying (What are the Signs and Symptoms of Concussion?, 2017). It is important to recognize these symptoms because more serious injuries can result if not treated, such as second impact syndrome, subdural hematomas, and epidural hematomas.

While concussions may not always seem serious because they are not as apparent of an injury, they are, and there are serious risks if not managed properly. Second impact syndrome can happen when a brain injury is not finished healing, and the person experiences another injury, this second injury can be fatal (Starkey & Brown, S.D. , 2015). Epidural hematomas occur when there is bleeding between the Dura Mater and the skull, symptoms for this usually become present within hours of the injury (Starkey & Brown, S.D. , 2015). As the bleeding continues and the size of the hematoma increases the conditions of the person deteriorates, at an active pace (Starkey & Brown, S.D. , 2015). Symptoms include complaints of an intense headache that has increased since initially being present, and a unilaterally dilated pupil (Starkey & Brown, S.D. , 2015). Subdural hematomas happen when bleeding occurs between the brain and dura mater. Subdural hematomas are a high-risk head injury that can result in death (Starkey & Brown, S.D. , 2015). Symptoms of a subdural hematoma are typically delayed and may not present for days, or even weeks (Starkey & Brown, S.D. , 2015). A chronic hematoma can take up to thirty days before symptoms become present (Starkey & Brown, S.D. , 2015). Head injuries can be life-threatening, and it is important to recognize symptoms and know of the different injuries that can become present after an initial injury.

While on-site in Belize I asked some brief questions about concussions to the children or women. The questions included:

- Does anyone know what a concussion is?
- Have you ever bumped your head really hard?

Following the questions, I taught about concussions through a brief lecture and discussion. I covered the most important information such as: recognizing symptoms and managing symptoms. I also handed out concussion symptom cards to help them to recognize symptoms. Through these conversations, it was evident, especially from the children's responses that they did not know what a concussion was. Both in San Carlos and Rancho Dolores, the children and women were engaged in the discussions and asked questions throughout these sessions. The symptoms cards were appreciated. Concussion education had not previously been a Belize project. This project should be continued and expanded to include teachers and principals.

REFERENCES

- Boston Children's Hospital. (n.d.). *Cataracts Symptoms & Causes*. Retrieved October 10, 2017, from Boston Children's Hospital: <http://www.childrenshospital.org/conditions-and-treatments/conditions/cataracts/symptoms-and-causes>
- CDC. (2016, May 4). *Keep an Eye on Your Vision Health*. Retrieved April 16, 2017, from CDC: <https://www.cdc.gov/features/healthyvision/index.html>
- CDC. (2017, April). *TBI: Get the Facts*. Retrieved April 16, 2017, from CDC: https://www.cdc.gov/traumaticbraininjury/get_the_facts.html
- Chandrasekhar, A. (n.d.). *Fundoscopy Examination*. Retrieved October 15, 2017, from Loyola University Medical Education Network: <http://www.meddean.luc.edu/lumen/meded/medicine/pulmonar/pd/pstep16.htm>
- Gilbert, C., & Muhit, M. (2012, September 1). Eye Conditions and Blindness in Children: Priorities for Research, Programs and Policy with a Focus on Childhood Cataract. *Community Ophthalmology*, 451-455.
- Glaucoma Research Foundation. (2016, November 18). *Glaucoma Facts and Stats*. Retrieved October 20, 2017, from Glaucoma Research Foundation: <http://www.glaucoma.org/glaucoma/glaucoma-facts-and-stats.php>
- Hunt, N., & Marshall, K. (2012). *Exceptional Children and Youth*. Belmont, California: Wadsworth.
- Mayo Clinic. (2018). *Glaucoma*. Retrieved April 16, 2017, from Mayo Clinic: <https://www.mayoclinic.org/diseases-conditions/glaucoma/symptoms-causes/syc-20372839>
- Starkey, C., & Brown, S.D.. (2015). *Examination of Orthopedic & Athletic Injuries* (4th ed.). Philadelphia, PA: F.A. Davis.
- Turner, T. (2017). *How is a Cataract Diagnosed?* Retrieved October 10, 2017, from Vision Aware: <http://www.visionaware.org/info/your-eye-condition/cataracts/diagnosing-a-cataract/125>
- What are the Signs and Symptoms of Concussion?* (2017, March). Retrieved from CDC - Signs and Symptoms: <https://www.cdc.gov/traumaticbraininjury/symptoms.html>

SUSTAINABLE COMMUNITY DEVELOPMENT IN BELIZE

Blake Newman, McMaster Scholar, Belize 2017-2018

The McMaster School for Advancing Humanity is focused on using scholarship, service, and action to improve the human condition around the world (McMaster School for Advancing Humanity, 2002). To progress successfully and with the greater good in mind, it is important to achieve a balanced level of sustainable development. Sustainable development is a way for a community to meet the needs of the present population, without impeding the development of future populations (International Institute for Sustainable Development). The concept of sustainable development was fundamental to my project as I worked to help the communities understand their past development and their direction for the future.

While in Belize, I conducted a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis and a Non-Invasive Poverty Index (NIPI) survey. Belize is a relatively new country, gaining independence from Britain in 1981 (Belize.com, 2018). While many improvements have been made in Belize since then, there are still many challenges that were evidenced in the results of the SWOT analysis and the NIPI survey I conducted. The two primary areas to consider as I prepared to work in several small, rural communities in Belize, were education, and jobs or familial income. Evidence shows the disparity in educational opportunities and income potential between rural and urban areas.

These critical differences provided insight for this project, both pre- and post-trip. The percentage of children not in school between the ages of 5 to 12 is triple in rural areas compared with urban areas. The percent for ages 13 to 16 not attending school falls just short of 3 times as high for rural areas versus urban areas (Profile, 2014). When there is limited access to education, the chances for improving your livelihood decreases significantly. Limited access to good education is not the only problem affecting individuals living in rural Belize. There are higher levels of poverty in rural areas with a concentration of the poor working in agriculture or related industries; in fact, 47% of agriculture jobs show earnings below the poverty line (Mendoza, P. and ABEN Consulting in Collaboration with The Ministry of Economic Development and The National Human Development Advisory Committee, 2009). As stated in the Sourcebook for Poverty Reduction Strategies, the various dimensions of poverty recognized by the World Development Report include lack of opportunity, low capabilities, low levels of security, and empowerment (Klugman, 2002). The lack of proper education in rural areas and low income in the agricultural industry were especially essential facts to consider because this project was focused on a rural farming village remotely located in the Orange Walk District.

SWOT Analysis

A SWOT analysis was used to help the community of San Carlos, Belize express what its residents believe to be areas of concern within their community. Although SWOT analyses are used mainly in business-related instances, there have been instances where the same processes are used for community development, (Phillips, 2014) such as, in Bangladesh, where a SWOT analysis was used to help a community sustain tourism (Mondal, 2017). A SWOT analysis in Belize was conducted to allow the community of San Carlos to commend the positive things happening, point out the places that need to be improved, and increase their community's self-awareness.

In 2012, the McMaster Belize team conducted the first SWOT analysis with the San Carlos village (Studer, 2017). The goal of this specific project in 2012, helped this community articulate their needs efficiently and effectively, and to self-determine a direction of development within the community. The results of the SWOT analysis found that the village, on average, had a very limited amount of income and was economically capped. The realization of the economic limitations of the village helped them come up with the idea for a restaurant. A group of women came together to start a restaurant that would become a thriving economic source for the village (Green, 2012). This restaurant today supports a third of the families in San Carlos. My goal in conducting the SWOT analysis this past December was similar to that McMaster Scholar, Bryant Green's goal in 2012. To have the village members and leaders be able to state specifically what they need and want as their community develops. Empowering the community to lead this dialogue ensures that sustainable development is directed by the community itself, rather than being imposed by outsiders.

I conducted the SWOT analysis by breaking it down into four parts, strengths, weaknesses, opportunities, and threats, and letting the community members I addressed take control of the discussion. The group was comprised of 35 men and women, approximately 25% of the population of the village, whose ages ranged from teens to beyond middle-age. There are only 35 households in the village so while only a quarter of the population attended, a majority of the households were represented.

The participants were able to articulate their conclusions on what needs to be done to further their development. In Belize, it was important to work through informal dialogue given the social structure of such a small village. This format helped to ensure that, in all situations, the community members felt comfortable and continued to break the communication barriers in order to make progress. Steering the conversation toward anything other than the community's intent would have deterred people from believing that they had the opportunity to create outcomes for themselves.

There is no forum for communication within the community to decide what needs to be done to better the environment around them. This lack of regular community dialog became apparent during the SWOT analysis session. The group articulated that there was the need for households within the community to be able to track income. While sources of income could be identified – expense and profit tracking, critical to the majority of residents who are self-employed there, was not being done. They need education in basic bookkeeping, a project a future McMaster Scholar can handle. They expressed other needs that the community had and prioritized them. The top priority for the village is the installation of a dock that would allow tourists to access the village, increase business for the restaurant and provide a market for crafts made in the village. The participants in the SWOT analysis viewed this as a way to increase the income of the village overall.

The village group also expressed interest in building a greenhouse, to better control the environment for seedlings and edible plants throughout the year. They expressed a need for a formal playground for the children of the community. Both of these projects could be built with recyclable materials and by community members. There was little trouble reaching consensus within the group about future development during the session, but it is interesting to note how little communication happens within this small village daily. They were surprised that they all had similar ideas and hopes for the future of the community.

NIPI Survey

A non-invasive poverty index is essential for assessing not only economic change within a community but improvement in the human condition as well. A poverty index is a measure of the standard of living in the community or a country. The basis for these indexes vary in strategy, parameters, and primary goal, but all agree that GDP per person, a measurement the material well-being of an individual based on a nationwide average, cannot be used to explain the quality of life of individuals within a country (The World in 2005, 2005). Many things play a role in the satisfaction, and quality of life of an



individual. These things include: health, environmental factors, political stability and freedom, education, job accessibility and security, and the list goes on (The World in 2005, 2005). Not all indexes consider all of these factors, in fact, many choose to focus on a particular goal to measure. The most relevant index for this project was the Multidimensional Poverty Index (MPI).

The MPI is a measure of poverty based on many dimensions, such as health, education, and standard of living, in which each has indicators within them that make clear the level of poverty of a nation (United Nations Development Programme - Human Development Report, 2010). The MPI uses factors from each of these areas to assess their overall interaction with one another and consider how these things determine and define poverty (United Nations Development Programme - Human Development Report, 2010)). A poverty index that still takes into account the multiple dimensions of MPI, yet is less invasive and more accessible, was the goal of the NIPI survey (Roush, 2017). Each question was strongly considered in its usefulness to the community partners of the McMaster School. The goal of developing the NIPI survey was to be able to use this tool to easily access information while eliminating any cultural, or social barriers that may occur when gathering information of this kind. The NIPI survey established a reference point from which we can use to then discuss with the community what specific things can be done to improve the prosperity of the community and to track improvement within the communities that the McMaster School works with, over time.

There are certain things we know about communities that we have worked with over long periods of time. In San Carlos, we know that there is a healthcare professional that comes once a month to the village. We know that the main foods the community members eat are chicken, rice, and beans, with fruit and vegetables as they are available. We know that health problems are rarely talked about and getting that information will continue to be difficult.

By analyzing the results of the use of the NIPI in San Carlos in 2017, it is clear that certain trends exist. Most of the community that was surveyed has a history of immigration from Guatemala in the 1980s. The community is very historical, a large portion of the population has been there for over 10, 20, even 30 years. However, there has been a recent influx in new families moving into San Carlos. There is a similarity in size and materials of houses with very few standing out on either end of the spectrum of wealth. The family sizes are also similar. Other than the new families that are still growing with only 1-3 kids right now, there tend to be large families in this area, with 6-10 even 14 kids in some. Another big and very important trend is that the entire village now has access to running water provided by the government to the village from a well and holding tank in Indian Church, a village nearby. This recently acquired access to clean water is vitally important to the village. Every single house that was surveyed had some type of access to water. If it wasn't the running water from Indian Church, it was a cistern, or a well, or treated water from somewhere else. Nearly all the homes in the villages have at least a single solar panel to provide energy for lights, charging a phone, or powering a small fan.

This information that the NIPI gathered on the level of poverty in the area is important for many reasons. The first is that with this we can see that the vital necessities of living are being met, and now the village can focus their attention on things that will allow them to prosper.

The NIPI survey worked cohesively, yet still separate from the SWOT analysis Using these together rather than individually explained so much about the current state of the community, the improvements for their future, and what that could mean for the community's development in the far future.

Through working on these projects with the community of San Carlos, it is clear that the village members' want development and they want to do so, in a way that will make the lives of those who come after them, better. It is also clear that the community of San Carlos has made great strides while partnering with the McMaster School in the areas of improving education, increasing its economic base, and improving its infrastructure including access to solar energy and clean water – all of these have been goals of the partnership between San Carlos and the McMaster School for over a decade.

REFERENCES

- Belize.com. (2018). *Belize History*. From Belize.com: <https://www.belize.com/history>
- Green, B. (2012). Strategic Planning in San Carlos, Belize. *The McMaster School for Advancing Humanity Journal*, 7, 22-23.
- International Institute for Sustainable Development. (n.d.). *Sustainable Development*. From International Institute for Sustainable Development: <http://www.iisd.org/topic/sustainable-development>
- Klugman, J. (2002). *A Sourcebook for Poverty Reduction Strategies*. Washington D.C.: World Bank. From <http://documents.worldbank.org/curated/en/156931468138883186/pdf/2980000182131497813.pdf>
- McMaster School for Advancing Humanity. (2002). *The Mission of the McMaster School*. From McMaster School for Advancing Humanity: <http://www.defiance.edu/mcmaster/>

- Mendoza, P. and ABEN Consulting in Collaboration with The Ministry of Economic Development and The National Human Development Advisory Committee. (2009). *National Poverty Elimination Strategy*. From <http://extwprlegs1.fao.org/docs/pdf/blz166913.pdf>
- Mondal, S. (2017). SWOT Analysis and Strategies to Develop Sustainable Tourism in Bangladesh. *UTMS Journal of Economics*, 8(2), 159-167.
- Phillips, R. a. (2014). *An introduction to community development* (2nd ed.). New York: Routledge.
- Profile, N. E. (2014). *Belize Region: Latin America and the Caribbean*. From https://www.epdc.org/sites/default/files/documents/EPDC%20NEP_Belize.pdf
- Roush, Z. (2017). Former McMaster Scholar to Belize. (B. Newman, Interviewer)
- Studer, M. A. (2017). Dean of the McMaster School. (B. Newman, Interviewer)
- The World in 2005. (2005). *The Economist Intelligence Units*. From https://www.economist.com/media/pdf/QUALITY_OF_LIFE.pdf
- United Nations Development Programme - Human Development Report. (2010). *Multidimensional Poverty Index (MPI)*. From United Nations Development Programme - Human Development Report: <http://hdr.undp.org/en/content/multidimensional-poverty-index-mpi>

WATER QUALITY ANALYSIS OF ENVIRONMENTAL WATERWAYS IN NORTHERN BELIZE

Logan Scott, McMaster Scholar, Belize 2017-2018

When researching the trends in the data collected throughout the McMaster School's ongoing water project in Belize, there seems to be a correlation between water temperature and the level of chemical contaminants present. Studies have shown a direct relationship between the metabolic rates and water temperature. This relationship occurs as many cellular enzymes are more active at higher temperatures. For most fish, a 10°C increase in water temperature will approximately double the rate of a physiological function, meaning that the fish will function better at a warmer temperature (Fondriest Environmental, Inc., 2014). Sources also note that the temperature of the water is positively correlated with pH levels. The McMaster School's previously collected data has significantly contributed to our understanding of the water quality in the New River Lagoon, Belize's largest body of freshwater, near the end of the rainy season, except data that was collected in May 2017. Comparing the data I collected in December 2017 to the data from May 2017 allowed me to identify any significant differences in the contaminant levels from just seven months prior. This comparison resulted in a better understanding of conditions in different seasons, including different ambient temperature conditions.

The most critical testing site identified in the May 2017 data was the New River next to the tortilla factory (water collected from onshore). According to past McMaster Scholar Madeline Homan in May 2017 the New River showed spiked levels of nitrates, leading our community partners to believe there may be a correlation between the tortilla factory and the high levels of nitrate contamination (Homan, 2017). December 2017 was the first time that a McMaster team had the opportunity to get on a boat and sample water offshore in the New River. Actually, getting on the New River, instead of testing from shore, gave our team the chance to test the effluent discharge from the factories (including the tortilla factory) so that we could ascertain the potential of industrial discharge to be a contributing factor to the fish kills that occurred in the New River at Orange Walk in July 2017. Through talking to individuals who had first-hand knowledge of the event, what they described allowed us to speculate that an algal bloom was the probable cause. Another critical testing site was Lemonal Creek and Resort Creek, where the data points from the May 2017 trip showed elevated nitrate levels. The center of Irish Creek was another location that former McMaster Scholar Madeline Homan identified when reviewing the data for the elevated phosphate levels that were collected in May (Homan, 2017). These sites were targeted for sampling during the December 2017 trip so that comparisons could be made. Trends could provide evidence to sources of contamination or allow for predictability relative to the environmental conditions at the time the sample was taken.

According to the EPA, the maximum levels for nitrate-nitrogen concentrations in water is 10mg/L and as low as 1mg/L in regulated water systems. When nitrate levels reach above these standards, it results in extremely unhealthy conditions



for aquatic life as well as for the communities that use the lagoon and the river as sources of water and food. Nitrate levels were anticipated to be lower, due to it being the end of the rainy season (December) as opposed to the end of the dry season (May). Normal Phosphate levels in water need to be in the range of 0.01mg/L - 0.03 mg/L. Phosphate levels in the range of 0.025mg/L - 0.1 mg/L stimulate plant growth, and 0.1 mg/L is the maximum level acceptable to avoid accelerated eutrophication; anything above 0.1 mg/L accelerates growth and consequently leads to problems (Office of Space Science Education at the Space Science and Engineering Center University of Wisconsin - Madison, 1997). For ammonia concentrations in the natural world, natural levels are below 0.2 mg/L. Any concentrations of ammonia higher than this level may be an indicator of agricultural runoff, livestock / human waste, industrial by-products, or sewage (Saskatchewan Ministry of the Environment, 1997). According to the Water System Council, pH levels in water that are acceptable for the consumption of water should be between 6.5 and 8.5 (Wellcare® Information for you about PH in your Drinking Water, 2007).

The international standard for levels of dissolved oxygen in rivers and lakes are as follows.

- Class I – DO >7mg/L; The condition of constant near-saturation of oxygen content and an insignificant presence of oxygen-demanding substances for aquatic life.
- Class II – DO 7-6mg/L; The oxygen saturation of water is good. Oxygen-demanding substances do not generally disturb oxygen saturation.
- Class III – DO 6-4mg/L; Oxygen deficiencies may occur in the hypolimnion. The presence of oxygen-demanding substances can sometimes present considerable negative impacts on aquatic life through the reduction of oxygen content.
- Class IV – DO 4-3mg/L; Oversaturation of oxygen deficiency occur in the epilimnion and oxygen deficiencies are frequent in the hypolimnion, possible owing to chronic problems with the presence of oxygen-demanding substances.
- Class V – DO <3mg/L; Acute problems occur in oxygen regime, i.e., oversaturation or oxygen deficiency in the epilimnion and oxygen deficiency leading to anaerobic conditions in the hypolimnion. The high level or presence of oxygen-demanding substances may equally cause acute deficiencies

(Economic Commission for Europe - Statistical Division, 1993).

Determining whether or not fires in the savannah which flanks the New River Lagoon on its eastern shore, or recent hurricanes that move over in the jungle/ New River lagoon area, affect any of the chemical contaminant levels is an ongoing question. However, 2017 showed no evidence of significant fires or hurricane activity. When fire burns down a forest, nitrate levels go up, and the effects are persistent, according to recent research from University of Montana scientists. They found that charcoal deposited during fire events has the potential to stimulate the conversion of ammonia to nitrates, an important step in the nitrogen cycle (American Society 2010). Ecological and toxicological effects generated by inorganic nitrogen pollution in aquatic ecosystems can cause major problems. Nitrogen pollution can increase the concentration of hydrogen

ions in freshwater ecosystems without much acid-neutralizing capacity, resulting in acidification of those systems. Nitrogen pollution can stimulate or enhance the development, maintenance, and proliferation of primary producers, resulting in eutrophication of aquatic ecosystems. Nitrogen could also reach toxic levels that impair the ability of marine animals to survive, grow and reproduce. Inorganic nitrogen pollution of ground and surface waters can also induce adverse effects on human health and economy (Carmago, 2006).

Gaining a critical understanding of the chemical contaminants in the New River Lagoon and the New River was important to my community partners and me as we work to identify not only the quality of the water but suspected sources of contamination.

While sampling on site in Belize, I used the GPS coordinates to label testing sites.

Phosphorous and Ammonia tests were conducted utilizing the Hach surface water test kit. Nitrate levels were assessed using a Hach Pocket Colorimeter 2 to digitally determine the levels and nitrate testing protocol (cadmium reduction method). Temperature, pH, and Dissolved Oxygen Tests were conducted at the surface by using Hach HQd Digital meter, pH101 gel-filled pH probe, and LDO101 dissolved oxygen probe.

During my research on the ground in Belize, the testing areas where the water temperature was slightly higher had a positive correlation with the nitrate levels. Many of the nitrate levels that were higher than the standards, however, did not correlate with the temperature. As we had anticipated the New River assays were very intriguing. In December the factories were starting up, such as the sugar cane factory and the rum factory. Which means the build up from their run-off was not yet at a significant level. The data that was gathered however is vital as it provides the necessary baseline data for this waterway testing. The New River data evidenced that water temperature was abnormally high for water of that depth at that time of year. So at this point, the thermal pollution should be considered during future testing. The comparative analysis of the May 2017 and December 2017 data indicated that at both Lemonal Creek by the resort and the tortilla factory (Orange Walk) discharge, the nitrate levels from December were lower than in May. At the tortilla factory, the level was 10.56 mg/L (Homan, 2017) in May and only 1.76 mg/L in December. At the Lemonal Creek by the resort, the levels were at 10.56 mg/L in May (Homan, 2017) and at 1.32 mg/L in December. This comparison is interesting because it shows during the warmer, less rainy season at these test locations the pollution of nitrates in these areas are dangerously high and could be due to the resort and the factory dumping waste into the water. At the tortilla factory in May, the dissolved oxygen levels were much lower than the recent test conducted in December. The dissolved oxygen levels in May at this location were 2.49 mg/L (Homan, 2017) and in December they were up to 4.07 mg/L at the same location. The lower levels in May could be due to waste dumping or waste run-off from the factory. The discharge point from the tortilla factory is an primary testing site for the next trip, especially if the partners notice another event that resembles an algal bloom such as we suspect occurred in July 2017. The complete spreadsheet of the water testing that was completed in December 2017, over 50 sites, was compiled and returned to our community partners in Orange Walk and Programme for Belize.

This trip has shown many similarities to the data that was collected in previous years. After analyzing the data, it showed that most of the contaminants were present in excessive levels when the temperature of the sample was higher at the same site. This was the case on parts of the New River. I compared past data to understand better how the water conditions vary dry season vs. post rainy season. This comparison indicated that contaminant levels (most especially nitrate levels) were higher in May than in December of the same year. As discussed previously this could have been due to the dumping or run-off of waste in specific areas or the environmental temperature could have caused contaminant levels to fluctuate.

The testing on the New River Lagoon is a project that needs to be continued for many years to come. The more data that is collected from that area, the easier it will be to identify contamination and perhaps lead to the identification of the source of the pollution. The surface water testing project in Belize is critical to the preservation of the marine environment and for the people that utilize these waterways as a source of food and employment.

REFERENCES

- American Society of Agronomy. (2010, August 9). Forest fires help power the nitrogen cycle. *ScienceDaily*. Retrieved October 23, 2017 from www.sciencedaily.com/releases/2010/08/100809093645.html
- Carmago, J. A. (2006, August). Ecological and toxicological effects of inorganic nitrogen pollution in aquatic ecosystems: A global assessment. *Environment International*, 32(6), 831-849. doi:10.1016/j.envint.2006.05.002
- Economic Commission for Europe - Statistical Division. (1993). *READINGS IN INTERNATIONAL ENVIRONMENT STATISTICS*. New York City: United Nations. Retrieved from https://unstats.un.org/unsd/envaccounting/ceea/archive/Framework/classification_in_environment.pdf

- Fondriest Environmental, Inc. (2014, February). *Water Temperature*. Retrieved from Fundamentals of Environmental Measurements: <http://www.fondriest.com/environmental-measurements/parameters/water-quality/water-temperature/>
- Homan, M. (2017). Former McMaster Scholar. (L. Scott, Interviewer)
- Office of Space Science Education at the Space Science and Engineering Center University of Wisconsin - Madison. (1997). *Black Earth Creek & Limnology Minifacts & Analysis Sheet 2 Phosphorus*. Retrieved from Information on Phosphorus Amounts and Water Quality: http://osse.ssec.wisc.edu/curriculum/earth/Minifact2_Phosphorus.pdf
- Saskatchewan Ministry of Environment. (1997). *Water Security Agency*. Retrieved from EPB431-Ammonia Fact Sheet: www.saskh20.ca/DWBinder/epb431.pdf
- Wellcare® Systems Council. (2007). Wellcare® Information for you About PH in Drinking Water. Retrieved from https://www.watersystemscouncil.org/download/wellcare_information_sheets/potential_groundwater_contaminant_information_sheets/9709284pH_Update_September_2007.pdf

EXERCISE AND NUTRITION TO IMPROVE HEALTH

Alyson Seibert, McMaster Scholar, Belize 2017-2018

In 2015 the average life expectancy for women in Belize was 76.6 years (Pan American Health Organization, 2015). The two major diseases prevalent in Belize are ischemic heart disease and diabetes (IHME). 71.1 % of the Belizean population, including 76.6% of Belizean women are considered to be overweight (Pan American Heart Association, 2012). The high prevalence of being overweight or obese coincides with the high death rate from ischemic heart disease and diabetes.

Ischemic heart disease is caused by a buildup of plaque in the coronary arteries, which is also known as atherosclerosis (Mayo Clinic, 2018). Multiple factors can contribute to the onset of ischemic heart disease. Some of the factors include age, gender, everyday stresses, diet, and the lack of physical activity (Mayo Clinic, 2018). This condition can worsen over time especially when the plaque begins to harden causing blockages in the arteries, thus preventing the flow of oxygen to the heart which then causes a heart attack to occur (Mayo Clinic, 2018). According to the American Diabetes Association, one in three women will die from heart disease, and women who have been diagnosed with diabetes are at a higher risk of getting heart disease in their lifetime (American Diabetes Association, 2014).

Diabetes mellitus is a prevalent issue in Belize. Diabetes can occur when the pancreas doesn't produce enough insulin, or when the body doesn't effectively use the insulin that is produced. Insulin is secreted by the pancreas and can help regulate blood sugar. However, an uncontrolled high blood sugar level, also known as hyperglycemia, can lead to serious damage to the nerves and vessels within the body (Mayo Clinic, 2018).

There are two types of diabetes mellitus. Type 1 diabetes is also known as being insulin-dependent. Type 1 diabetes is often seen in children and usually requires a daily administration of insulin. Some symptoms of Type 1 diabetes include polyuria, weight loss, excessive thirst, and vision changes (Mayo Clinic, 2018). The other type of diabetes is often seen in adults. Type 2 diabetes is also known as being non-insulin-dependent and is usually the result of gaining excess body weight from the lack of physical activity (Mayo Clinic, 2018). Type 2 diabetes has similar symptoms of Type 1 diabetes, but they are often ignored until complications are presented.

There are also other factors that can contribute to ischemic heart disease and diabetes such as hypertension, age, and gender. While a few of the factors that lead to these diseases can be uncontrollable, most of them are controllable, such as high cholesterol, hypertension, and obesity (National Heart, Lung and Blood Institute).

Improving health, balance, and overall strength has been the goal of several of the women's groups that the McMaster School has been working with in Belize. These women are living longer and often without the support of an extended family due to the increased urban migration of this society. Many younger people move to the urban areas to secure jobs leaving older relatives in the remote rural villages. This aging population needs to be self-dependent, therefore good health and sustained mobility are critical.



According to The Centers for Disease Control and Prevention, one out of five falls results in broken bones or a serious head injury (Centers for Disease Control and Prevention, 2017). There were over 646,000 people globally who were hospitalized last year because of a hip fracture that they suffered due to falling. Also, 80% of the falls occur in lower or middle-income countries. Approximately 37.3 million falls are severe enough that they require medical attention (World Health Organization, 2018). As a result, lots of older adults become fearful of falling, so they limit their daily activities. By limiting their daily activities, they are at an even higher risk for chronic diseases to occur.

Tai Chi exercise that focus on the importance of flexibility, balance and neuromuscular coordination is one mechanism to prevent falls. When someone's coordination is impaired, daily activities such as walking, bending, reaching, and being able to move from a sitting to a standing position may be more difficult (Lašinytė, 2017). Also, Tai Chi is a good way to strengthen

the core muscles. The core is composed of the lumbopelvic-hip complex, and this also acts as a tension system for the trunk when the muscles are activated. Having core strength can help limit the number of low back injuries and lower extremity injuries both of which result from falling. The primary muscles that make up the stabilizing system for the trunk include the transverse abdominis, internal oblique, multifidus, and the gluteal muscles, which also features the rotators of the hips (Watson, 2017). Strengthening these muscles through exercise provides more stabilization during physical activity and can have many psychological and physiological benefits. Pairing this type of activity with proper nutrition will also help decrease the women's risk of diabetes and heart disease.

While in Belize I conducted a women's exercise classes in San Carlos and Rancho Dolores. I demonstrated exercises both with and without the use of Therabands. These exercises included squats, lunges, the "monster" walk, star touches on the ground, four-way shoulder stabilization, and breathing exercises. I talked to them about how long every stretch should be held, how long to balance for, how many repetitions and sets should be performed, and the importance of doing this for at least 30 minutes per day.

In Rancho Dolores, I took the blood pressure of seven of the women who had participated in the exercise session and completed a relaxation breathing cooldown. The women's ages ranged from 33 years to 65 years old. Three (42.8%) of the women had blood pressure readings that fell within the normal range and four (57.2%) women had readings that fell within the pre-hypertension range. These women were interested in knowing more about what normal meant and how they could either achieve or maintain the normalcy. Those that had pressures in the normal range were intrigued because that meant that they had already taken definitive steps in decreasing the risk of getting these diseases.

After the exercise classes were complete, I emphasized the importance of proper nutrition to the women in both villages. There are steps that the women can take to live a healthier lifestyle. According to the Ministry of Health, the people can reduce their fat, sugar, and sodium intake by choosing to bake, steam, roast, or grill foods instead of frying them. They can

also limit their intake of high-fat salad dressings, soft drinks, jams, jellies, and other sweets (Belize, 2012).

While working in San Carlos, I was able to observe what the women cook in The Sunbreeze Restaurant. Beans, rice, tortillas, and chicken are staples in the Belizean diet. After eating at The Sunbreeze Restaurant, I realized that their portion sizes are much larger than those recommended by the nutritional guidelines developed by the Belize Ministry of Health (Belize, 2012). I explained to the women in both villages a way to determine how much to eat for specific food groups. For example, making one full fist is the equivalent of how much vegetables to eat with a meal. One cupped hand is the number of carbohydrates (rice), one palm is how much protein (chicken), and about the size of someone's thumb is equivalent to how much fats and oils should be with a meal. I also provided the women copies of The Food-Based Dietary Guidelines of Belize as a reference should they want to know more about what types of food fall under which category (carbohydrates, proteins, fats, etc.). The Food-Based Dietary Guidelines also included a few recipes in to help show the women that they can still eat foods similar to what they are used to, but in the appropriate portions. Having the chance to cook with the women was a fantastic way to see how they cook and what they eat.

It's important to have a healthy diet and exercise daily to have a healthier lifestyle. I hope that implementing an exercise program and educating the women on portion control will lead to an improvement in their overall health.

REFERENCES

- American Diabetes Association. (2014, June). *Coronary Heart Disease*. Retrieved from American Diabetes Association: <http://www.diabetes.org/living-with-diabetes/treatment-and-care/women/coronary-heart-disease.html>
- Belize, M. o. (2012). *Food-based dietary guidelines - Belize*. Retrieved from Food and Agriculture Organization of the United Nations: <http://www.fao.org/3/a-as852e.pdf>
- Centers for Disease Control and Prevention. (2017). *Important Facts About Falls*. Retrieved from Centers for Disease Control and Prevention: <https://www.cdc.gov/homeandrecreationalafety/falls/adultfalls.html>
- IHME. (n.d.). *Belize - What Causes the Most Deaths?* Retrieved from IHME: <http://www.healthdata.org/belize>
- Lašinytė, E. M. (2017). DOES BALANCE IMPROVE AFTER THE APPLICATION OF TAI CHI EXERCISE PROGRAM IN POSTMENOPAUSAL WOMEN WITH OSTEOPOROSIS? *Baltic Journal*(2), 33-39.
- Mayo Clinic. (2018). *Coronary Artery Disease*. Retrieved from Mayo Clinic: <https://www.mayoclinic.org/diseases-conditions/coronary-artery-disease/symptoms-causes/syc-20350613>
- Mayo Clinic. (2018). *Hyperglycemia in diabetes*. Retrieved from Mayo Clinic: <https://www.mayoclinic.org/diseases-conditions/hyperglycemia/symptoms-causes/syc-20373631>
- Mayo Clinic. (2018). *Type 1 Diabetes in Children*. Retrieved from Mayo Clinic: <https://www.mayoclinic.org/diseases-conditions/type-1-diabetes-in-children/symptoms-causes/syc-20355306>
- Mayo Clinic. (2018). *Type 2 Diabetes*. Retrieved from Mayo Clinic: <https://www.mayoclinic.org/diseases-conditions/type-2-diabetes/symptoms-causes/syc-20351193>
- National Heart, Lung and Blood Institute. (n.d.). *Coronary Heart Disease Factors*. Retrieved from National Heart, Lung and Blood Institute: <https://www.nhlbi.nih.gov/health-topics/coronary-heart-disease-risk-factors>
- Pan American Health Organization. (2015). *Country Report: Belize*. Retrieved from Pan American Health Organization: https://www.paho.org/salud-en-las-americas-2017/?page_id=91
- Pan American Heart Association. (2012). Belize. *Health in the Americas: 2012 Edition*, 92. Retrieved from https://www.paho.org/salud-en-las-americas-2012/index.php?option=com_docman&view=download&category_slug=hia-2012-country-chapters-22&alias=115-belize-115&Itemid=231&lang=en
- Watson, T. G. (2017). *International Journal of Sports Physical Therapy*, 12(1), 25-41.
- World Health Organization. (2018, January). *Falls*. Retrieved from World Health Organization: <http://www.who.int/news-room/fact-sheets/detail/falls>



McMaster Belize Team completes training with the Belize Council for the Visually Impaired, May 2017.

DISABILITY AND THE KINGDOM OF CAMBODIA

Jo Ann Burkhardt, McMaster Fellow, Cambodia 2016-2017

Review of the Literature

The Kingdom of Cambodia has experienced economic growth and development over the past five years. Although the growth is evident, the impact of war and conflict and the brutal reign of the Khmer Rouge has continued to severely impact the people of Cambodia (Šiška, 2015).

Cambodia remains one of the poorest countries in the world, with its most vulnerable members, including children and adults with disabilities, (National Institute of Statistics, Directorate General for Health, and ICF International, 2014) receiving few, if any educational, social, medical, and rehabilitation services (Mak, 2011). It has been determined that an accurate prevalence rate or percentage of the population with disabilities has been difficult to determine (Mak, 2011). The percentage of individuals with disabilities in Cambodia has been estimated from 2.2 % to 32% of the population (Connelly, 2009), (Šiška, 2015), (Graham, 2014), and (Sabariego, 2015).

According to Šiška, & Suchánek, (Šiška, 2015), the high rate of disabilities can be attributed to the atrocities committed against the Khmer people during the reign of the Khmer Rouge from 1975-79 and the subsequent post-conflict years following the reign.

Cambodia's government sponsored schools do not provide programming or welcome students with disabilities into the K-12 system. Student-aged children and youth have a constitutionally protected right to a public education as a result of the ratification of the United Nations Convention on the Rights of Persons with Disabilities in 2012. Although safeguards and procedures were to be in place to assure an inclusive school system by 2015, little or any progress has been made and toward a government provided education for students and youth with disabilities (Šiška, 2015).

In addition to lack of support from the Cambodia government in encouraging students with disabilities from registering and attending public schools, other mitigating circumstances exist. Kurodo, Kartika, and Kilamura (Kuroda, 2017) cite lack of training for teachers pertaining to students with disabilities. They assert that teachers in Cambodia lack even a cursory understanding of disabilities, the educational needs of these students, or any strategies for teaching students with disabilities.

In addition to a lack of training, Kalyonpur (Kalyanpur, 2014), asserts that Cambodia's teachers are among the poorest paid in the world. She suggests that perhaps Cambodian teachers are not motivated to assume an additional challenge of teaching students with disabilities.

Poverty has been considered a contributing factor in students with disabilities in Cambodia not attending schools. Parent and caregivers lack financial resources to seek education, medical, and rehabilitative services for their children with disabilities (Mak, 2011), (Connelly, 2009), (UNICEF Cambodia Local Governance and Child Rights, 2014).

School officials and teachers have been accused of discrimination towards children and adults with disabilities. Their lack of training and cultural beliefs about the nature of disabilities has been the underlying cause of the discriminatory exclusion from public school education (Kuroda, 2017), (Hackett, 2016).

Cambodia is a Buddhist country with the vast majority of citizens adhering to the beliefs of Theravada Buddhism. These beliefs include a belief that hardships, challenges, illness, and disabilities are a result of evil, wrongdoing, or wrong thinking in a past life. Parents often feel shame when raising a child with disabilities, as it is generally understood in the culture that behavior in a past life warrants the stigma of having a disability (UNICEF Cambodia Local Governance and Child Rights, 2014), (Connelly, 2009).

Students with disabilities in Cambodia do not attend public schools. Nonattendance can be attributed to lack of enforcement of national laws by the government, lack of teacher training and understanding, discrimination, parental poverty and cultural shame.



Methodology

As a result of my work with the McMaster School for Advancing Humanity, in Cambodia, I have had access to government officials, school administrators, and teachers, non-governmental organizations (NGOs) and their staffs and directors and Buddhist nuns from 2005 through the present. In 2014, I began a three year research project in order to gather data to begin to construct an understanding of the reasons for school non-attendance for children and youth with disabilities in Cambodia.

Data was collected using focus groups and individual interviews during the years 2014-2016 while in Cambodia with McMaster Fellows and Scholars engaged in international, community-based service learning. Participants included government officials, teachers and school administrators, NGO directors and staff members, public school teachers and Buddhist nuns (Burkhardt, 2016).

Consistently, participants reported that children and youth do not attend public schools in Cambodia due to lack of teacher training, parental shame, discrimination, and specific cultural beliefs ascribed to the cause of disability (Burkhardt, 2016). Their responses aligned with the professional literature except none of the participants assigned responsibility for lack of school attendance to governmental non enforcement of national laws.

During May of 2017, I traveled to Cambodia, with McMaster Scholars and Fellows to engage in international, community-based, service learning. It was my research goal to meet with groups of Buddhist nuns and clarify what previous research had identified as the construct of parental shame as a reason for nonattendance in public school for children and youth with disabilities.

Results

In Pursat Province, west of Phnom Penh, I was able to interview a group of 20 Buddhist nuns in a local monastery. I began the interview by recounting what participants in prior years had indicated as reasons for nonattendance in public schools of students with disabilities. The respondents concurred that the lack of teacher training, discrimination, poverty, and parental shame were reasons for nonattendance.

With prompting, the participants addressed the issue of parental shame. They clearly ascribed the shame to Buddhist beliefs. These beliefs focused on the results of wrong behavior in a previous life as the cause of a disability. These “wrong” behaviors included murder, theft, and violence against others and animals. The nuns were descriptive in the ways that animals and others had been abused.

Discussion

In Cambodia, students with disabilities do not attend public, government-run schools. The professional literature clearly identifies lack of teacher training, discrimination, non-enforcement of governmental policies, poverty and parental shame as reasons for students with disabilities in Cambodia being denied access to educational services.

It appears as though cultural beliefs contribute, and may be the source of parental shame as it relates to children with disabilities not having access to educational services. Further investigation into this construct might provide additional insight into Cambodian understanding of disability and discrimination.

REFERENCES

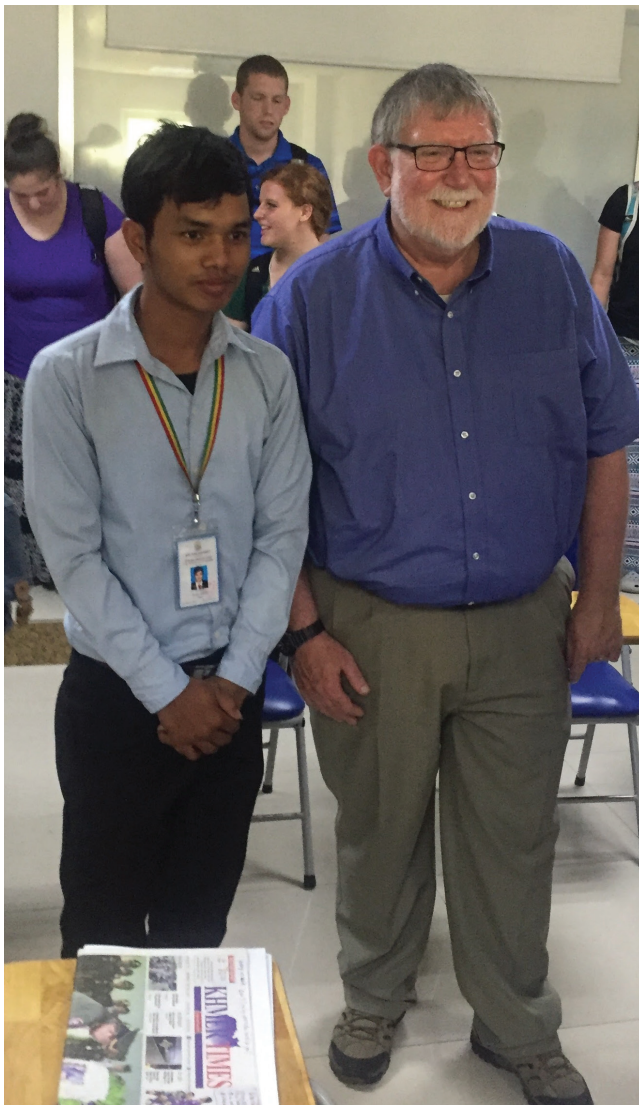
- Burkhardt, J. (2016). Cambodia and Disability. *McMaster School for Advancing Humanity Journal*, 9, 31-33.
- Connelly, U. B. (2009). Disability Rights in Cambodia: Using the Convention on the Rights of People with Disabilities to Expose Human Rights Violations. *Pacific Rim Law & Policy Journal*, 18(1), 123-153.
- Graham, N. (2014). *Fixing the Broken Promise of Education for All: Findings from the Global Initiative on Out-of-School Children*. Montreal: UNESCO Institute for Statistics.
- Hackett, J. H. (2016). Cambodian Inclusive Education for Vulnerable Populations: Toward an Ecological Perspective Perspective Policy. *Journal of International Special Needs Education*, 19(1), 3-14.
- Kalyanpur, M. (2014). Distortions and Dichotomies in Inclusive Education for Children with Disabilities in Cambodia in the Context of Globalisation and International Development. *International Journal of Disability, Development and Education*, 61(1), 80-94.
- Kuroda, K. K. (2017). *Implication for Teacher Training and Support for Inclusive Education in Cambodia: An Empirical Case Study in a Developing Country*. JICA Research Institute.
- Mak, M. a. (2011). “Reasonable Accommodations” or Education for All? The Case of Children Living with Disabilities in Cambodia. *Journal of Disability Studies*, 22(1), 55-64.
- National Institute of Statistics, Directorate General for Health, and ICF International. (2014). *Cambodia Demographic and Health Survey*. Rockville, Maryland: National Institute of Statistics, Directorate General for Health, and ICF International.
- Sabariego, C. O. (2015). Measuring Disability: Comparing the Impact of Two Data Collection Approaches on Disability Ratings. *International Journal of Environmental Research and Public Health*, 12, 10328-10355.
- Šiška, J. &. (2015). Access to Education for Learners with Disabilities in Cambodia as a Post-Conflict Country. *Development, Environment and Foresight*, 1, 277-291.
- UNICEF Cambodia Local Governance and Child Rights. (2014). *Situation Analysis for Disability-Inclusive Governance and Community Development in Cambodia*.

McMASTER SCHOLAR LED TRAINING SESSIONS IN CAMBODIA: MEASURING THE IMPACT

Fred Coulter, McMaster Fellow, Cambodia 2016-2017

This ongoing project has provided valuable information for the development of training projects of the Cambodia Learning Community scholars for the past three years. The information provided by this research has helped refine the selection of content for the McMaster Scholars' training content and enhanced their method of delivery over the years. Data was collected on previous McMaster trips to Cambodia in 2014, 2015, and 2016 (Coulter, 2014), (Coulter, 2016a), (Coulter, 2016). Previously data was collected from teachers, administrators, and staff at non-governmental organizations (NGOs), and students enrolled at a university. This research is important to the Cambodia Learning Community in three ways. First, to ensure that the McMaster Scholars' training presentations provided relevant content in ways that were understood by the participants. Second, what could be improved in the selection and delivery of content. Finally, contribute to the database of presentations that have been made in Cambodia and provide a record of what the participants learned.

There are definite benefits to professional development for all professions and pre-professionals in training. (Lyons, 2016). A barrier to professional development in Cambodia is the lack of access to relevant content in their own language and cultural perspective. Many professionals' training was in a language that was not native to them, such as French or English and taught from a Western point of view. While English is the common language of commerce and western practices are influencing the Cambodian culture, professionals may have difficulty reconciling the two spheres of knowledge, their own and that being taught to them (Berkvens, 2012).



The challenge of developing relevant training sessions for professionals in Cambodia is that they may have had years of experience in their positions. Therefore, they have knowledge of what they need to be doing, what they may lack is the theoretical framework connecting the multitude of experiences they have had over time. One of the objectives of the training sessions is to help participants supplement their prior knowledge with what they have learned in the training session and then apply that synthesized knowledge to their professional practice. This application of knowledge process affirms what they already know, supplements the participants with additional knowledge, and helps them to see how what they know and what they learned can be applied to their professional positions (Kot-Shimada, 2016).

For the 2016-2017 year, the eight projects developed by the McMaster Scholars were Theories of Motivation, Models of Decision Making, Understanding Post Traumatic Stress Disorder, Descriptive Statistics, Understanding Type 2 Diabetes, Understanding the Lesbian, Gay, Bisexual, and Transgendered Community, Cardio-Pulmonary Resuscitation, and Water Testing including Safe Water Handling Strategies. These topics were selected and developed based on previous years' participants' comments after training sessions. In addition, the community partners were asked what topics would be most relevant to them for professional development. This approach to developing training sessions based on partners feedback is based on a tenant of the McMaster School as serving as "a catalyst for innovative, interdisciplinary, community-based work by creating and supporting opportunities for teams of faculty, students, and staff to use their professional and academic skills to address a

community need” (McMaster School for Advancing Humanity, 2016)

The main reason that professional development is needed in Cambodia is that during the rule of the Khmer Rouge from 1975-1979, nearly 2 million were victims of a genocide that attempted to purge Cambodia of what Pol Pot and his cadre believed were corrupting outside influences from western countries. His goal was to return Cambodia to a much earlier prosperous time during the Khmer Empire. In his article, Sokhom (Sokhom, 2004) wrote that “the Khmer Rouge not only ended virtually all forms of formal education, it also actively sought out and killed the educated population” (Sokhom, 2004). In the ensuing years of rebuilding the country first by the Vietnamese, the United Nations, and finally for nearly 25 years by the prime minister, Hun Sen, the number of educated professionals has begun to grow. However, the lack of educational materials and training opportunities continue to be barriers to equipping professionals to be on par with other professionals around the world (Duggan, 1996).

Review of the Literature

Professional Training

According to Berkvens et al. (Berkvens, 2012), the quality of professional development activities conducted in Cambodia is diverse. They may vary in the level of the training the trainers may have, and it may not be conducted in their own language. As a way to provide quality training in topics that are relevant to the participants, this research project proposes to implement an evaluation process that will measure the impact of the requested training sessions on the professionals’ knowledge and practice.

Bloom’s Taxonomy

Benjamin Bloom (Bloom, 1956), in conjunction with a group of educational psychologists, developed a taxonomy of thinking that is structured from the recitation of facts to using critical thinking to evaluate a concept. The six levels of thinking from most basic to abstract are (1) knowledge, (2) comprehension, (3) application, (4) analysis, (5) synthesis, and (6) evaluation. This taxonomy is helpful not only when planning instruction, such as what basic facts and terminology do students need to know in order to understand and think about more complex concepts, but how to ask questions that address a particular level of thinking.

The taxonomy was revised in 2001 by Anderson and Krawthwohl to reflect the more dynamic action of the cognitive process. There six levels based on the original taxonomy were: (1) remembering, (2) understanding, (3) applying, (4) analyzing, (5) evaluating, and (6) creating. Each of the levels requires a particular type of thinking that becomes more complex and abstract. Each level builds upon the other so that learners build on their previous level of thinking before moving up to the next. For example:

- (1) Remembering: Recognizing or recalling knowledge from memory. Remembering is when memory is used to produce or retrieve definitions, facts, or lists, or to recite previously learned information.
- (2) Understanding: Constructing meaning from different types of functions be they written or graphic messages or activities like interpreting, exemplifying, classifying, summarizing, inferring, comparing, or explaining.
- (3) Applying: Carrying out or using a procedure through executing, or implementing. Applying relates to or refers to situations where the learned material is used through products like models, presentations, interviews or simulations.
- (4) Analyzing: Breaking materials or concepts into parts, determining how the parts relate to one another or how they interrelate, or how the parts relate to an overall structure or purpose. Mental actions included in this function are differentiating, organizing, and attributing, as well as being able to distinguish between the components or parts. When one is analyzing, he/she can illustrate this mental function by creating spreadsheets, surveys, charts, or diagrams, or graphic representations.
- (5) Evaluating: Making judgments based on criteria and standards through checking and critiquing. Critiques, recommendations, and reports are some of the products that can be created to demonstrate the processes of evaluation. In the newer taxonomy, evaluating comes before creating as it is often a necessary part of the precursory behavior before one creates something.
- (6) Creating: Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing. Creating requires users to put parts together in a new way, or synthesize parts into something new and different creating a new form or product. This process is the most difficult mental function in the new taxonomy.

By asking questions based on the level, students’ learning can be assessed either at levels one or two, referred to as *Lower Order Thinking (LOT)*, in addition to assessing learning for *Higher Order Thinking (HOT)*, assessing learning at levels three

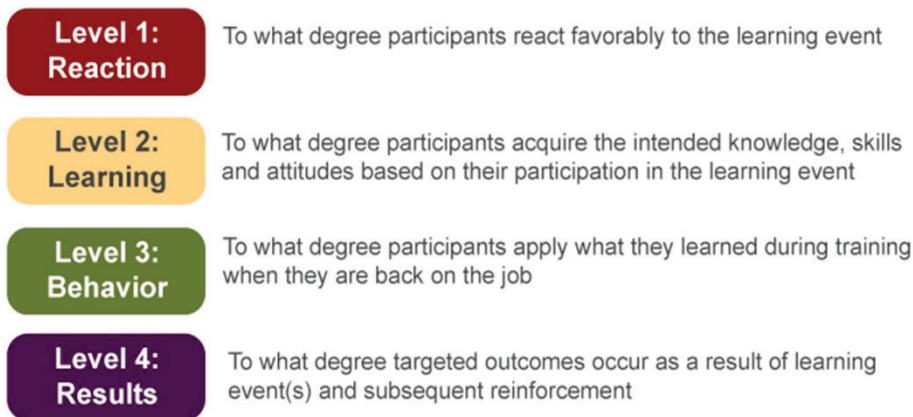
through six. A premise of teaching using Bloom’s Taxonomy is that students will have learned or know enough information at the first two levels in order to learn and think at higher levels. So, it is important for educators to make sure that students have sufficient knowledge to think at the desired level (Churches, 2009).

Kirkpatrick Evaluation Model

Over fifty years ago, Donald L. Kirkpatrick developed a model of evaluation as part of his doctoral program at the University of Wisconsin. The model has been since revised by him and his son, James, and used to evaluate training programs conducted by businesses, educational agencies, and nonprofit organizations. The Kirkpatricks stated that, “there are three reasons for evaluating training programs. The most common reason is that the evaluation can tell us how to improve future programs. The second reason is to determine whether a program should be continued or dropped. The third reason is to justify the existence of the training department . . . and its budget” (Kirkpatrick, 2006). Kirkpatrick and Kirkpatrick’s (Kirkpatrick, 2006) *evaluation* model consists of four levels, (1) reaction, (2) learning, (3) behavior, and (4) results. Each level provides specific information about the training session. The authors’ definitions for each level reflects the specificity of the evaluation process. Evaluation at the Reaction level “measures how those who participate in the program react to it. I call it a measure of customer satisfaction” (Kirkpatrick, 2006). Learning “can be defined as the extent to which participants change attitudes, improve knowledge, and/or increase skill as a result of attending the program” (Kirkpatrick, 2006). Behavior “can be defined as the extent to which change in behavior has occurred because the participant attended the training program” (Kirkpatrick, 2006). Results “can be defined as the final results that occurred because the participants attended the program” (Kirkpatrick, 2006). In other words, have the objectives of the training program been met.

Kirkpatrick and Kirkpatrick (Kirkpatrick, 2006) emphasized that completely implementing the four levels of the evaluation model can be time consuming and expensive. They suggested that the evaluation process should be focused, concise, and evaluate essential components of the training program. Ideally, a training program will be repeated so that what was learned from the evaluation process can be applied to the next round of training programs.

THE KIRKPATRICK MODEL



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Methodology

Participants

The participants in the research project were selected using the convenience sample method. Students enrolled at Asia Euro University in Phnom Penh completed the prompts. An informal introduction at the beginning of the training sessions revealed that about half of the students were in their third year of an English program and the other half were in their second year. A total of 29 responses were collected from the group.

Instruments

Two prompts were developed for the professionals to respond, based on Bloom’s Revised Taxonomy (Anderson, 2001). The prompts aligned with the first three levels of the taxonomy, remembering, understanding, and applying. The first prompt was, *What important information did you learn from the class?* (remembering and understanding). The second prompt was, *How would you use this information in your current or future job?* (applying).

Procedures

Vichea, our community partner and translator, gave the instructions to the participants in Khmer. He emphasized that their participation was voluntary and that they should not make any identifying marks on the plain paper that was given to them to keep their responses as confidential as possible. The participants were given white pieces of paper with the prompts printed on them, one at the top, the second halfway down the page. They were given as much time as needed to complete writing to the prompts. When completed, they placed their papers folded in half in a file folder.

Data Analysis

The participants' responses were analyzed using the Kirkpatrick's *Four-Level Evaluation Training Model* (Kirkpatrick & Kirkpatrick, 2006). Kirkpatrick and Kirkpatrick's (Kirkpatrick, 2006) model consists of four levels, (1) reaction, (2) learning, (3) behavior, and (4) results. For this research project, only the second and third levels of the model were used to assess the effectiveness of the training sessions. This is due to the time it takes for each training (the scholar presents the content in English, then the translator verbally translates what is said into Khmer, which naturally can double the time of the presentation). Sufficient time needed to be given to the participants to write their responses so the time spent in presenting the information during the training was much greater compared to the time spent evaluating what they have learned and how it influenced their professional practice.

Since all the students were studying English, they wrote their responses in English. This made the analysis much easier than in the previous years when the responses had to be read and translated by Vichea.

Results

In general, the results indicated that participants understood what was being presented during the training sessions. Also, participants could apply what they learned from the training sessions to their current or future jobs. Listed below are samples of their responses to prompts from the training sessions where data was able to be collected. Please note that the participants' responses are presented verbatim.

Level 2: What did the professionals learn from the training sessions?

Cardio-Pulmonary Resuscitation, First Aid, and Blood Pressure

The important information I learned today from the class is CPR. It is very important because I can help other people when I know this. The important information that I learned today is saving people life by Mr. Xavier.

Understanding the Lesbian, Gay, Bisexual, and Transgender Community

Today I have learned about LGBT, this lesson has provided a lot of experience in society. On the other hand, I'm interested in this. Because in Cambodia society, they have run into the a couple who have married the same sex.

Understanding Motivation

Motivation is very vital for me to know the value of motivating myself and other people to have desire and strong willingness to do something due to the expectancy theory and value theory which will result in internal, external, and utility that they'll get in the future in short term and long term in their lives.

Water Testing and Safe Water Handling

Yes, today your topic about health water is very interesting for me. Because most the peoples in the world needed water to drink for good health and we can know how to protect and clean the water for use.

Level 3: How would you apply what you learned to your professional practice?

Cardio-Pulmonary Resuscitation, First Aid, and Blood Pressure

I can help other people or my co-worker, my classmate when they swoon by CPR and other thing I can share CPR to my family and my friends.

Understanding the Lesbian, Gay, Bisexual, and Transgender Community

I will teach to another people and friends about CPR, motivation, and LGBT because I want they to know about more new knowledge.

Understanding Motivation

Well, I could use it in the future with my student, family or others. It's such a good idea to motivate them not to be blame, to encourage them even they did it good or not.

Water Testing and Safe Water Handling

I will tell my family, my friends or other people that I know about how to use pure water and how to protect the health to cut down the bacteria.

Discussion

By using Kirkpatrick and Kirkpatrick's (Kirkpatrick, 2006) two levels, to assess the students', the results indicated that the participants learned the information presented at the training sessions and were able to apply that knowledge to future professional practices. The students' ability to learn the material was enhanced by the presentation method. All the participants were given a printed copy of the presentation in Khmer and the presentation was translated from English to Khmer by Vichea, the McMaster Cambodia Learning Community's translator. In addition, at the end of each presentation, participants were encouraged to ask questions to elaborate on what they had read and heard. Many of the participants took advantage of that opportunity and fielded thoughtful questions for the presenters to answer.

Continued evaluation of the training sessions would be the recommendation for future research to ensure that the presentation topics and methods of presentation were effective in helping participants learn the material. Also, another prompt could be added asking the participants for future topics they would like to learn about. This would be in addition to the topics requested by community partners. Having this pool of topics would help recruit and select future McMaster scholars based on the responses. Once a topic is chosen, the process of preparing McMaster Scholars to give their presentations would stay the same. Scholars would participate in the yearlong Cambodian Learning Community, during which time they would thoroughly research their topic, write a complete presentation in English, and work with the McMaster Fellows to revise and edit the presentation. Then once in Cambodia, work with the Fellows to incorporate feedback to tailor each presentation to the participants (teachers, faculty, administrators, or caseworkers), their particular site (such as urban or rural), and the amount of time allocated for the presentation (this can range from 45 minutes to 2 hours). In order for the scholars to make such adjustments, they have learned their topic at a very deep level. Not only do the participants benefit from the scholars' presentations in learning about new topics and how to apply them to their practices, but the students learn by having to internalize the knowledge so that they can teach it to others (Lasater, 2012)

Two quotes from participants sum up the whole experience for all of us,

*I like this learning in class all the topic very interested. I hope we will have more time to learn again.
I know that anything and understanding when I learn, realize, and share idea to Cambodian people. Thank you so much.*

REFERENCES

- Anderson, L. W. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Boston, MA: Allyn & Bacon.
- Berkvens, J. K. (2012). Improving the Adult Learning and Professional Development in a Post-Conflict Area: The Case for Cambodia. *International Journal of Educational Development*, 32, 241-251.
- Bloom, B. a. (1956). Taxonomy of Educational Objectives: The Classification of Educational Goals, by a Committee of College and University Examiners. In B. a. Bloom, *Handbook 1: Cognitive Domain*. New York: Longmans, Green.
- Churches, A. (2009). *Bloom's Digital Taxonomy*. Retrieved from <http://edorigami.wikispaces.com/file/view/bloom%27s%20Digital%20taxonomy%20v3.01.pdf/65720266/bloom%27s%20Digital%20taxonomy%20v3.01.pdf>
- Coulter, F. (2014). Measuring the Impact of Training Session for Teachers in Cambodia. *The McMaster School for Advancing Humanity Journal*, 8, 49-53.
- Coulter, F. (2016). McMaster Scholar Led Training Sessions in Cambodia: Measuring the Impact. *The McMaster School for Advancing Humanity Journal*, 9, 49-52.
- Coulter, F. (2016a). Measuring the Impact of Training Impact of Training Session for Professionals in Cambodia. *The McMaster School for Advancing Humanity Journal*, 9, 34-37.
- Duggan, S. (1996). Education, Teacher Training and Prospects for Economic Recovery in Cambodia. *Comparative Education*, 32(3), 367-375.
- Kirkpatrick, D. &. (2006). *Evaluating Training Programs: The Four Levels (3rd Edition)*. San Francisco: Berrett-Koehler.
- Kot-Shimada, K. Y. (2016). Building the Capacity of Nursing Professionals in Cambodia: Insights from a Bridging Programme for Faculty Development. *International Journal of Nursing Practice*, 22 (Supplement 1), 22-30.
- Lasater, K. U. (2012). Global Partnerships for Professional Development: A Cambodian Exemplar. *Journal of Professional Nursing*, 28(1), 62-68.
- Lyons, K. Y. (2016). Professional Development Barriers and Benefits in a Tourism Knowledge Economy. *International Journal of Tourism Research*, 18(4), 319-326.
- McMaster School for Advancing Humanity. (2016). *The McMaster School for Advancing Humanity*, 9, 2.
- Sokhom, H. (2004). Education in Cambodia: Highland Minorities in the Present Context of Development. *Inter-Asia Cultural Studies*, 5(1), 137-149.

POST-TRAUMATIC STRESS DISORDER IN CAMBODIA

Dalton Bettis, McMaster Scholar, Cambodia 2016-2017

The purpose of my project was to raise awareness of post-traumatic stress disorder (PTSD) and its prevalence in Cambodia as a result of the genocidal and tortuous Khmer Rouge regime, as well as the possible intergenerational effects of trauma that can be passed down from parents to their children. Also, my project provided the participants with some useful tools and strategies for the diagnosis and treatment of PTSD. Furthermore, I intended to give the participants of the project appropriate resources to implement the most effective and feasible solutions for themselves and the people that they serve.

In my review of the literature, I found that Cambodia is one of the most PTSD stricken regions of the world. Joel Brinkley detailed the recent troubled history of Cambodia in his book *Cambodia's Curse*. With the rise of the Khmer Rouge and the Pol Pot regime, lasting from 1975 until 1979, the Cambodian people were victims of a genocide, which left 2 million people, about a quarter of the nation's population, dead and the rest traumatized. The Khmer Rouge effectively dismantled the Cambodian infrastructure; they overthrew the government, destroyed the economic, education, and healthcare systems by killing any professionals and anyone with any education or wealth, such as doctors, psychiatrists, teachers, lawyers, engineers, etc. As a result, about half the adult population in Cambodia shows signs of PTSD, and only 40 years later, the country is still trying to rebuild all of the lost knowledge and resources that could be used to combat this problem (Brinkley, 2011)

Research has also shown that the effects of PTSD can be passed down from one generation to another in some capacity. With only 40 years since the Khmer Rouge, the wound left by Pol Pot is still very fresh, and even babies being born today are perhaps only two generations removed from the atrocities of the Khmer Rouge regime. Micah and Sima Weiss, as well as Rachel Dekel and Hadass Goldblatt, both researched the intergenerational effects of trauma, through both direct and indirect transmission, in their respective works. Micah and Sima Weiss conducted a case study of children of Holocaust survivors, which showed the different effects of their parents' trauma and the effect it had on themselves. The study aimed to differentiate between direct transmission of trauma, in which a child learns to act in disturbed ways similar to their parents because of the parent's projection of their trauma onto the child, and indirect transmission of trauma, in which a parent's parenting skills are diminished as a result of the trauma they experienced, thereby affecting their children (Weiss, 2000). Dekel and Goldblatt's article reviewed the literature on the intergenerational effects of PTSD on children of combat veterans, focusing almost entirely on American wars from World War II to the present, and sought to determine, or at least hypothesize, what mitigating factors may help determine the risk of intergenerational transmission of trauma (Dekel, 2008)

Like Micah and Sima Weiss, Miri Scharf also studied the long-term effects trauma may have on the second and third generation of Holocaust survivors. The article mostly explored the effects of the parenting styles of the Holocaust survivors and the impact they may have on the next generation through indirect transmission (Scharf, 2007). Nigel P. Field, Chariya Om, Thida Kim, and Sin Vorn conducted a similar study of the parenting styles of survivors of the Khmer Rouge regime and the effects of which on the next generation through indirect transmission. Field et al.'s study was one of the first to analyze the possibility of PTSD being transmitted from one generation to the next in the context of the Khmer Rouge genocide in Cambodia. They found that there is indeed a correlation on the parenting styles of a survivor of the Khmer Rouge regime and an increase in symptoms of depression and anxiety in their children (Field, 2011).



I presented my project on post-traumatic stress disorder in Cambodia and the possible intergenerational effects of trauma six times to a very diverse collection of people. I trained 20 staff members from the Cambodian Organization of Children and Development (COCD) in Kampot Province; 69 adolescent students and 19 nuns and religious women at a Buddhist monastery at Oudong in Kampong Speu Province; 23 students, 10 staff members, and 15 community members at a Khmer Youth Association sponsored vocational school in Prey Veng Province; 31 students at Asia Euro University in Phnom Penh; 16 monks, 21 nuns, and 13 religious men and women at a monastery at Kampong Speu Province; and 49 nuns and religious men and women at a monastery in Pursat Province.

In addition to the verbal presentation of my project, I also distributed various materials, translated from English to Khmer – an outline of my presentation, as well as copies of the Primary Care PTSD Screen for the DSM-5 (PC-PTSD-5), which could be used by them to determine if someone may have PTSD.

During my time training these people in Cambodia, I noticed many things about the Cambodian people, their culture, and their knowledge of PTSD. I expected there to be a lack of knowledge on not only PTSD but also mental health in general, as a result of the long-reaching effects of the Khmer Rouge. I expected that when I asked if anyone knew anything about, or even heard of PTSD that the majority of the group who I was presenting to would have little, if any, prior knowledge of PTSD. I also expected that some of the symptoms of PTSD would be lost in translation to a certain extent and would need further explanation. For example, I did not expect them to know what a nightmare or a flashback is, and I expected that I would have to spend more time explaining what things like anxiety or hypervigilance are. Now, of course, they knew what these things were, and had probably even experienced them at some point in their lives, but they were just unfamiliar with the terms used to describe these things. However, I did not expect to have to spend as much time as I did explaining what trauma is and providing examples of both physical and psychological trauma. When asked what trauma is or to provide examples of trauma, there would usually be about one or two participants who would use the example of motorbike accidents, but seldom would anyone describe anything else. I was also very surprised when I had to explain to 31 second and third year English students at Asia Euro University what a symptom was (and in this particular day of training my project was to be presented entirely in English with help from the Khmer interpreter only when necessary) because they had never heard the word before.

In addition to these examples of words' meanings being complicated by the translation from English to Khmer, what struck me was the knowledge, or lack thereof, of the Khmer Rouge regime. Except for when I was presenting at the monasteries with an audience who the majority of which were alive to experience the Khmer Rouge regime first-hand, it seemed that not much was known about this significant piece of Cambodian history that happened only 40 years ago. After establishing what trauma is and providing some examples, I would always ask the participants to identify the most prominent example of trauma in Cambodian history. The first time I presented, I was shocked when no one answered in the group of 20 COCD staff members, all of which were in at least their mid-twenties and most of which probably had college degrees, until one young man answered with the Khmer Rouge regime. In other presentations no one could answer the question; even though they had all heard of the Khmer Rouge, they just hadn't learned enough about it to make the connection. When I would ask them what they knew about the Khmer Rouge and the Pol Pot regime they would say "not a lot" or that there was "a lot of killing." They said that they simply did not learn about it in school; their only knowledge of it came from stories told by family members. When I asked the same question when presenting to Asia Euro University students, initially they didn't answer. But when I brought Pol Pot and the Khmer Rouge into the discussion they seemed to know a lot. These students even said that in addition to learning about it from family members who experienced it first-hand, they had also learned about it in high school and at the university. Perhaps this could be because the majority of these students may not have attended a government high school but instead went to private schools that were run by non-governmental organizations.

REFERENCES

- Brinkley, J. (2011). *Cambodia's Curse: The Modern History of a Troubled Land*. New York: Public Affairs.
- Dekel, R. &. (2008). Is There Intergenerational Transmission of Trauma? The Case of Combat Veterans' Children. *American Journal of Orthopsychiatry*, 78(3), 281-289.
- Field, N. O. (2011). Parental Styles in Second Generation Effects of Genocide Stemming from the Khmer Rouge Regime in Cambodia. *Attachment and Human Development*, 13(6), 611-628.
- Scharf, M. (2007). Long-term Effects of Trauma: Psychosocial Functioning of the Second and Third Generation of Holocaust Survivors. *Development and Psychopathology*, 19(2), 603-622.
- Weiss, M. &. (2000). Second Generation to Holocaust Survivors: Enhanced Differentiation of Trauma Transmission. *American Journal of Psychotherapy*, 54(3), 372-385.

CPR, FIRST AID, AND BLOOD PRESSURE MANAGEMENT TRAINING

Xavier Blyden, McMaster Scholar, Cambodia 2016-2017

The purpose of my project was to provide training to non-governmental organization (NGO) workers, Buddhist nuns and university students about appropriate procedures to administer cardio-pulmonary resuscitation (CPR) to an unconscious person, how to apply basic first aid, and how to measure blood pressure using a blood pressure cuff (sphygmomanometer).

Cambodia is a developing nation, a nation made up of people who live by the teachings of Theravada Buddhism, speak the language, Khmer, and live in a climate directly above the equator. Its present-day capital, Phnom Penh, lies in the center of a nation that is still suffering from the effects of the ever-bleeding wounds of a genocide that sought to destroy it (Chandler, 1998). The group responsible for the Cambodian genocide was the Khmer Rouge. The mission of the Khmer Rouge was to downgrade a Cambodia that was growing too fast and becoming too modern and corrupt for the well-being of the Cambodian population (Chandler, 1998). The leaders of the group forced innocent people of all classes, ethnicities, and religions including educated people, professionals, doctors, Christians, and Muslims - to work against their will, in conditions that they had never worked in before (Leitsinger, 2010). The Cambodian prisoners had two main choices: either conform and work in the fields, or oppose and die.

From 1975 to 1979, the rise and fall of the Khmer Rouge, more than 1.2 million Cambodians died from exhaustion and starvation, and an additional 200,000 were “executed without trial” because of their class status (Chandler, 1998). Today, Cambodia suffers from an educational gap that has left them decades behind many other countries (Chandler, 1998). Cambodia’s health care system, from the education of the medical professionals to the direct care given to patients, is lackluster.

Out of the 500 physicians who practiced before the invasion, very few remained. The medical system, among many other things, has been in a state of rebuilding since.

Dr. John Cantwell, a cardiologist who traveled to Cambodia with the medical mission Flying Doctors of America, and his team saw over 1,000 patients in four days (Cantwell, 2014). Uy Chanthol, the medical doctor that he met in Siem Reap, is the only doctor in a town of 125,000 and had just recently learned how to use a defibrillator. While in Cambodia, Dr. Cantwell had diagnoses for the patients that he met with but had no method of treating them with medication or testing them extensively



(Cantwell, 2014). Although Cambodia consists of twenty-four provinces-most of which have hospitals--most of the country is still underdeveloped (Zimmer, 2006). Much of the population includes farmers and construction workers who live in more rural areas in the country (Cantwell, 2014). When dealing with sudden medical emergencies, Cambodians are unable to transport victims to the nearest health facilities. It is because of this that training in basic first aid-including cardiopulmonary resuscitation (CPR) and blood pressure measurement training is helpful and lifesaving for rural Cambodians (Nia, 2008).

Hypertension stands as one of the world’s leading causes of death and is one of the main risks factors for heart disease. In more developed nations including the United States people with hypertension are usually diagnosed and then prescribed medications. In lesser developed nations, including Cambodia, it is more challenging to diagnose and treat people because of limited access to public health centers (Isaakidia, 2011). Maryam Bigdeli of the

World Health Organizations' Alliance for Health Policy and Systems Research and Bart Jacobs of the German International Cooperation (GIZ) in Cambodia (Bigdeli, 2016) surveyed 709 individuals who had self-reported and had been treated for diabetes and hypertension in rural Cambodia. In their research, they found that "5-11% of adults" had diabetes while "12-25%" had hypertension. Additionally, 58% of the adults with diabetes still had uncontrolled blood sugar, and 39% of the adults with hypertension were unaware of their blood pressure measurements (Bigdeli, 2016).

In addition to hypertension, people getting burns in Cambodia is very prevalent. According to an article about Cambodian children, there are an estimated 20,000 burns and 2000 burn deaths annually (Hsiao, 2007). Many of the victims are children under the age of 10. Contact with hot liquids including water and grease as well as contact with hot surfaces including stovetops, exhaust pipes, and burning rubber are the main contributors to the prevalence of burns in Cambodia (Hsiao, 2007). When asked what to do after getting burned, the majority of the participants choose to apply toothpaste on the burn, while fewer participants chose using a bandage or calling for help.

My project aimed to train people in Cambodian communities how to correctly take their blood pressure measurements in addition to first aid training including cardiopulmonary resuscitation (CPR) and techniques for assisting victims of burns, fractures, heat exhaustion, and trauma.

The CPR, First Aid, and Blood Pressure training was presented a total of seven times to a total of 269 people. The first presentation was at a local school in Phnom Penh. The school was specifically for the young children of factory workers. Additionally, trainings were conducted at the Cambodian Organization for Children and Development, the Oudong Mountain Monastery, in Prey Veng Province at the Khmer Youth Association, the Asia Euro University, in Phnom Penh at the Cambodian Volunteers for Community Development center and in the Kamspeu Speu Province at the Association of Nuns.

Learning how to be a prepared bystander is vital for every person regardless of vocation or profession, and the goal of this project was to empower people to be more prepared bystanders. In every location in which I trained, the Cambodian participants showed an eagerness and willingness to learn. As a presenter, I learned that I have to determine what is known before beginning and to assess their understanding throughout the training. Also, I learned that education, no matter how long it takes to share and learn concepts, is an invaluable piece of life.

REFERENCES

- Bigdeli, M. J. (2016, January 27). *Access to Treatment for Diabetes and Hypertension in Rural Cambodia: Performance of Existing Social Health Protection Schemes*. doi:10.1371/journal.pone.0146147
- Cantwell, J. (2014). Cardiologist in the Shadow of Angkor Wat: A Medical Mission to Cambodia. *Baylor University Medical Center Proceedings*, 27(2), 153-155.
- Chandler, D. (1998). Safeguarding Peace: Cambodia's Constitutional Challenge. *Accord Publication*(5), 12-19. From Accord Publication: http://www.c-r.org/downloads/Accord%20Cambodia_Historical%20legacy.pdf
- Hsiao, M. T. (2007). What Do Kids Know: A Survey of 420 Grade 5 Students in Cambodia on their Knowledge of Burn Prevention and First-Aid Treatment. *Burns*, 33, 347-351. doi:10.1016/j.burns.2006.0.002
- Isaakidia, P. &-E. (2011). Treatment of Hypertension in Rural Cambodia: Results from a 6-Year Programme. *Journal of Human Hypertension*, 25, 241-249. From <http://www.nature.com/jhh/journal/v25/n4/pdf/jhh201049a.pdf>
- Leitsinger, A. (2010, July 26). *A Timeline of the Khmer Rouge Regime and its Aftermath*. From CNN: <http://www.cnn.com/2010/WORLD/asiapcf/07/25/cambodia.khmer.rouge.timeline/>
- Nia, M. N. (2008). The Role of Performing Life Support Courses in Rural Areas in Improving Pre-Hospital Physiologic Conditions of Patients with Penetrating Injuries. *J Coll Phy*, 18(9), 538-541. doi:09.2008/jcsp.538541
- Zimmer, Z. K. (2006). The Impact of Past Conflicts and Social Disruption on the Elderly in Cambodia. *Population and Development Review*, 32(2), 333-360. From <http://www.jstor.org/stable/20058878>

UNDERSTANDING TYPE TWO DIABETES

Jessica Crigger, McMaster Scholar, Cambodia 2016-2017

The purpose of this project was to conduct training sessions with non-governmental organizations (NGOs), Buddhist monks, nuns and lay religious men and women, and university students about type two diabetes. As part of the training sessions, along with the printed materials, I created models to help the people understand what was happening in their body when a person who has type two diabetes and when a person does not have type two diabetes. I also gave them an example of a proper diet. I created a glossary and an outline that was translated into Khmer.

In Cambodia, there is a rising epidemic of diabetes among its people (Jung, 2014). A study conducted by Megan R. Renfrew and her fellow team members noted that people in Cambodia have a mistrust of western medicine so they do not understand how medication can be used to control insulin levels. The people in Cambodia use herbs and healing practices to treat people when they are ill. In the same study, they also found that Cambodians are not educated thoroughly on diabetes. This increased prevalence of diabetes in Cambodia can be caused by diet, lack of exercise, and lack of knowledge and treatment (Renfrew, 2013). In Cambodia, the people have a rice-based diet; evidence supports that a heavy carbohydrate-based diet can contribute to diabetes. Another factor contributing to diabetes, is the lack of exercise. In a study completed by Chang Hee Jung, and his team reported data about 1289 Cambodians with diabetes, and they found that 72% were overweight (Jung, 2014).

My project addressed the problem of diabetes in Cambodia by teaching the people what diabetes is, how they can recognize the warning signs and symptoms of diabetes, and how they can manage it. I showed them about what foods would be more suitable for them to eat and taught them the importance of exercise and weight control.

I went to Cambodia Organization for Children and Development (COCD) where I presented my project to twenty staff members. Then we traveled to Oudong where I presented to nineteen nuns/religious people and sixty-nine adolescent students. The following day I trained twenty-three vocational students, ten staff members, and fifteen community members at Khmer Youth Association (KYA) in Drey Veng. Additionally, I conducted training sessions for fifty students at Asia Euro University and in Kamspeu Pong where I trained fifty religious men and women

During my training sessions, I found that most people in this country have heard the word diabetes and that is it. The people that I trained with did not understand how diabetes affects your body. They did not understand the health consequences that would come if you let this condition go untreated. To make it easy for the people to understand what happens when a person has diabetes, I used visual models and provided a demonstration of how a diabetic person and a non-diabetic person processes the rice in the body. I learned that being a trainer can be difficult because there is a language barrier. For my project, there is no Khmer word for glucose or insulin. This became difficult because then I had to introduce words with new meaning to them. Sometimes I would have to explain something multiple times and then change the way I was saying it so that they could understand. I ran into difficulties explaining the relationship between glucose and insulin to the translator because they had trouble understanding it as well.



REFERENCES

- Jung, C. K.-K.-H.-S.-Y.-Y. (2014). The Glycemic Status of Diabetes in an Urban Area of Cambodia. *Diabetes Research and Clinical Practice*, 104(2), e34-e37. doi:10.1016/j.diabres.2014.02.008
- Renfrew, M. R. (2013). Barriers to Care for Cambodian Patients with Diabetes: Results from a Qualitative Study. *Journal of Health Care for the Poor and Underserved*, 24(2), 633. doi:10.1353/hpu.2013.0065

RAISING AWARENESS OF THE LGBT+ COMMUNITY IN CAMBODIA

Taylor Haydinger, McMaster Scholar, Cambodia 2016-2017

The purpose of this project was to provide training for non-governmental organizations (NGOs), university students and community activists on the LGBT+ (Lesbian, Gay, Bisexual, Transgender, +) community.

Cambodia is a country located in Southeast Asia with a population of around 15.7 million. About 97% of Cambodians are Buddhists. In 1975 Cambodia experienced a genocide. This genocide killed a large percentage of the educated people (The World Factbook, 2016).

Since the liberation of Cambodia from the Khmer Rouge, Cambodians have been trying to rebuild their infrastructure with limited knowledge and resources due to the loss of trained professionals. The country faces many economic, educational, and social justice problems including discrimination against the LGBT+ community.

When examining a reason as to why people discriminate against the LGBT+ community, a contradiction arises. Ninety-seven percent of the country is Buddhist and Buddhist teachings do not stigmatize those people who experience different sexualities and genders. However, it has been found that discrimination, against the LGBT+ community, does exist in this Buddhist country (Kossov, 2015).

Kossov and Vanntey found that in four different provinces in Cambodia (Koh Kong, Kampong Thom, Kampot, and Takeo) LGBT+ bullying was prevalent. The majority of bullying came from male students. Others who bullied LGBT+ members include community members, police, and teachers. Those being bullied experienced verbal, physical, and sexual bullying (Kossov, 2015).



One of the reasons why people may discriminate against the LGBT+ community is because they believe it is caused by mental illness brought on by a dissolved relationship or one's family culture (Kossov, 2015). Cambodia's culture reflects collectivist views, making them extremely family orientated (Harley, 2016).

Cambodians also practice the act of maintaining a 'good face', meaning they want to keep a good reputation or self-image. Being part of the LGBT+ community can be frowned upon when a culture is family orientated since it creates change within traditional roles. Families want children, and they believe that if someone is part of the LGBT+ community they cannot provide children. This leads people to

believe that being part of the LGBT+ community is shameful because they believe that they are unable to procreate.

Since Cambodians maintain a 'good face', they do not want to be shamed and seen as an outsider by others. This not only leads to discrimination against the LGBT+ community but promotes fear in others who are considering their gender identity (Harley, 2016).

I conducted training for 69 adolescent students in the town of Oudong. I trained 23 vocational students in the Prey Veng Province at the Khmer Youth Association. My training continued at the Asia Euro University and with the Association of Nuns.

Throughout my training, I was challenged to adapt my project with every audience. Before I began my training, I had to make sure that the audience understood what LGBT+ meant. Once this information was established, I was able to introduce gender, sexuality, and discrimination. With the students, my project focused more on discrimination and bullying. When I asked the students if they knew anyone who was gay, lesbian, or transgender, there were two instances where students would point to an individual student in an attempt to make fun of them. The students used these terms on other students if they were different, even if they did not identify as LGBT+. This encounter allowed me to transition into the topic of discrimination. I learned that the students knew that it was wrong to discriminate and bully, but did not know why they did it.

When training the college students, they knew more about the LGBT+ community and did not point at other students when asked the same question, but offered stories of the people that they knew were part of the community. With the college group, I found a contradictory opinion. In Cambodian law, it states that marriage "... is a solemn contract between a man and a woman..." (Law on the marriage and family). When I asked the afternoon class if people of the LGBT+ community can get married, they said no. When I asked the morning class, they said yes. What I learned is that though the law states that marriage is only between a man and a woman, some people of the LGBT+ community do get married, but it is not often seen. Through my observation of the students, I believe there is a split in opinion based on their level of understanding, socioeconomic backgrounds, and family influence.

Throughout the training, I realized that the students had a basic understanding of the LGBT+ community. They understood the terms boy, girl, gay, lesbian, and bisexual. They understand the basic concept of transgender but do get confused with it. When I ventured into other terms such as pansexual and agender, the students did not seem to understand; they became quickly confused. I believe this confusion came about because they do not understand the concept of gender versus biological sex. They believe they are interchangeable, which creates confusion when talking about certain terms. This has led me to believe that one of the reasons people do not accept the LGBT+ community in Cambodia is because they lack the understanding of gender versus biological sex. Since they believe these terms to be one in the same, they do not grasp terms such as agender, pansexual, genderfluid, transgender, and more.

Through my training, I was able to form a broad picture of how people view the LGBT+ in Cambodia. Stigma still exists against the LGBT+ community, but there have been steps to end it. There are organizations in Cambodia fighting for rights for the LGBT+ community, and there are people that are becoming more accepting of the community. With the advancements of rights for the community and proper education, I believe we will see an increase in acceptance of people who identify as LGBT+.

REFERENCES

- Harley, D. (2016). Asian Americans and Native Pacific Islander LGBT Elders. *Handbook of LGBT Elders*, 159-176. doi:10.1007/978-3-319-03623-6_8
- Kossov, I. &. (2015, December 18). *LGBT bullying endemic, report finds*. From Phnom Penh Post: <https://www.phnompenhpost.com/national/lgbt-bullying-endemic-report-finds>
- The World Factbook*. (2016, April 16). From CIA: <https://www.cia.gov/library/publications/the-world-factbook/geos/cb.html>

DECISION MAKING

Elyzabeth King, McMaster Scholar, Cambodia 2016-2017

There was an expressed need from the community to learn about the best practices in decision making and business administration due to the genocide that targeted the country's educated population. This project educated the NGOs, businesses, and universities that participated in the training, on different methods to make effective decisions and to give participants the ability to apply these models to their practices.

I developed a training session that covered alternative processes of making effective business decisions, which include showing how to include the three aspects of society, economy, and the environment when making decisions as well as explaining the difference between programmed and non-programmed decisions. This training also provided the understanding of a decision model and how to apply it to the life goals of the people.

I prepared, translated, and presented a training session and manual that was offered to the NGOs, businesses, and universities to educate the participants on effective decision making. Those who attended can use the information from the session to train others in their professional practice, ultimately increasing the chances of success in businesses, organizations, and even life goals.

Due to the genocide that has happened in Cambodia within the last 50 years "Cambodia's tragic historical legacy is nowhere more evident than in the case of education.

Virtually, the entire educated class perished or fled the country in the 1970s" due to the Khmer Rouge (Hill, 2014). With the genocide, many of the educated individuals either starved or were killed. This left the country with a young population that did not have the education or knowledge to maintain the economy. According to research, the major problem is that many did not know of, or have a strong system for making decisions that can heavily impact the success of their country. To make matters worse, the Khmer Rouge implemented a profoundly radical regime. Money, markets, and private property were abolished (Lilja, 2010).

Research suggests that decision-making in Cambodia was formed and characterized by the country's violent past and the 1993 implementation of liberal values (Lilja, 2010). While Cambodia may be called a hybrid democracy, the word democracy has a different meaning in the U. S. than it has in Cambodia. Democracy was used to describe Cambodia even while they were under the power of the Khmer Rouge. This led the government to have more control over the economy. Cambodia's economy has been rapidly rebuilding and growing, but they do not have a system of how to make wise decisions leading to corruption. As one local NGO stated in an article "Corruption is everywhere [in Cambodia]. People consider that normal." (Lilja, 2010). Cambodia is very much a collectivist society, but they have been mainly acting as individuals when it comes to decision making.



I presented my project on 'Decision Making' five times. I first presented in Kampot Province for the Cambodian Organization for Children and Development (COCD) where I was able to train 20 staff members. Next, I was able to educate approximately 35 adolescent female students in the temple at Oudong. My third time presenting was 90km from Phnom Penh in the province of Prey Veng where I trained 23 vocational students for the Khmer Youth Association (KYA). I also presented my project to 32 students in Phnom Penh at the Asia Euro University and in the city of Pursat to the Association of Buddhist Nuns where I was able to educate 42 nuns and religious workers.

The audiences I trained were all very excited and intrigued to learn about decision making and how to apply models to make better decisions. The initial understanding of what a decision was and how to make them varied for each group. The staff at the COCD had the most previous knowledge on decisions and was also able to recognize the decisions they make and determine if they were programmed or non-programmed. They were able to participate actively and apply decisions they make in their organization to the model I presented. I feel this group was also the audience that took the most away from Practical Approach decision-making model.

Other groups I trained did not have a strong understanding of decisions, and I had to adapt my training plan to spend more time on the basics for the group to truly understand the concept of decision making and adapt examples to fit the audience better. The next two groups I trained were at Oudong and Khmer Young Association (KYA), were all younger students so I adapted the training to provide details of what a decision is and how a decision can be made based on a goal. Many of these children have the intent to do well in school to then achieve a profession of a police officer, doctor, etc. I used this goal of theirs as an example to educate them that good decision making should bring you closer to achieving the goal. Overall, the students seemed to grasp the concept very well. At the Asia Euro University, the students initially struggled with understanding the concept of what a decision was, but after a more detailed explanation and some practice with audience participation the class was able to understand decision making and goals. I was able to provide training for these students on the details of the model and methods of evaluation of the variables so that they could determine which option would get them closer to the goal and have the most value in terms of economic, social, and environmental factors. Similar to the children at Oudong and KYA, I gave these college students scenarios and working together. They were able to evaluate the different variables in each choice and recognize that while there may be more than one option that will bring us closer to the goal, they were able to cognitively make the decision that had the most value and moved towards the goal. The last groups I worked with were the nuns and religious workers at Pursat. These people were knowledgeable and quick learners. They were able to identify the goals and decisions they face in their lives and through participation in the training session the audience worked through the Practical Approach decision-making model with examples that directly applied to their experiences

Even though each location took more time to understand the concept of what a decision was than expected, the audience left with a much stronger understanding of decision making and all locations took away the new knowledge about applying their decisions to the models presented.

REFERENCES

- Hill, H. &. (2014). Cambodia: Rapid Growth in an Open, Post-Conflict Economy. *World Economy*, 37(12), 1649-1668. doi:10.1111/twec.12206
- Lilja, M. (2010). Discourses of Hybrid Democracy: The Case of Cambodia. *Asian Journal of Political Science*, 18(3), 289-309. doi:10.1090/02185377.2010.527220

WATER TESTING

Arlen Stoller and Rachel Wehrman, McMaster Scholars, Cambodia 2016-2017

Through this project, we trained our community partners on how to test and treat water, and prevent the further recontamination. We provided the information and training to allow the community to attain clean water.

The Khmer Rouge was the communist party of Kampuchea in Cambodia. This communist party wanted all “educated people” to be eliminated. Also, all persons that held government jobs before the Khmer Rouge were targeted. Over two million people were killed from the reign of the Khmer Rouge. These people were killed by starvation, exhaustion, inadequate medical care, torture, murder, and execution (Tyner, 2016). The party got rid of the doctors, dentists, professors, government officials, and anyone that wore glasses. The Khmer Rouge wanted the lower class left with no experience in anything. Since all of the professors and doctors were killed, the lower class did not know anything about any problems that would occur in Cambodia. This is still an issue in today’s society and can be observed in the flaws in infrastructure, increasing the hardships of Cambodians daily. One example of the effects of the Khmer Rouge is the lack of access to clean water. According to a study done by Shaheed, A, et al., unhygienic water storage and improper handling of the water has led to cross-contamination of the water. The water’s contamination is mostly from the households mixing improved and unimproved water sources. A high percentage of the water sources in the rural areas of Cambodia are contaminated with *E. coli* bacteria (Bennett, 2010). The highest concentration of waterborne diseases was in the water that was at the point-of-use. This shows that even the water that may be safe initially can be contaminated as it is transported or stored.



At the ten locations where we tested the water, the amount of ammonia, nitrates, nitrites, chlorine, and phosphates were all at or under safe levels determined by the World Health Association. Our community partners would collect water that came from their primary water sources, including wells, ponds, cisterns, and collected rainwater. The materials and chemicals used for testing the water were from Hach. Specific chemical reactions would be used to cause a color change corresponding to each chemical level in the sample tested. The bacteria test consisted of putting a pillow of bacteria indicator in a sterile bottle. 100 ml of water was added, and after 48hrs if the color of the water was changed from brown to black, there were

bacteria present in the water. This caused a problem for us to record the results and to give that information back to our community partners. We decided to leave the test with the community partners. Based on previous years and other research, we could assume that a majority if not all the bacterial tests came back positive. The last test we performed, was pH. We used a pH meter to determine the water value on the pH scale.



Our goal of testing water in Cambodia was to inform our community partners about the contaminants that are present in the water and train about removing the harmful substances or reducing the concentrations to a safe level. We presented a total of five times, working with the following organizations: Transformation Fellowship (a faith-based Christian primary school), the Asia Europe University, Khmer Youth Association, two rural primary schools, and a Buddhist monastery in the Pursat province. We presented to approximately

100 individuals. These individuals range from the age of 5 to 70 and from the intellectual background of having no formal education to college students, graduates, and professionals. A majority of the time spent presenting was developing the concept of bacterial recontamination. A high percentage of our audiences understood that bacteria are present in the water and that it was unfit for direct consumption. However, they lacked the understanding that bacteria are present throughout the environment. Without this prior knowledge, we had to develop the thought that bacteria can cause 'clean water' to become unfit to use again. We then spent a considerable amount of time developing the idea that washing food and cookware with water that was free of contaminants is a must. Something as simple as washing one's hands before food preparation with clean water was a new concept that had to be developed. By using glitter as a representation of bacteria, we were able to develop an understanding of why bathing, washing fruits, vegetables, and cooking ware was critical to their health. It was observed that our community partners were using ceramic filters that we provided in previous years. We also had the opportunity to tour one of the community partners water treatment plant. Throughout our time in Cambodia, we gained a better understanding and appreciation of the use of language in everyday life. We found that many of the words that we use to convey our messages are not a direct translation from English to Khmer. Instead, we had to build context on what we were trying to convey. We believe that great strides have been made in not only the understanding of recontamination of water but also in proper water hygiene.

REFERENCES

- Bennett, H. S. (2010). Characterisation of the water quality from open and rope-pump shallow wells in rural Cambodia. *Water Science and Technology*, 61(2), 473-479. doi:10.2166/wst.2010.817
- Tyner, J. a. (2016). To live and let die: Food, famine, and administrative violence in Democratic Kampuchea, 1975–1979. *Political Geography*, 52, 47-56. doi:10.1016/j.polgeo.2015.05.004

DESCRIPTIVE STATISTICS

Conner Varner, McMaster Scholar, Cambodia 2016-2017

The purpose of this project was to introduce organizations, schools, and businesses in Cambodia to descriptive statistics, and provide training for them on how to apply descriptive statistics to their work. This training particularly focused on the arithmetic mean, or the average, and how it may be useful to each organization.

Cambodia's history is one that contains great power, but one that also contains great tragedy. In 1975, the biggest tragedy began, the Khmer Rouge led by Pol Pot (Johnson, 2008). Cities containing millions of people were evacuated, and its citizens were forced to work in the countryside on agriculture. During these evacuations, thousands of people were killed. The leaders of the Khmer Rouge wanted to get rid of any Western influence, and to turn Cambodia into a communist country in which there would be no class system, no money, no free markets, no normal schooling, no private property, no foreign clothing styles, and no religious practices. Pol Pot feared those who opposed him or threatened his power, so he executed soldiers, minority people, doctors, teachers, lawyers, and any well-educated adults. At least a quarter of the Cambodian population (about 1.7 million people) was wiped out during the Khmer Rouge which ended four years later in 1979 (Cambodia Profile - Timeline, 2017).

The repercussions of the Khmer Rouge remain today. The government



of Cambodia alone would not have been enough to rebuild what was taken away during the Khmer Rouge (Brinkley, 2011). Many non-governmental organizations (NGO) emerged to help create a better Cambodia. One very important role of NGOs is to help in redeveloping a good education system, which was completely destroyed during the Khmer Rouge. Today there are few qualified educators in Cambodia. Younger generations are not being taught basic ideas that will be helpful to them in the future. This includes the absence of education on descriptive statistics, like mean, median, and mode. Descriptive statistics are important in developing any sort of business, school or organization.

I presented my project four times while in Cambodia. The first was in Kampot Province, where I educated 20 members of the Cambodian Organization for Children and Development (COCD) on how to use arithmetic mean to analyze attendance at their preschools. The second time I presented was in Prey Veng Province to the Khmer Youth Association (KYA). Here, I worked with 23 vocational students, ten staff members, and 15 community members on calculating the average cost to make a dress, and then discussed how this could be used to calculate what they should sell the dress for. I led training in Phnom Penh at the Asia Euro University for 31 students who were in school to become English teachers, so I adapted my training to teach them how using the arithmetic mean can be useful in calculating test scores for their future classes. Additionally, I presented to 49 nuns and religious at the monastery in Pursat Province, using descriptive statistics to determine how much rice is necessary to prepare each day.

The concepts of descriptive statistics were well received by all audiences. It was intended to provide training about all the measures of central tendency. It appeared as though measures of central tendency were new knowledge. The majority of the training time was devoted to building understanding of the concept of the arithmetic mean.

Members of the training audience asked many questions on how to calculate the average and on when the average would be helpful to use. I grew as a trainer and learned how to adjust my project and the language I used within my project to the audience.

REFERENCES

- Brinkley, J. (2011). *Cambodia's Curse: The Modern History of a Troubled Land*. New York: Public Affairs.
- Cambodia Profile - Timeline*. (2017, May 25). From BBC: www.bbc.com/news/world-asia-pacific-13006828
- Johnson, J. (2008, May 18). *Khmer Empire*. Retrieved May 25, 2017 from New World Encyclopedia: http://www.newworldencyclopedia.org/p/index.php?title=Khmer_Empire&oldid=711921

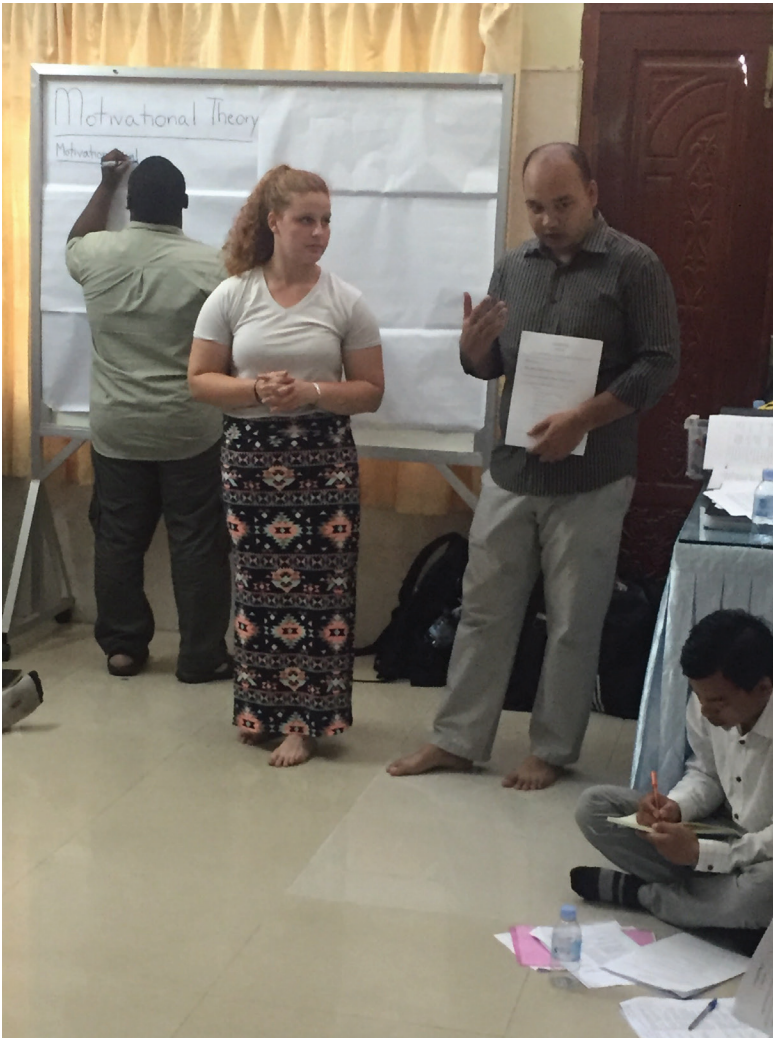
MOTIVATIONAL THEORY

Brooke Waidelich, McMaster Scholar, Cambodia 2016-2017

In Cambodia, the community as a whole is undertrained as a result of years of war, conflict, and the reign of the Khmer Rouge. Most of the professionals in Cambodia have not had access to knowledge of theoretical models that might be useful in their professional practice. My project was designed to provide training for these professionals on the use of motivational theory to increase the productivity of their staff. The information of this project was shared to keep students interested in learning, help educators to be more effective, and assist non-governmental organization (NGO) productivity.

The history of Cambodia is long and rich, but in recent times, Cambodia has been under distress. Beginning in 1975, Cambodia began the long and painful years under the control of Khmer Rouge (Chandler, 2009). The Khmer Rouge did not take human rights into consideration, which further led to the destruction of Cambodia. More than two million people were killed, and many more were treated inhumanely. The Khmer Rouge committed a nationwide genocide in which the intellectuals were targeted. 75 percent of the colonially educated population were either killed or forced to be captives (Dy, 2003). Formal schooling was abolished.

This caused a significant lack of knowledge for Cambodia. Many of the people of the older, educated generation had been killed, and the new generation had never had formal schooling (Chandler, 2009). This created an issue for all aspects of Cambodian society. As the nation has begun to recover, schools, universities, and NGOs have developed. These organizations are interested in learning new research, ideas, and theories to best help their students and staff in everyday



life. One specific method that applies to virtually all fields and people is motivation. Without the knowledge of motivational theory, many leaders are struggling to maintain the focus of their groups (Cook, 2016).

This can especially be seen in classrooms. Only two-thirds of Cambodian teachers are educated. This number includes the teachers who have gone through the quick training process to get their degree and credentials (Dy, 2003). Without the in-depth education on how to be a teacher, it is difficult to understand the students. By offering training on motivational theory, this project's primary focus, Cambodian teachers were provided more information in an attempt to keep students engaged in learning. By knowing the importance of motivating students, some ways to encourage students, and the impact that motivation can make on students, teachers may be able to make the high dropout rates in the country to decline.

Similar to teachers with their students, businesses and NGOs must motivate their employees. The professionals in these fields can use the ideas of motivational theory to get their employees to be more effective.

To teach the content of the motivational theory, I began each presentation by defining and explaining motivation, then transitioned into the specific discipline of motivational theory. I taught two motivational theories: expectancy theory and value theory. For each presentation, I explained the

methods, and then I provided examples and offered the participants information as to how knowing motivational theories would be helpful to them. I presented a total of eight times at six different organizations throughout the country.

In the Kampot Province, I presented to 20 staff members of the Cambodian Organization for Children and Development (COCD). Every staff member worked directly with children or families, depending on the project. The projects included hygiene, child services, and preschool training. Motivational Theory was presented to this group, as a tool to help their projects be more effective.

In Oudong, I presented at a Buddhist monastery, organized by the Association of Nuns. Here there were 19 nuns and religious people and 69 adolescent students. The adolescents were divided into two groups – males and females. The motivational theory was presented to the adolescent students as a way to stay motivated in school.

In the Prey Veng Province, the Khmer Youth Association invited us to train in vocational schools in neighboring villages where I presented to 23 of the students.

In Phnom Penh, I presented at Asia Euro University to 50 students. As many of these students were studying to be English teachers or NGO leaders, I related the presentation to students and non-profit leadership. Also in Phnom Penh was the NGO Cambodian Volunteers for Community Development. I presented to 21 staff members, all of which were teachers at schools the NGO assisted. The motivational theories were given to the teachers so they would better understand and help their students be motivated.

The final training I did was in Pursat Province. This was again with the Association of Nuns where a group of 49 nuns and religious people gathered and learned from the training.

As I presented the information, it was apparent the participants, even the adolescent students, were aware of the term

motivation. They could tell me what they were motivated to do, but the issue came when I asked for them to define motivation and explain what caused them to be motivated. The motivational theories were new to all of those I trained.

Because the concepts of motivation and motivational theory are very abstract, I found how important it was to use the proper words when defining and explaining. Some words that we use in everyday life did not have a word in Khmer. For example, with the word “task,” I had to explain it and give examples for them to understand what I meant. It was also essential to make sure the context and background information was presented clearly. If I had not done this before I got to the theories, the participants would not have been able to comprehend the more difficult information about the theories.

As a trainer, it was also imperative I fully understood all of the information about my training. I had to be able to describe everything two or three different ways to ensure those attending the presentation were understanding. I also had a lot of questions that were asked that went beyond the information I had prepared. Because I understood my information at a deeper level than just being able to recite it, I was able to answer their questions and have a conversation with them about the theories.

Part of presenting this new and challenging information was making meaningful and relatable examples for those at the trainings. To do this, I continually was asking them questions and interacting with them to check for understanding and help apply it to their lives. By doing this, they could see that the information I was sharing had importance. Besides telling them how the information could be used, I also asked them questions so they could make connections to the information they already knew to be true in their lives. From this, they were able to think about the information themselves, which kept them more engaged than if I would have just presented the training as a lecture.

Through my presentation, I learned many teachers are intrigued by the idea of promoting student success through practice and encouragement. Several teachers asked if there was any place for blame within the motivational theory, which led me to believe teachers are told to blame or shame the students when they do not do well. The idea of encouraging students, staff, and peers to help motivate them seemed to be a new but welcomed concept to the participants.

With value theory, many of the participants were able to share the value of many tasks they did. Once introduced, they were able to distinguish between the types of value (internal, external, and utility) and explain what type of value came from certain tasks as well. It seemed to intrigue them that internal and utility value can be more motivational than merely external value. Some participants asked for ways to help motivate students and staff internally and how to get their students to see the utility value of doing things. These questions gave me hope that they will use the information learned through my training to help in their profession.

Overall, the information in my project was well received and seemingly understood. The educators and NGO employees especially were interested in learning about these theories. Ideally, their knowledge of my project will spark a change in how they interact with those that need motivating. Further projects could be done to share about other motivational theories as I only was able to get through the expectancy and value theories.

REFERENCES

- Chandler, D. (2009). Cambodia History. *Cambodia Tribunal Monitor*.
- Cook, D. A. (2016). Motivation to Learn: An Overview of Contemporary Theories. *Medical Education*, 50(10), 997-1014.
- Dy, S. a. (2003). Basic Education in Cambodia: The Impact of UNESCO on the Policies in the 1990s. *Education Policy Analysis Archives*, 11(48), 1-20. doi:10.14507/epaa.v11n48.2003



ADVANCING HUMANITY

in the LOCAL AREA

2017 - 2018 Learning Community

Carla Higgins, Ph.D., McMaster Fellow

Rick Custar, McMaster Scholar

Madeleine McMaster, McMaster Scholar

Amoy Russell, McMaster Scholar

Marissa Windau, McMaster Scholar



McMASTER LOCAL INITIATIVE – INDEPENDENCE EDUCATION CENTER

Carla Higgins, McMaster Fellow, Local 2017-2018

The Independence Education Center (IEC), which serves as the site for local McMaster initiative, is located approximately 6 miles from the Defiance College campus. Serving students in Kindergarten through Grade 12, 23 school districts in Northwest Ohio utilize the school's intensive support program for students who are not achieving adequate success in their home school setting. According to its description, the school, "strives to provide students with opportunities to succeed and grow as individuals in a therapeutic environment that encourages students to take healthy chances and feel good about themselves" (Northwest Ohio Educational Service Center).

The administration and teaching staff at the IEC utilize a leveled system of behavioral supports in order to help students transition back to their home school setting. Because they can transition, the enrollment during any given academic year fluctuates from day to day. During the 2017-2018 school year, the school served 97 total students with an average daily attendance of 67. Twelve students graduated from the IEC, three transitioned to the Four County Career Center, and four returned to their home schools. The 2018-2019 school year will begin with 72 students, an increase of sixteen students from last year. Each classroom teacher utilizes the assistance of a paraprofessional with a class size of approximately 6-10 students.



The IEC was first suggested as a local site after many communications between the administration and the McMaster School. Defiance College students from various programs were already providing service to the school via tutoring and mentoring. The IEC administration shared needs for their students that included social skill development, health and wellness education, envisioning future life opportunities through meaningful experiences, and alternative, independent stress management strategies. It was determined that Defiance College had the potential to address these needs through projects designed and implemented by

McMaster Scholars from multiple disciplines. The immediate goals aligned with the mission of the McMaster School and the College. These needs also aligned with several Sustainable Development Goals published by the United Nations - good health and well-being, quality education, and reduced inequalities (United Nations, 2015). Four scholars were chosen to work at the local site. Their projects included authentic experiences for writing and social skill development, investigation of aspirations for future employment opportunities, alternative means for reducing stress, and awareness of healthy eating habits to impact mood, motivation, and general health. The first year of partnership with the IEC yielded positive results as is evidenced in each scholar's summary of their project implementation.

REFERENCES

Northwest Ohio Educational Service Center. (n.d.). Retrieved August 28, 2017, from <http://www.nwoesc.k12.oh.us/iec>
United Nations. (2015). *United Nation Sustainable Development Goals - 17 Goals to Transform our World*. Retrieved October 2, 2017, from United Nations: <http://un.org/sustainabledevelopment/sustainable-development-goals>

PEN-PAL PROGRAM: IMPROVING READING AND WRITING LITERACY THROUGH AUTHENTIC LEARNING TASKS

Rick Custar, McMaster Scholar, Local 2017-2018



The purpose of this pen-pal project was to motivate students to practice and use reading and writing skills while engaging in a meaningful, authentic task. According to Gambrell, Hughes, Calvert, Malloy, and Igo, "...authentic reading, writing, and discussion activities involve meaningful, purposeful, and functional experiences that motivate and engage students" (Gambrell, 2011). One reason for increased motivation in regards to authentic tasks is that students can make decisions about their learning, and decide what direction they would like to take it. Another reason there may be increased motivation among students is they can realize the purpose of the skill that they are learning in a real-world context (Rankin, 1992)). If students are learning a skill and are unable to see when they would ever use it, they will likely become less motivated which leads to more feeble attempts to complete tasks. The authentic task I chose for the students at the Independence Education Center (IEC) was a pen-pal program. The students at the IEC were each assigned a pen-pal from Defiance College, and they engaged in exchanging letters. The students at the IEC were given opportunities to see

letters written by college students who modeled appropriate letter writing. This modeling provided students with authentic examples to use when responding. Gambrell et al. (Gambrell, 2011) agreed that student learning improves when they can visually see what proper technique is when completing a task and Rankin (1992) suggested that there is a correlation between improving writing skills and participating in pen-pal programs. The result of Rankin's study was that the students were able to develop these areas of their writing, although the author was quick to point out that students were given more instruction, and the pen-pal program was used in conjunction with the instruction.

After reviewing the literature about authentic reading and writing tasks, the next logical step was to implement the pen-pal program and examine the results. The expectation was that the students would be motivated to read and write, and their writing skills would improve as well. In the development of my project, I met with two staff members at the IEC and, after constructive conversations, we agreed that enhancing reading and writing literacy of the students through an authentic and engaging process was a worthwhile endeavor. During the discussions, we decided that motivation strategies would be necessary to ensure students would remain engaged in the pen-pal process. During this time, I worked with 13 Defiance College students and 13 IEC students in grades 4-7.

Before explaining the letters, I asked IEC students to complete a reading and writing attitude survey where they were asked to circle a number between 1 and 10 (1 being the lowest and ten the highest) to indicate how they felt about both reading and writing. The results showed that students felt indifferent about both of these skills, as the average was just over five on the 10 point scale for both reading and writing. I then paired each IEC student with a Defiance College student and asked the college students to write a brief letter to introduce themselves. I also asked the college students to ask many questions to provide prompts for the IEC students. After giving IEC students ample time to respond to their letters, I would collect them, read them and then distribute the letters to their corresponding pen-pals. While reading the letters, I would note the length and the content that was contained within. Defiance College students would then be given time to read and respond to the letter that they had received and I took the completed letters back to the IEC to give to the students. This process was carried out several times throughout the semester, along with administering another attitude survey at the very end of the experience.

After reviewing the letters and interacting with students at the IEC, the pen-pal program appeared to be a valuable resource to implement when attempting to improve both reading and writing literacy, as well as improving motivation to practice reading and writing skills. While reading the letters, I saw an increased length in responses from IEC students and the letters began to shift from simply answering questions to asking questions of their own and attempting to carry on a conversation through writing. I also was able to observe the IEC students' excitement when they received their letters from their pen-pals. Students would smile, and many would open their letters before returning to their seats. They then sat quietly, intently reading the letters and immediately wanting to respond. This excitement also showed when I went to the classroom to discuss the project with the homeroom teacher. When I walked in, students would excitedly ask where their letters were. If I did not have them, they would immediately ask when they would receive them. I also observed that the attitudes of the students toward reading and writing increased (although minimally), with the average being about 6.5 (up from about 5) on a 10 point scale when responding to the same attitude survey that was given to them earlier in the year. I believe that more research needs to be done to determine the positive long-term effects of implementing a pen-pal program with students at the IEC with perhaps the implementation of several different mediums such as email or shared documents.

REFERENCES

- Gambrell, L. B. (2011). Authentic Reading, Writing, and Discussion: An Exploratory Study of a Pen Pal Project. *Elementary School Journal*, 112(2), 234-258.
- Rankin, J. (1992). Connecting Literacy Learners: A Pen Pal Project. *The Reading Teacher*, 3, 204.

YOGA AND MBSR: HEALTHY COPING MECHANISMS

Madeleine McMaster, McMaster Scholar, Local 2017-2018

According to the administrators at the Independence Education Center (IEC), high-stress levels among students in the school are prevalent. The students are provided intensive intervention to help them manage stress and to improve their social and emotional behaviors. I worked with students in four classrooms, from kindergarten through grade seven. In each classroom, there were approximately ten students with one teacher and one paraprofessional.



The stress-reducing strategies of yoga and Mindfulness-Based Stress Reduction (MBSR) were used with the students for this project. MBSR is a non-religious structured program that teaches students to treat stress as an opportunity instead of a threat and, therefore, changes the way they think. MBSR helps them deal with stress in a healthy way (Grossman, 2004). Yoga is a practice that is constructed of poses, breathing, and meditation. According to Yogi Ramcharaka, the creator of Hatha yoga, Hatha yoga is that is associated with physical characteristics of the body (Ramacharaka, 1936).

One goal of the project was to make the students aware of their stress and how to cope with stress in a healthy way using yoga and MBSR. Another goal was to prepare students to do the yoga

and breathing on their own when deemed necessary. I chose to use Hatha yoga because it is the basic yoga that beginners typically use. Yoga not only helps with flexibility and breathing but also helps reduce stress through relaxation. Yoga can teach students how to control their breathing by using asana, which are poses, and pranayama, which are breathing exercises (Mayo Clinic, 2015). This combined with MBSR can teach control in reacting to stressful situations. These two components combined complemented each other and gave the students a better understanding of how to utilize them appropriately. Before beginning the project, I researched the different poses in yoga and created a sequence of movements easy for beginners. I also examined the Mindfulness-Based Stress Reduction method and how to conduct breathing techniques with a class.

Once on site, I first made the students aware of what can cause stress and some of the symptoms of stress. We discussed ways they dealt with stress. I then taught yoga combined with sessions of MBSR. In each session, I began with the MSBR for approximately 5 minutes and used the remaining time to complete the yoga sequence. On the last day of the project, I asked students to share what they learned about yoga and MBSR as stress-relievers and if they ever used the techniques on their own.

Upon completion of the project, I reflected on the stress levels of the students before the class versus after based on the responses to the questions I asked before and after the project. Students indicated they knew the purpose of the breathing and remembered many of the yoga poses. One student stated that he taught his sister how to use the breathing to relieve stress. I would recommend that yoga and MSBR continue for the students at the IEC because the benefits will be long-lasting.

REFERENCES

- Grossman, P. N. (2004). Mindfulness-Based Stress Reduction and Health Benefits: A Meta-Analysis. *Journal of Psychosomatic Research*, 57(1), 35-43. doi:10.1016/S0022-3999(03)00573-7
- Mayo Clinic. (2015). *Yoga: Fight stress and find serenity. Is yoga right for you? It is if you want to fight stress, get fit and stay healthy*. Retrieved November, 2017 from <http://www.mayoclinic.org/healthy-lifestyle/stress-management/in-depth/yoga/art-20044733>
- Ramacharaka. (1936). *Hatha Yoga or, the Yoga Philosophy of Physical Well-Being, with Numerous Exercises, etc.* Chicago: Yogi Publication Society.

NUTRITION AND HEALTHY EATING

Marissa Windau, McMaster Scholar, Local 2017-2018

The purpose of this project was to provide insight on nutrition and food safety, and how to incorporate that information into an everyday diet. In a face to face interview with school administrators at the Independence Education Center (IEC), they identified that the lack of knowledge and awareness of basic nutritional facts was a problem for their students. The objective of the project was to educate the students on the basics of nutrition including, but not limited to the daily diet, the five food groups, and how food can impact emotions.

In preparation for this project, I reviewed the literature on nutrition and how it affects adolescent education and emotions. The research indicates that it is typical for adolescents to eat improper amounts of the five essential food groups often not consuming recommended daily servings of vegetables and whole grains (Lipsky, 2017). It is also widely reported that adolescence is a critical time in the growth and development of appropriate nutritional and physical activity habits (Vizbaraite, 2011).

On the first day of the project, I introduced myself to get to know the students and conducted a survey asking questions about their current diet and knowledge of food. In reviewing the surveys, I discovered that none of the students could name the five food groups; however, 70 percent of the students agreed that food could impact the way you feel.

Once the project began, I conducted lessons once a week for one hour for six weeks. Each lesson covered a different topic, and every lesson ended with a game to test the students' knowledge and allow them to apply their understanding of nutrition. The lessons included the five food groups, stress eating, dehydration, food safety, processed versus unprocessed food, and explore new fruits and vegetables. The exploration of new fruits and vegetables was conducted through a blind taste test.

The students at the IEC benefitted from the lessons as was evidenced by their responses each time we reviewed. Long-term results could be determined with further research. Due to the lack of a stand-alone health class at the school, this project could be continued indefinitely to help improve the overall health and well-being of the students.

REFERENCES

- Lipsky, L. M.-M. (2017). Diet Quality of US Adolescents During the transition to Adulthood: Changes and Predictors. *The American Journal of Clinical Nutrition, 105*, 1424-1432. doi:10.3945/ajcn.116.150029
- Vizbaraite, J. G. (2011). Evaluation of Nutrition Habits of Adolescents in the Aspect of Gender and Physical Activity. *Lithuanian Academy of Physical Education, KaunasLithuania, 81*, 52-58.



ADVANCING HUMANITY in PANAMA

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LISTENING TO COMMUNITY VOICES

Alesia Yakos-Brown, McMaster Fellow, Panama 2016-2017

The objective of my research was to conduct a community assessment of the area of Mañanitas, near Panama City, where our community partner the Biblioteca is located. I set out to gather the general demographics of the area, as well as to assess the community strengths and needs from the perspective of the residents. In line with the social work value of client self-determination, interviews focused on the residents and what they perceived to be assets and priorities within their community (Homan, 2011), (Kirst-Ashman, 2015). The goal of the assessment was to provide information to the Biblioteca that could prove useful to future planning and implementation of programming, as well as helpful to future McMaster Panama teams as we work collaboratively in serving the Mañanitas community.

The Biblioteca is a community center whose mission centers on the healthy growth and development of the community's youth through services that support education, the arts, and physical activity (Centro Juvenil y Biblioteca Las Mañanitas). I interviewed thirteen females, 25-69 years of age, attempting to obtain equal representation from the different age grades. All those interviewed had varying ties to the Biblioteca, either utilizing services themselves or having family members who used the center, both of which could have influenced the importance placed on the facility when answering questions within the survey. Furthermore, all those interviewed were women, possibly due to gender roles and/or the employment schedules of males within the community. Interviews were translated by liaisons Maria Elena Marquez de Rivera and Ximena Cambefort, and on one occasion by a Spanish speaking McMaster Scholar.

Interest in a community survey in Mañanitas originated from a similar instrument conducted in March of 2016 during McMaster travel to Curundù, another neighborhood of Panama City in poverty where the community partner Centro Educativo Marie de Poussepin (CEMP) school is located. The Curundù survey had provided insight into core issues that impacted the overall quality of life for residents and the academic achievement of youth. As a result, the Biblioteca requested a similar survey be conducted during Panama McMaster travel 2017 (Rivera, 2016). Survey questions centered on strengths and needs of the overall household as well as those specific to the children within the home, however the main focus of the survey surrounded questions that addressed the residents' perspectives on the overall strengths and needs of the Mañanitas community, as to provide the requested insight to the Biblioteca for future programming.

Of the women interviewed, households ranged from only two family members to one containing twelve members, with an average of 5.4 people per household. The composition of the household contained minor children in most of the homes (10/13), a little less than half with adult children within the home (5/13), and three homes with both adult and minor children within the home. In addition over half of the homes (7/13) contained three generations under one roof, along with two with adult siblings, and one with a family friend. As a result, it was no surprise that common answers to the *family's greatest strength* were responses such as "extended family", "close/supportive family", "family oriented", "family unity" and "three generations under one roof".

Construction was the greatest employer of adult males within the home (9/13), with transportation services (taxi driver, bus driver) coming in second. Of the adult females interviewed seven of the thirteen had part-time employment in domestic services, and one was a nursing student. All adult children within the home were employed or attending university, with positions ranging from retail, flight attendant, and tourism with the adult daughters, and a lab tech and a lawyer with the adult sons within the home. Twelve out of the thirteen interviewed indicated employment within the household and/or retirement income, with one reporting only part-time employment within the residence. Although steady sources of income were noted in a majority of the households, five of the thirteen interviewed still mentioned financial needs as the family's greatest concern, with household income being inadequate to the family's needs.

Employment within the household appeared to have had a direct impact on the type of healthcare within the family. According to the women interviewed if there was employment within the home then Panamanian "Social Security" provided health care coverage to the family including routine prevention checks and basic care, but without employment minimal care was obtained from area health clinics, like the one located across the street from the Biblioteca. It was also reported that children were required to obtain annual health visits in order for the family to be eligible for educational scholarships from the Panamanian government for school tuition, uniforms, and supplies. Of the minors within the households interviewed common health concerns controlled by medication included asthma and ADHD. Other health concerns of children reported involved skin disorders, bone fractures, and a need for dental braces. Of the adult females interviewed the

only health commonalities were optical, having or needing prescription eyewear. Hypertension was mentioned as the main health concern of husbands and parents (grandparents) within the home. The health histories of adult children within the households interviewed led to reports of polycystic ovaries and scoliosis.

Important to the overall health of a community is the consumption of nutritious foods. A student scholar's project on the McMaster Panama team centered on *Mi Plato* or *My Plate*, a lesson for children on the five food groups and proportions of a healthy diet (United States Department of Agriculture). Because this scholar's project included container gardening with vegetables, I chose to further complement this research by surveying the women on types and frequency of vegetables consumed within the homes of Mañanitas. The frequency of vegetables consumed varied from daily to once a month, with an overall average of 3.3 times per week of the women surveyed. Favorites amongst the community's children included carrots, tomatoes, lettuce, cucumbers, and cabbage. Spinach was mentioned as the most likely vegetable to be grown on the property of those interviewed.

Questioning on the survey also included items central to the services of the Biblioteca, which in Spanish means library. The center strives to promote *learning values* to the youth of the community by providing a facility for homework assistance and access to books and computers for educational research (Centro Juvenil y Biblioteca Las Mañanitas, n.d.).

Questions were asked about reading and availability of books and computers within the home in an attempt to explore what changes may have occurred within the community since the opening of the Biblioteca in 1997. Out of the thirteen interviewed a little over half (54%) reported books, or reading material within the home, with a majority modeling reading within the home through religious practices, cooking, newspapers, and magazines. Additionally, families averaged reading with their children approximately twice a week, either through assistance on homework or print within the home. In regards to computers, a little under half (46%) had a computer within the home, with the majority indicating the importance of the Biblioteca being the only educational access to a computer and copier/printer in the community.

Although not all households had access to a computer within the home, all but one of those surveyed had access to cell phones for purposes of familial communication and employment. As access to electronics and social media continues to expand on a global scale, one student scholar on the Panama team focused her project on the safe use of technology with children. It was important to note from the survey two minor children on occasion used the phones of adults within the home (ages 11 & 17), and furthermore, two had their own cell phones (ages 16 & 17).

The main goal of my community assessment was to assess the strengths and needs from the perspective of the residents themselves, as such information could prove valuable to the Biblioteca's strategic planning and future projects of McMaster teams. It was essential to focus not only on the needs but the strengths as well, as a means to provide hope and empowerment to those being interviewed (Kirst-Ashman, 2015). It became clear that the residents view the Biblioteca as the community's greatest asset, with 77% placing the center at the number one spot in their lists of strengths. A variety of services were mentioned leading to the Biblioteca's rank including homework assistance, book and computer access, a safe center for healthy recreation and entertainment for children, and adult programming, such as the Women's Sewing Circle.



Other community strengths verbalized included schools, churches, parks, a new police station, a health clinic, good water in all but one sector, and a new center for community improvements. Although mass transportation was mentioned as a present need, many believed the completion of the Metro service that extended to Mañanitas would soon prove to be an asset, linking the community with faster mobility to quality jobs and basic services.

In contrast to the greatest number of strengths of the area primarily revolving around one main topic, the Biblioteca, the community needs voiced by those interviewed could be grouped under six main themes, those being programming to benefit youth and families, education, employment, health, infrastructure, and safety. The area receiving the most discourse was programming to benefit youth and families. Although those interviewed realized the value in sports and appreciated such programs within the community, many believed programming in character building, the arts, and life skills were of equal importance and needed to prevent youth and young adults from being enticed to join gangs or partake in delinquent activity. Other common needs within this themed area included parenting classes, workshops to improve family communication and coping, and a community swimming pool.

All those interviewed valued an education as the means to good employment and quality of life, and thus overall health of the community. For this reason, there were many needs touched upon surrounding the areas of education and employment. Common conversations to address these areas regarded evening and weekend programming for vocational training, English language classes, computer workshops, and high school completion programs. An increase in services for children with disabilities was also mentioned under education, with several believing present programming was inadequate in addressing such needs. Lastly, some of interviewees would like to see a sewing shop erected in the community, thus providing women a source of income while working from home.

The last main themes discussed by those surveyed regarded health, infrastructure, and safety. There appeared to be a need for affordable fresh produce in the community, along with health workshops, as suggested within the Biblioteca or local public health clinic. Road creation or repair, trash collection and water quality in sector 20 (Genesis neighborhood) were indicated as infrastructure improvements needed. Safety of the community centered upon the presence of gangs in the area, particularly in the evening hours. The main suggestions made by the residents interviewed included greater police presence, especially within the community parks after sundown.

The results of the survey were shared with the liaisons of the Biblioteca in Mañanitas. It is hoped the findings will serve as an impetus for future collaborations between the center and the McMaster Panama team surrounding programming to benefit youth and families as indicated above by the community residents interviewed. Such projects could include but not be limited to character building, coping skills, healthy living, communication skills, basic first aid, educational goal setting, and tips for parents with children with disabilities.

REFERENCES

- Centro Juvenil y Biblioteca Las Mañanitas. (n.d.). Retrieved from <https://www.facebook.com/www.exalumnasesclavas.org/>
- Homan, M. S. (2011). *Promoting Community Change: Making it Happen in the Real World (5th Edition)*. Belmont, CA: Brooks/Cole.
- Kirst-Ashman, K. &. (2015). *Generalist Practice with Organizations and Communities (6th Edition)*. Stamford, CT: Cengage Learning.
- Rivera, X. C. (2016, February 20). Personal Communication. (A. Yakos-Brown, Interviewer)
- United States Department of Agriculture . (n.d.). *Choose My Plate*. Retrieved from United States Department of Agriculture: <http://www.choosemyplate.gov>

RELAXATION TECHNIQUES TO REDUCE STRESS

Da'Ja'Nay Askew, McMaster Scholar, Panama 2016-2017

Due to the lack of resources on and knowledge of stress relief available to the population, the community partners in Panama expressed the need for coping skills and relaxation techniques. Without the proper resources, some Panamanian youth and adults may turn to drugs, alcohol, or violence to deal with life's stressors, so it is essential that they learn to relieve stress independently and in a positive way. The effects of stress can lead to many detrimental physiological and psychological deficits. Large amounts of stress can cause heart disease, sleep disturbances, depression, anxiety, and decreased immune system functioning (Lovas, 2015). For children, extensive amounts of stress can lead to reduced concentration and subsequently diminished academic performance (Culver, 2015). Due to these potential effects, our community partners of the Biblioteca in Mañanitas and in the El Congo Village thought it was essential to emphasize relaxation techniques as coping skills. The purpose of my project was to help the community members relieve stress

independently and provide them with coping skills that promote stable mental health.



In Panama, I worked with 45 fourth and fifth graders and 16 adults at the Biblioteca in Mañanitas and 50 community members in the village of El Congo. To begin my project, I gave pretests and asked the participants about their stressors, how they cope with stress, and how they feel at the moment by circling sad, neutral, or happy faces. My project included art therapy as a coping skill, and I used a dream catcher as a means of emotional expression. Everyone received a blank dreamcatcher coloring page and were instructed to write positive emotions on the inside and write negative emotions on the outside. The positive emotions were meant to be trapped and kept forever, while the negative emotions were to be forgotten and eliminated from focus. Participants were instructed to mark out the negative emotions with a dark writing utensil. This part of the

project served as a liberating factor to make the members of the community feel more empowered and focus on the positive aspects of life. Following the dreamcatcher activity, I gave the participants handouts that described the different types of coping skills and the benefits of them.

I also demonstrated relaxation techniques as coping skills as opportunities for the participants to relieve stress independently. I introduced deep breathing exercises, self-massage techniques, yoga exercises and meditation. After experiencing these coping techniques, the participants were given posttests that asked about the new coping skills they just learned and how they felt after doing these exercises by circling sad, neutral, or happy faces. I calculated my results based on the information of the sad and happy faces in the pre and posttests. In the pretests, 7 out of 61 members of the Biblioteca in Mañanitas had neutral or sad faces, which is 11% of the participants. In the posttests, there were no sad or neutral faces, all of the faces circled were happy. Furthermore, all participants reported learning a new coping skill.

Based on the results and conversations I had with the community partners, I feel that my project was executed effectively and it was well received. It seemed that the community members enjoyed the relaxation techniques and they took them seriously. Some adults from the El Congo Village asked for longer length in programming to cover relaxation techniques, especially muscle relaxation. One limitation of my project was the emotional expression during the dreamcatcher activity. The communities that I worked with were very close and tight-knit, so some of the participants did not want to disclose their emotions or their potential stressors in their lives. I was not aware of this issue, and it will be important to note for future McMaster scholars. I felt that this project accommodated the needs of our community partners and promoted relaxation and stable mental health. The data collected in this initiative will help the community partners and future McMaster Scholars reflect on the importance of stress relief while promoting several health benefits.

REFERENCES

- Culver, K. A. (2015). Yoga to Reduce Trauma-Related Distress and Emotional and Behavioral Difficulties Among Children Living in Orphanages in Haiti: A Pilot Study. *Journal of Alternative & Complementary Medicine*, 21(9), 539-545. doi:10.1089/acm.2015.0017
- Lovas, J. (2015). Evidence-Based Relaxation Therapy Physiological and Psychological Benefits. *Journal of the Australian Traditional-Medicine Society*, 21(2), 105.

SOCIAL MEDIA SAFETY IN PANAMA

Denique Dennis, McMaster Scholar, Panama 2016-2017

New technological advances have led to the creation of new methods of communication and increased media usage among youth. These methods include text messaging, blogging, email, forums, and social media. These improved methods of communication have also improved the outlets for self-expression and learning. The teenage identity today is influenced by their existence in a variety of multi-faceted environments which all play a part in shaping their values, attitudes, and behaviors. Among these environments are social networking platforms (Livingstone, 2010). By exploring how the social media identity is interconnected with the adolescent identity, the most effective methods of remaining safe against dangers such as human trafficking and predatory groups/individuals may be recommended.

As cultures change and begin to include social network usage in the formation of individuals' self-concept, it becomes more apparent that there is a mutual relationship between the individual and the self that they create on a social network. The social network identity, while representing the real self, is often a 'project' that adolescents work continuously to enhance. The effectiveness of their enhancing is often evaluated based on the number of likes, comments, or responses that they gain from their fellow users (Livingstone, 2010). By seeing the social network self as a project, researchers recognize that there is a detachment between it and the real person. While it very much influences their self-identity, young adolescents don't always know the direct connectedness between both identities. As such youth often do not typically understand the potential consequences of their interactions on social media on their real lives and those that they interact with on social media.

Through their exploration of new updates in technology, children may unsuspectingly happen upon harmful content. For example, in a study conducted by Livingstone et al. it was found that a significant portion of internet users under the age of 18 had at some point become exposed to pornography, pro-self-harm sites, violent content, and cyberbullying (Livingstone S. K., 2014). Forums which enable online communication also increase the likelihood that children will seek out individuals whom they have only interacted with online. This is another safety hazard because children are not aware of the real identities of these new acquaintances.

It is important to highlight that many disturbing incidents happen because some children may not recognize the severity of what is happening or that their behavior may be seen as inviting or perpetrating illicit and sometimes illegal activities. Too often, children only see the benefit of media usage. Indeed, these may be relevant to self-development, but moderation and context should be stressed (Mitchell, 2010). So, whereas a website offering advice on sexual activities may be beneficial, sharing personal information across these forums may incite predatory relationships and a violation of privacy. Similarly, as technology increases the accessibility and timely nature of communication, it also reduces the time that may be taken to consider the activities deliberately.

There appears to be consensus across recent literature that it is imperative for youth who are likely to be exposed to technological communication platforms to be educated. Nonetheless, Mitchell (Mitchell, 2010) suggests that particular attention is paid to poor, at-risk youth with poor self-concepts as they are more likely to employ unsafe tactics to receive favorable responses from other users. Smokowski et al. support this finding in their recent research study which suggests that youth from low-income families and who have negative relationships with their parents and friends are more likely to develop depression and self-concept discrepancies (Smokowski, 2014). These two research studies show help to establish a

connection between at-risk youth and their media usage patterns.

In light of the growing need to educate children about woes of social media, the question of whose burden it is remains unanswered. In a research study conducted by Moreno, Egan, Bare, Young, and Cox a group of participants including parents, teachers, and physicians unanimously agreed that it was primarily the job of the parents to incorporate social media and texting etiquette into the parenting duties (Moreno, 2013). As such, it is pertinent that parents themselves continue to be educated about technological advances to equip themselves with the necessary knowledge. Where parents fall short in this area, participants in Moreno et al. suggest that teachers employ



classroom discussions and other means to equip students with safety protocol (Moreno, 2013). These media literacy and safety practices should ideally meet the level of media engagement that their students are at (Livingstone S. &, 2010). If media literacy lags behind media usage, this poses safety risks as students will continue to explore realms in which they lack awareness about how to protect themselves.

Strategies for teaching children about social media safety must be well-planned and carefully executed. Agosto and Abbas recommend eight key tips about the types of strategies to select (Abbas, 2016). They include teaching teens about risk analysis, offering hands-on lab sessions and demonstrations, avoidance of scare tactics, and favoring education over restriction. These are practical and direct strategies. Additionally, the researchers stress the importance of fostering strong adult-youth relationships. This way parents, teachers and other stakeholders are viewed as trustworthy by youth. This promotes a sharing relationship in which the youth feels comfortable sharing sensitive information about their online activities. Such relationships with youth also afford adults the opportunity to lead by example and model the behavior they want youth to utilize on social media (Abbas, 2016). It is imperative that parents, teachers, and youth work together to come up with the most effective strategies for a variety of situations that may arise.

It is pertinent that children in Panama are aware of these methods of sexual content /communication prevention notably since the country has been listed by the US Department of State's Trafficking in Persons 2015 report as a Tier two country (US State Department, 2015). Tier two means that while the Panamanian government is making efforts to improve the incidence of trafficking, their laws and policies are not yet in compliance with the minimum requirements stipulated by the Trafficking Victims Protection Act. Among the most vulnerable are women and children, who are likely to become victims of sex trafficking within the country (US State Department, 2015). The fight to end human trafficking is a concerted effort. Therefore, while the government does its part, individual citizens should protect themselves against potential risks. Of course, one such method is fortifying themselves against social media predators.

In essence, many researchers seem to agree that there is a need for effective programming geared to teaching social media safety to youth as they grow up in a technology-centered world. This fosters a balance between healthy explorations of the world around them while safeguarding against danger. It is this need that forms the basis of this project. It affords Panamanian parents and children within the communities of El Congo and Las Mañanitas the opportunity to gain relevant knowledge on how to appropriately maneuver social media in a way that ensures safety.

In Panama, I conducted hour-long sessions with the students at La Biblioteca de Las Mañanitas. The groups were divided by grade and maturity level to address the pertinent issues relative to age and level of technology usage. To begin each session, I distributed a pre-test and asked probing questions to ascertain the current knowledge base that students had surrounding

the particular topic. Afterward, I taught various social media safety strategies, emphasizing those that seemed to be lacking in the initial questions. Following each major strategy, I led an oral scenario activity where students applied the knowledge that they learned in the session. These provided the post-test responses to see how much of the strategies they retained. The information used to create the presentation was shared with the teachers in attendance. By sharing this information with the teachers, I hoped to provide a model for them to follow in future workshops. This somewhat ensured the sustainability of the project.

In a separate group with parents in El Congo, we discussed some of the dangers of social media and how parents may stand as a median to protect their children. The risks were explained using culturally appropriate and familiar examples to demonstrate why it is necessary for them to be proactive. The second half of the discussion consisted of empirically-proven strategies that they may use when their children are at home. Providing parents with guidelines and demonstrations on how to handle technological and social media predicaments gave them specific ways to combat threats and protect their families.

Because this project was the first one targeting social media safety in this location, it served as the primary tool to ascertain baseline information about the current social media usage and trends among children, and the efficacy of parents in handling their children's usage of these platforms.

Overall, the execution of this project was successful. The interactions with the students were most insightful and produced clear evidence of the media usage among children within the region of La Biblioteca. Responses to the initial probing questions along with the pre-tests indicated that the majority of students in all cohorts use social media at a frequency of at least a few times per month. The three most used social media platforms were Facebook, Instagram, and WhatsApp. An interesting finding was that many of the students who reported not using social media platforms were using internet sites such as Youtube, but did not recognize it as a social media site in the same way they would Facebook and others.

The scenarios that were given in the post-test were helpful in providing an understanding of the motivations behind students' usage. There was a tendency for students to choose responses that showed a trend towards independence and proactivity. For example, some responses favored contact with a fake profile rather than speaking with a responsible adult. Similarly, children tended to copy poor social media practices.

Other valuable data collected was relative to the students' level of comfort with seeking help if they are in a compromising circumstance while using social media. The majority of students (41.3%) reported feeling uncomfortable, less said being somewhat comfortable (33.3%), and an even smaller amount felt very comfortable (25.3%). This represents a need for an increase in the motivation for help-seeking behaviors.

My project was essential in providing preliminary information on social media usage in the Panamanian communities of El Congo and Las Mañanitas. This project still requires additional efforts, particularly in areas that increase the scope of 'social media' to include wider platforms such as search engines and which advance the scope of parents' ability to supervise their children. The Powerpoint and other resources that were used in the completion of this project were shared with the coordinator of La Biblioteca de Las Mañanitas to be integrated into programming throughout the year.

REFERENCES

- Abbas, J. a. (2016). Simple Tips for Helping Students Become Safer, Smarter Social Media Users. *Knowledge Quest*, 44(4), 42-47.
- Livingstone, S. &. (2010). On the Rapid Rise of Social Networking Sites: New Findings and Policy Implications. *Children & Society*, 75.
- Livingstone, S. K. (2014). In Their Own Words: What Bothers Children Online? *European Journal of Communication*, 29(3), 271-288. doi:10.1177/0267323114521045
- Mitchell, K. (2010). Remaining Safe and Avoiding Dangers Online. *The Prevention Researcher*, 17, 7-9.
- Moreno, M. E. (2013). Internet Safety Education for Youth: Stakeholder Perspectives. *BMC Public Health*, 13, 543. doi:10.1186/1471-2458-13-543
- Smokowski, P. E. (2014). Ecological Correlates of Depression and Self-Esteem in Rural Youth. *Child Psychiatry and Human Development*, 45(5), 500-518. doi:10.1007/s10578-013-0420-8
- US State Department. (2015). *Trafficking in Persons Report 2015*.

SETTING GOALS

Taylor Gillig, McMaster Scholar, Panama 2016-2017

The objective of my project was to have a positive influence on goal setting in fifth and sixth grades in Panama City. According to “5 Powerful Reasons Why Goal Setting is Important,” goals are valuable because they provide focus, allow you to measure progress, keep you locked in and undistracted, help you overcome procrastination and provide motivation (Osman, 2017). Our community partners requested that I expand my goal setting project conducted in 2016 with K-2nd graders, to older students to encourage high school enrollment and retention. After speaking to the community partners, I realized that an activity that would provide daily reminders of the goals set would work best to support students’ achievement.

Students in fifth and sixth grades at the Biblioteca of Mañanitas completed a *Goal Setting* puzzle piece on which they recorded their goals for the academic year and their future careers. To explain the importance of goal setting and how to goal set, I described the SMART goal technique. “**S**pecific, **M**easurable, **A**ttainable, **R**elevant, **T**ime-bound” (Personal Goal Setting, n.d.).

The students were able to express themselves by decorating their puzzle pieces. Some of the responses for the academic year goals were - getting good grades, receiving a certain grade point, and moving onto the next class. Common responses that I received for career goals were teacher, policeman, fireman, and diver. Once completed, all the puzzle pieces were connected to complete a mural which is now displayed in the Biblioteca.



As a post-test, students completed the following four questions; “Do you have goals for this school?” “Do you plan on going to high school?” “What do you want to be when you grow up?” and “How likely is it that you will attend high school?” Data was collected from the post-test given to two 5th grade and one 6th grade class.

The results showed that all of the students had set goals for the current school year. 82.8% of the students said that they planned to go to high school but only 68.9% said that it was likely that they would attend high school, and only 68% of those students said that they thought they would graduate.

Our community partners said that this project was beneficial. One of the women at the Biblioteca asked for a blank copy of the puzzle piece so they could implement the activity through the rest of the school year with other students who come to the center.

REFERENCES

- Osman, A. (2017). *5 Powerful Reasons Why Goal Setting Is Important*. Retrieved from Code of Living: <https://www.codeofliving.com/goals/5-powerful-reasons-why-goal-setting-important>
- Personal Goal Setting*. (n.d.). Retrieved from Mind Tools: <https://www.mindtools.com/page6.html>

WATER QUALITY – CRITICALLY IMPORTANT

Toni-Ann Ledgister, McMaster Scholar, Panama 2016-2017

According to The World Bank between 2011 and 2015, 95% of Panama's total population has access to improved drinking water, which consists of 88.62% of rural Panamanians (The World Bank, 2011-2015). The remaining 11.4%, however, does not have access to safe potable water; hence, they are susceptible to many water-borne diseases. Data collected by former McMaster Scholars to Panama showed some sites that tested positive for bacteria. Additionally, two sites had high levels of nitrates, one of which was the school faucet.

Unfortunately, only three of the sites tested in 2016 were able to be retested in 2017. Additional locations tested in 2017 had high levels of nitrates, phosphates, water hardness; low levels of dissolved oxygen; and tested positive for bacteria.

My project included further investigation into the possible causes of the above-indicated contamination. This was done by examining the environment directly surrounding these sites, as well as those environments related to the water supply and asking questions concerning any possible health issues experienced by the users of that water source. My project was to expand on the water quality analysis previously carried out to include water hardness. Water hardness was added to investigate whether there is a correlation between excess calcium and magnesium and the health issues such as kidney and gastrointestinal problems reported by members of the El Congo village.

The tests were carried out using the Hach surface water test kit and included both biological and chemical tests. A total of thirteen sites from the El Congo Village were tested for eight possible contaminants, which included nitrates, phosphorus, free chlorine, total chlorine, bacteria, calcium, water hardness, ammonium nitrate and dissolved oxygen.

The results for 2017 showed 30.8% of the tested sites had bacteria present. Approximately 46.2% of the sites tested had high levels of nitrates. A total of 31% of the tested sites had water hardness values that fell into the 'moderately hard' category, and 77% of the tested sites had high levels of phosphates. Additionally, several other places had visible sediments in the water, and one location had worms coming from the faucet. The residents stated that they did not boil or chlorinate their water before consumption.

The direct impact of my project was to contribute my findings to the baseline data, as this project and travel site is relatively new. This will benefit the future McMaster scholars and will facilitate better analysis of the water quality in El Congo. The village also benefitted from this project as they became more aware of the contaminants present in their water supply along with how they can be affected by it.



REFERENCES

The World Bank. (2011-2015). *People using at least basic drinking water services (% of population)*. Retrieved from The World Bank: <https://data.worldbank.org/indicator/SH.H2O.BASW.ZS>

NUTRITION

Adam McGinnis, McMaster Scholar, Panama 2016-2017

Malnutrition is a term that relates to both over and under-nutrition. One cause of malnutrition is a poor diet (Els, 2013). In Mañanitas near Panama City, a poor diet amongst children can result from lack of access, affordability, or education (Rivera, 2016). The community partner of the Biblioteca in Mañanitas expressed a distinct need for nutrition education and community gardening with school-aged children. As a result, my project was split into two parts. The first part was a *Mi Pato (My Plate)* lesson on healthy food choices and appropriate portions needed to have a balanced diet (United States Department of Agriculture, 2015). The second part was a demonstration on container gardening to provide the means for children to grow their food and hopefully inspire them to eat healthier.

At the start of this project, research began by looking at the needs of the people. I examined what their current diets consisted of and looked at how that diet might be improved. I also researched the growing season for their crops as well as what foods grew natively in the area. I decided on a plan that would help students understand why it was important to eat healthily and what foods might help make that a possibility.

The *My Plate* activity used in the lesson consisted of healthy foods from the five different food groups (United States Department of Agriculture, 2015). Students were asked to identify which types of food fit into each food group, as well as to determine the daily required portions of each food group. After their answers were recorded, they were given the correct answers to take home and refer to in the future.

I was able to incorporate container gardening at the Biblioteca with the use of EarthBoxes® (Novelty Manufacturing, 2016). Earthboxes® are designed to help people grow a variety of plants in almost any condition. They are designed to keep water at the bottom of the container at a perfect distance for the roots to reach for maximum plant growth. I assisted the children in planting tomatoes, cucumbers, and carrots, with onion seeds left for the center to plant in the future. These container gardens remained for the community at the Biblioteca to continue in the education and nutrition of the students for years to come.



Overall, this project was a success. Based on the activity, I was able to show that almost all of the students were able to identify which foods belonged in each food group. What the students could not determine was the portion sizes for each food group. Additionally, they were unable to say how many portions of each food group should be eaten each day. As for the Earthboxes®, the students appeared very excited to plant the vegetables and to learn about container gardening. Likewise, the adult staff of the Biblioteca wanted to learn about the Earthboxes® and asked to keep in touch to continue to monitor the gardens as they grow.

My project reached its goal of providing school-aged children of the Biblioteca in the Panamanian community of Mañanitas education on nutrition and gardening. It is a project that can be continued in the same location and expanded on with other community partners in future years. I am hopeful that this project will contribute to a healthier diet for these Panamanian.

REFERENCES

- Els, A. (2013). The Impact of Preschool Feeding Programs on the Growth of Disadvantaged Young Children in Developing Countries: A Systematic Review of Randomized Trials. *South African Journal of Clinical Nutrition*, 26(2), 33-40.
- Novelty Manufacturing. (2016). *Earthbox*. Retrieved from Earthbox: www.earthbox.com
- Rivera, M. d. (2016, October). Personal Communication. (A. McGinnis, Interviewer)
- United States Department of Agriculture. (2015). *My Plate*. Retrieved from United States Department of Agriculture: <https://www.choosemyplate.gov/multilanguage-spanish>

EMERGENCY RESPONSE TRAINING IN REMOTE AREAS IN PANAMA

Alexis Walker, McMaster Scholar, Panama 2016-2017



Having the opportunity to travel to Panama over the past few years, it was apparent that the areas that we work in did not have access to adequate emergency health services. According to the Centers for Disease Control and Prevention (CDC, 2012), the leading causes of premature deaths in Panama include chronic obstructive pulmonary disease, cerebrovascular disease, and ischemic heart disease. Moreover, in one of the communities that we work with, it is rare for emergency responders to travel to their village because of the distance.

Our community partners have continuously requested information about Cardiopulmonary Resuscitation (“CPR”) and other life-saving techniques in the schools, the after-school programs, and the communities. Hence, the goal of my project was to provide information and training for Cardiopulmonary Resuscitation (“CPR”) and the Heimlich maneuver for adults, children, and infants, as well as other

first aid techniques. Along with the implementation of my project, there were multiple first aid kits and emergency response manuals given to the communities of the Biblioteca in Las Mañanitas and the rural village of El Congo.

During the workshops, I was able to gather information about common home remedies and other techniques used for the emergency situations I discussed. I was also able to record other health care conditions that are common in Panama that need to be covered in future years.

Using feedback from pre and post tests and discussions with community partners in 2016, I determined which topics I needed to emphasize during the workshops conducted in 2017.

In 2017 I demonstrated how to perform CPR and the Heimlich maneuver on adults, children, and infants. We discussed the pre-assessments needed when determining the necessary level of care of a victim in the case of an emergency as well as the step-by-step basics of providing CPR, the Heimlich maneuver, and other life-saving techniques. Information on the basics of continuous vital assessments was also presented during the workshops. All participants were encouraged and given the opportunity to practice these skills during each presentation.

After presenting to the Biblioteca in Las Mañanitas and the Village of El Congo, I used post tests to assess the comprehension and retention of the information. The test was used to organize a review and determine if there were any clarity errors. The results of the tests indicated that all of the participants scored 83% or higher. These results provided evidence that participants understood and retained the information provided during the past initiative in 2016 and this project’s initiative in 2017. These results also show that the continued emergency response training can make a significant impact on the knowledge and skills of communities where there is an absence of access to emergency health care. Additionally, it will be essential to continue to implement this project in more communities. Though the impact of this project cannot be immediately measured, the continuation of this project can be justified by the project’s potential to save lives.

REFERENCES

CDC. (2012). CDC in Panama Fact Sheet. Atlanta: CDC.

VISUAL ACUITY SCREENINGS

Kaytlyn Williamson, McMaster Scholar, Panama 2016-2017

According to our community partner, Biblioteca of Mañanitas children living in Panama do not always have the resources to have their vision tested. The Biblioteca was concerned that visual impairments might be hindering some children's education. According to The Human Rights of People with Disability in Panama 7,891 people had a visual disability in Panama (Human Rights of People with Disability in Panama, 2006). Research states that the best way to test an individual's vision is by doing a visual acuity exam, specifically using a Snellen visual acuity chart (Kaiser, 2009). It was found that there were children within the Biblioteca that did have visual impairments.

My project educated children on why vision is essential and then using a Snellen visual acuity chart that I had created, I tested the children's vision. I tested one hundred and forty-seven children while in Panama.



Each child was positioned twenty feet away from the Snellen chart. Then covering one eye at a time, they were asked to read a repeated pattern of stars, hearts, and squares of different sizes. Depending on the smallest line the child could read I was able to assign a vision score better or worse than 20/20.

The outcome of this project was that there were some children within in The Biblioteca that did have a visual impairment. Ninety-seven out of one hundred and forty-seven (65.9%) children had 20/20 vision or better in both eyes. Forty-five out of one hundred and forty-seven children (30.6%) had 20/30 vision in one or both of their eyes. Five children out of one hundred and forty-seven children (3.4%) had 20/40 vision in one or both of their eyes. This data collection shows that vision testing is important because without it we would not have these results. Each child received a notecard that had their score for both eyes and a note stating whether it was recommended that they seek an optometrist for vision correction. Also, our liaison in Panama is attempting to connect families with assistance in getting the optical corrections needed for their children.

REFERENCES

- Human Rights of People with Disability in Panama. (2006). National Secretariat for the Social Integration of Persons with Disabilities, 3-51. Retrieved from [http://gwweb.jica.go.jp/km/Fsubject0601.nsf/03a114c1448e2ca449256f2b003e6f57/f1692ec3188fd280492572f9002bdfcc/\\$FILE/Human%20Rights%20of%20the%20People%20with%20Disability%20in%20Panama.pdf](http://gwweb.jica.go.jp/km/Fsubject0601.nsf/03a114c1448e2ca449256f2b003e6f57/f1692ec3188fd280492572f9002bdfcc/$FILE/Human%20Rights%20of%20the%20People%20with%20Disability%20in%20Panama.pdf)
- Kaiser, P. K. (2009). Prospective Evaluation of Visual Acuity Assessment: A Comparison of Snellen Versus ETDRS Charts in Clinical Practice (An AOS THESIS). *Transactions of the American Ophthalmological Society*, 107, 311-324.

ADDRESSING HEALTH-RELATED OUTCOMES FOR PANAMANIAN COMMUNITIES

*Sheldon Goodrum & Tim Rickabaugh, McMaster Fellows,
Kathleen Westfall, McMaster Associate Fellow, Panama, 2017 – 2018*



Panama has the highest per capita income in Central America, but the second worst income distribution in Latin America with approximately one-fourth (23%) of the Panamanian population living in poverty (World Bank, 2015). Bowman reported that while Panama City serves to maintain Panama's relatively high gross domestic product (GDP), the people of Panama City continue to battle with an unemployment rate of approximately 7.3 percent with 35 percent of the urban population living below the poverty line (Bowman, 2017). During previous trips, The McMaster School's liaisons in Panama expressed that elementary school children, along with their parents, need additional education on issues related to health and overall quality of life. Therefore, this year's McMaster scholars developed and implemented community-based research projects centered on education and health-related issues such as basic nutrition, water quality, literacy, conflict resolution, vision testing,

social learning skills, learning disability intervention strategies, CPR and first-aid, and stress management activities.

The majority of our work was conducted with Panama City community schools and after-school support programs. We worked for four days with the Central Educativo Marie De Poussepin (CEMP) School in Curundù (population 16,361), a low-income area within the central city where we conducted multiple classroom, faculty & staff, and parent sessions. Additionally, instructional sessions were conducted at school support settings such as the Biblioteca in Mañanitas (low-income outlying area of the city), the Fundación Amaneceres after-school program (middle income area of the city), and the Aprojusan after-school program located in the historic Casco Viejo area of the central city. We also traveled to El Congo village (125 km from Panama City) to work in their school and to test their water sources.

While in Panama we provided valuable information and training to address health-related issues of concern and our student-scholars gained invaluable insight and skills that will greatly assist them in their professional and personal lives in the future. Each student was able to conduct research and interact with individuals within populations very different from their own to gain a global perspective on issues that are both complex and unique.

REFERENCES

- Bowman, J. (2017). *Panama City. Our World: Panama.*
World Bank. (2015). *Poverty headcount ratio at national poverty lines (% of population).* Retrieved from World Bank: <http://data.worldbank.org/country/panama>

USING RELAXATION TECHNIQUES AND COPING SKILLS TO BOOST LOW SELF-ESTEEM

Da'Ja'Nay Askew, McMaster Scholar, Panama 2017-2018

The Panamanian community lacks the resources for professional training to improve the lives of youth; as a result, community partners have expressed the needs for information about self-esteem and coping skills. Having low self-esteem can lead to impairments in academic performance and false perceptions of the self (Ticusan, 2016). Also, low self-esteem is common in adolescents, and it mostly stems from the media and social comparisons. Children with low self-esteem do not feel like they have many positive, worthy characteristics and may feel ashamed, embarrassed, guilty, sad, or angry about themselves (Oswalt, 2010). The Panamanian youth could practice coping skills to help eliminate the negative effects. Using coping skills can boost self-esteem and mindfulness while working to reduce stress. Relaxation techniques such as yoga, deep breathing, meditation, and self-massage can promote educational achievement, increase awareness, promote sleep, and improve self-esteem. Due to these positive effects, our community partners felt that it would be relevant to incorporate relaxation techniques to boost self-esteem. The purpose of my project is to help the children and parents of the Bibliotheca in Mañanitas, El Congo, Aprojusan, and Fundación Amaneceres boost their self-esteem through art therapy and promote relaxation through coping skills.

On the ground in Panama, I worked with a total of 261 participants whose ages ranged from six to fifty years old. Most of the participants were students in the first, second, and third grades. There were 94 total students at the Biblioteca in Mañanitas, 33 students at the village of El Congo, 18 students at Aprojusan, 94 students at the Centro Educativo Marie Poussepin (CEMP) School in Curundù, and 22 community members at Fundación Amaneceres. The project that was executed on the ground was two-fold: (1) the flower activity was used to increase self-esteem and (2) the relaxation techniques were used to relieve stress. To begin my project, I asked the participants questions about their mood at the moment, their knowledge of self-esteem, and what makes them happy. After the questions were asked, the participants were given a “self-esteem flower” that was used as a tool to provoke positive emotions and increase self-esteem. This component of my project also served as a positive reminder of when individuals feel down. The participants wrote their names in the middle of the flower, then they wrote or drew aspects about their lives or themselves that make them feel happy. Following the completion of the flowers, the participants shared the work they have done and reflected on their positive emotions. Next came the

relaxation technique exercises. The participants moved through a series of deep breathing, yoga, self-massage, and meditation. Deep breathing was demonstrated by using a tool called a breathing ball that kept everyone on the same rhythm, and this was done for about 10 minutes. Yoga presented included the mountain pose and other poses to stretch the arms and back. The participants used self-massage to relax their hands and temples. Lastly, meditation was used to increase mindfulness and regain focus. After the project was completed, the participants reflected on their experience, discussed the new knowledge they gained, and revealed how they felt after the exercise.



The data for this project is qualitative, and it is based on the reflective questions I asked and what the participants put on their flowers.

The participants reported that school, church, television, playing outside, being with family, and eating made them happy. A few older participants understood what self-esteem was, but did not have a clear definition for it. The participants reported learning deep breathing, yoga, stretching, and how to feel better when they get upset. Overall, all participants said learning a new coping skill.

From self-observation and conversations with our community partners, I feel that my project was useful and beneficial for these Panamanian communities. The participants enjoyed the activities, and it seemed that they were able to understand the primary purpose of the project quickly. Our community partners wish to expand and continue this project throughout the country. One limitation of this project was my lack of knowledge of the abilities of the students. I created pre and post-tests to have an easier data analysis, but I worked with such a young population, that the tests were not used. I had to adapt my project by asking the participants questions about what makes them happy and how they cope with stress, instead of getting the details on their true levels of self-esteem. The data collected from this initiative will aid these Panamanian communities and future McMaster scholars in understanding the importance of self-esteem and relaxation techniques.

REFERENCES

- Oswalt, A. M. (2010). *Benefits of Healthy High Self-Esteem*. Retrieved April 16, 2017, from Mental Health.Net: <https://www.mentalhelp.net/articles/benefits-of-healthy-high-self-esteem/>
- Ticusan, M. (2016). Depression and Low Self-Esteem and its Influences on School Performance. *Scientific Research & Education in the Air Force*, 2669-2673. doi: 10.19062/2247-3173.2016.18.2.26

VISUAL ACUITY ASSESSMENTS FOR CHILDREN AGED 7-12

Chelsey Braunwart, McMaster Scholar, Panama 2017-2018

Visual acuity is imperative for school-age children to succeed in the classroom. If a child cannot see the board, or observe what the teacher is doing, their learning capabilities will be reduced. Humans rely on vision for learning more than any other sense, and as a student goes through their school career the demand for visual acuity is progressively higher and the amount of time spent studying and reading increases while the size of the text font decreases (American Optometric Association). If a child has poor visual acuity, their learning will be diminished, their motivation to learn will suffer, and, as a result, their grades will suffer as well.

My project involved conducting visual acuity testing for 288 students at Curundù School (grades 1, 2, 3, and 7) and El Congo School (grades 4, 5, and 6). The overall goal of the project was to get each student's vision assessed and to give them information about where they can access appropriate visual care.

To perform the vision testing, I had students stand either 14 feet or 17 feet away from the eye chart which utilized a variety of familiar shapes (as opposed to letters). Room size often restricted distance for testing and because of the changes in length, scores were adjusted, so that line seven (at 17 feet) and line eight (at 14 feet) were considered to represent 20/20 vision. We determined the lowest row the student could identify without missing more than one shape.

After testing was completed, an individual score was recorded for each eye and group mean scores reflected on the overall vision of students within each classroom. Individual index cards were completed for all students indicating that they either had good vision (20/30 or better in both eyes) or demonstrated poor vision and could potentially be a candidate for corrective lenses (if the student had 20/40 or worse in at least one eye). Results of testing are presented in Table 1 and Table 2 below:

Table 1. Visual Acuity Testing Results from El Congo School (N = 56)

Grade	Total tested	Good vision (%)	Poor vision
4	13	10 (77%)	3
5	27	26 (96%)	1
6	16	14 (88%)	2

Table 2. Visual Acuity Testing Results from Curundù School (N = 229)

Grade	Total tested	Good vision (%)	Poor vision
1	63	47 (75%)	16
2	64	43 (67%)	21
3	50	31 (62%)	19
7	52	35 (67%)	17

Additional testing was conducted for 3rd and 7th-grade classes (at Curundù) for color deficiencies using pseudoisochromatic plates. It should be noted that the usage of these plates is limited in that they should not be used for a large number of subjects at one time and that there usually is only about a 30% agreement between plate identification and actual diagnosis of colorblindness. The plates chosen for this test were selected to determine the presence of a general color deficiency, as opposed to diagnosing a specific color deficiency. Of the 102 students tested, two of them failed the testing. I placed an additional note on the index card for them to be retested by a licensed eye care professional.



Upon reflection of the implementation of this project, I believe that procedures were somewhat difficult to control initially, but as more students were tested, we gained a better understanding of how to produce reliable and accurate results despite inherent limitations

such as room size, lighting conditions, and language translation. It would have also been quite beneficial to have spoken with classroom teachers about some of the symptoms associated with blurred vision because many students exhibited this symptom (rubbing eyes after trying to focus for a period, squinting to see the shapes, or physically leaning forward to get a better view). Regarding the importance of this project, one student, in particular, sticks out in my mind because she could not read the top line of the chart correlated to 20/100 vision and, as she was walking into the room, ran into the desk. Especially in this student's case, I would have loved to have been able to talk with her teacher, or even more with her, to gain better insight into how she has adapted to further her education.

While our results indicate that most students have good vision, there were many students (like the one mentioned above) affected by potential vision deficits indicating that these assessments are potentially very valuable in Panama. These students and their potential success in the classroom are the reason that our McMaster initiative completed vision testing in Panama, and I hope that future scholars that will continue this project.

REFERENCES

American Optometric Association. (). *School-Aged Vision: 6 to 18 Years of Age*. Retrieved from American Optometric Association: <https://www.aoa.org/patients-and-public/good-vision-throughout-life/childrens-vision/school-aged-vision-6-to-18-years-of-age>

NUTRITION EDUCATION FOR PANAMANIAN SCHOOL CHILDREN

Morgan Connor, McMaster Scholar, Panama, 2017-2018

Dietary planning is a primary function of everyday living, and nutritional education should be completed for all children during their elementary school years. The Food and Agriculture Organization of the United Nations has completed a *Dietary Guideline for Panama* that is available to the public (Food and Agriculture Organization of the United Nations, 2013). I developed nutrition education and dietary planning activities based on the *My Plate* guidelines developed in the United States (United States Department of Agriculture, n.d.), as well as *The Edible Schoolyard Project* which has been utilized in Panama since May 2017 (Edible Schoolyard Project, 2017). The overall goal of this project was to assist Panamanian elementary schoolchildren in building a solid foundation of basic nutritional knowledge and strategies for dietary planning that can help to improve their overall health and well-being.



While in Panama City I taught groups of elementary school children about the importance of smart nutritional strategies and healthy dietary choices. I was able to work with a total of 91 students, in four different 5th and 6th grade classrooms at Curundù and one after-school program at Aprojusan where the students' ages varied from ten to seventeen years old. The educational sessions were based upon the assumption that they would not want to change the eating habits that are primarily associated with their culture, but when choices are available, a healthy choice should be made. Questions and learning activities were inserted at several points in the presentation to promote interaction among the school children. The first step was to find out some of their favorite foods, which included, but was not limited to, watermelon, strawberry, pizza, chicken and rice, soup, fish, and pineapple. Once their preferred foods were discussed, we focused on the food categories from the *Dietary Guideline for Panama* (Food and Agriculture Organization of the United Nations, 2013). Also, key words were presented for each category to help them remember the importance of eating a balanced food intake from each category every day. Finally, a bingo game was played using a modified board created before traveling to Panama. Utilizing different hints for each food category, the students identified the proper placement for common foods. For example, they were asked, "What food is in the grains category and is used to make a sandwich?"

After the games were completed, review questions were asked. Based on the students' responses I was able to understand how much of the information was retained and to address any areas of confusion. The five review questions that I asked were:

- 1) Why is it important to eat fruits and vegetables?
- 2) How many times a day should you eat fruits and vegetables?
- 3) What is the name of the purple category on the plate?
- 4) What is a drink that should be avoided?
- 5) The dairy category is important to build strong bones and what else?

The percentage of correct answers recorded for the combined settings indicated that most of the students had retained the information and were able to apply it to basic scenarios. Therefore, it was satisfying to see how quickly some of these concepts were learned and I hoped that the children were able to take this concept home and make good nutritional choices.

Upon completing my presentation, and speaking with our liaisons, we determined that most Panamanian students do not learn about the importance of nutrition until 6th grade or higher.

In addition to teaching the school children about basic nutrition, I also gained much from this experience. Working with a population different than any I had ever experienced, I gained the insight from individuals who do not view everything from a U.S. perspective. Additionally, by working with Panamanian children that were very happy despite having fewer resources than I am used to, I was able to appreciate their positive attitude on life.

In conclusion, this project was successful in meeting its intended goals as indicated by student responses and application of dietary knowledge along with the positive feedback provided by classroom teachers and our “on-the-ground” community liaisons. Hopefully, this project can be continued by future McMaster Scholars to extend nutritional learning to other students and to adapt learning activities for additional grade levels.

REFERENCES

- Edible Schoolyard Project. (2017). *El Colegio de Panama School Gardening and Cooking Program*. Retrieved from Edible Schoolyard Project: <https://edibleschoolyard.org/program/el-colegio-de-panama-school-gardening-and-cooking-program>
- Food and Agriculture Organization of the United Nations. (2013). *Food-based dietary guidelines - Panama*. Retrieved from Food and Agriculture Organization of the United Nations: <http://www.fao.org/nutrition/education/food-based-dietary-guidelines/regions/countries/panama/en/>
- US Department of Agriculture. (2018, January 26). *MyPlate*. Retrieved from US Department of Agriculture ChooseMyPlate. Gov: <https://www.choosemyplate.gov/MyPlate>

SOCIAL EMOTIONAL LEARNING FOCUSED ON EMOTIONAL RESILIENCE AND SOCIAL INITIATION IN PANAMANIAN CHILDREN

Madysyn Creighton, McMaster Scholar, Panama 2017-2018

Our community partners at the Biblioteca in Mañanitas, the village of El Congo, and the after-school program at Aprojusan expressed the need for social-emotional learning (SEL) with a focus on regulating emotions and social interaction. Building social skills and healthy relationships are among the most significant concerns of children because they are not fully aware of their classmates' emotions, body language, and differences at this time. SEL targets this area of child development to educate children about problems relating to socialization and emotions. Social-emotional learning is geared towards changing behaviors that can better support academic growth, ensure control over emotions, and enhance the development of effective social skills. Wong, Li-Tsang, & Siu reported that the development of social and emotional learning skills could lead to better academic success by improving memory and self-regulation while also increasing attention span within a school setting (Wong, 2014). The goal of the study is to present and implement SEL strategies that can positively alter behavior, emotions, and attention levels in Panamanian school children. SEL instruction can also be extended to teachers to enhance their social-emotional skills, improve teacher/student relationships, and to promote positive classroom settings (DeMeulenaere, 2015).

While in Panama I worked with 112 students at the Biblioteca in Mañanitas, 28 students in the village of El Congo, and 20 students at Aprojusan. I began my project by explaining the term emotional resiliency in a manner that could be easily understood by the students. I then asked the students three pretest questions and compiled data by having them raise their hands or answer verbally. Subsequently, I told the students a story about a mistake I once made. I told the class that while on the drive to their school I was drawing all of them a picture and was so excited to pass them out, but I stopped drawing because I made a mistake. I then asked the class if they would be willing to help me fix my mistake. Each student was given

the picture that I made a mistake on and was distributed evenly throughout the classroom. Half of the children received a drawing with a circle on it, while the other half received a drawing with pointed lines. Each student was then given ten minutes to complete the drawing using his and her imagination. I then had two students present their drawings and explain their pictures to the class. The game was concluded with a posttest. I then told the students that it is okay to make a mistake and that you can learn from your mistakes. Additionally, I explained to the students that mistakes could allow us to apologize if we did something wrong, admit wrongdoing, ask for help, take a different approach, and learn from mistakes to prevent them from happening in the future.



The second game began with two pretest questions. I then discussed the importance of building social skills with the class. I explained to the students that socializing can allow us to learn something new about someone else while discovering common interests that can lead to new friendships.

In the next game, I had the students work together at their tables. Each student was given a Bingo sheet that had various topics. The goal of this game was for each student to ask five different people one of the questions on the sheet. For example, one of the boxes on the sheet stated, “likes to play a sport.” I asked the students to ask someone at their table if he or she plays a sport and record the person’s name in the box. After all five of the boxes were completed students raised their hands and received a sticker. This game was concluded with a posttest question. I then discussed the importance of building social skills and interacting with others. I described that one could apply social skills to many areas of life including school, future careers, and relationships with others.

The tables below show students’ responses to pre and post-test questions. Data was not collected at the village of El Congo. Participants reported that concluding my presentation they would feel more comfortable making a mistake. Similarly, the students expressed that they liked to make new friends and that they had learned something new about someone.

Emotional Resilience Drawing Game Pre-Test (yes/total participants)	
Q1: How many people get mad if they make a mistake?	122/132
Q2: What are some example of mistakes you have made?	bad grades, fighting with siblings, forgot about class, teasing
Q3: What are some feelings you have when you make a mistake?	mad, sad, worried, frustrated
Q4: What are ways to respond to a mistake?	talk with family, apologize
Q5: Does anyone think a mistake is a good thing?	24/132

Emotional Resilience Drawing Game Post-Test (yes/total participants)	
Q1: How many people would be comfortable making a mistake now?	55/132

Social Initiation Bingo Game Pre-Test (yes/total participants)	
Q1: How many people get nervous talking to someone new?	112/132
Q2: How many people like to make new friends?	93/132

Social Initiation Bingo Game Post-Test (yes/total participants)	
Q1: How many people learned something new about someone?	71/132

After speaking with our community partners and looking over my results, I feel that my project was successful. It appeared that the students benefited from a mixture of discussion as well as an activity. It was useful to have the students provide insight into the mistakes they have made as well as the feelings that accompanied mistakes. This allowed me to address the negative feelings associated with making mistakes while implementing strategies to overcome them. Similarly, the bingo game allowed the students to interact with one another and learn something new about their classmates. However, the concept of this game was difficult for the students to understand. The goal of this game was to have the students interact and socialize with one another. However, the younger students directed the questions at themselves and answered them accordingly. In conclusion, I feel that this project worked well with the needs the community partners expressed and promoted emotional resilience as well as social skills.

REFERENCES

- DeMeulenaere, M. (2015). Promoting Social and Emotional Learning in Preschool. *Dimensions of Early Childhood*, 43(1), 8-10.
- Wong, A. L.-T. (2014). Effect of a Social Emotional Learning Programme for Primary School Students. *Hong Kong Journal of Occupational Therapy*, 24(2), 56-63. doi:10.1016/j.hkjot.2014.11.001

STRATEGIES TO PROMOTE READING AND WRITING AT HOME

Samantha Ervin, McMaster Scholar, Panama 2017-2018

Literacy is an essential skill that can often limit individual success and overall quality of life. Reading and writing skills should be supported in the home from an early age to promote emergent literacy. Steiner reported a significant relationship between parent involvement with reading and writing and the overall success of a child in school (Steiner, 2014). Despite this inherent connection, many parents may not understand how important it is for them to read with their children for their literacy skills to be developed. Additionally, there may be inadequate reading resources available to parents or a lack of understanding of literacy skills development strategies.

Even though Panamanian schools and many households may have more inherent barriers to literacy development than in typical U.S. setting, there are many ways in which Panamanian parents can foster their children's literacy development. Some of these strategies include reading books to their children as well as reading day-to-day observable items such as signs, labels, and menus. Parents can also support their children's early attempts at reading and writing by making lists of toys and reciting rhymes with them (Gunning, 2016). Additionally, when a parent reads something simple like a street sign or a grocery store list, it will establish literacy patterns that allow children to grow as a reader, helping them to better succeed in the classroom. To supplement reading, the use of writing activities will also develop emergent literacy skills for children. Simple activities such as drawing pictures developed from scribbling and writing words to describe them. The overall purpose of my project was to encourage Panamanian parents to increase their efforts to build their children's literacy skills by working with them on a variety of reading and writing strategies at home.

While in Panama schools and after-school programs I completed several instructional sessions for parents focused on fostering their children's literacy skills. During these sessions, the parents were supplied with a packet of resources and instruction on reading and writing activities that they could do with their children at home. During my presentation, we focused on the concept of emergent literacy which is the self-discovery process of learning to read and write. I explained to the parents that reading with their kids at home can have a significant impact on how well they do in school.

The first resource I gave to the parents was a writing folder that contained the Spanish alphabet and a book for the children to write down sight words or words that they see every day. The next resource explained the writing development process relative to older children to provide guidelines for producing well-written documents. I also presented a reading strategy menu that explained processes to improve reading comprehension. Parents were supplied with a set of Spanish alphabet flash cards that they could use to quiz their children or encourage their children to practice spelling. Post-it notes were also

provided so parents could write the name of everyday household items, placing them on things for practice with sight words and reading.

Activities discussed and practiced during the sessions included picture sorts to provide children with practice in differentiating animals, colors, letters, and words. I also showed parents how children could practice writing in shaving cream as a fun way to practice writing letters or words at home.

A total of 24 parents attended instructional sessions at Biblioteca and Curundù schools, and each of them completed a survey to identify reading and writing behaviors they utilized to develop their children’s literacy. The six questions on the survey were as follows:

1. What resources do you have at home to practice reading and writing with your child?
2. Do you have easy access to children’s books?
3. Do you have a local library that you can go to?
4. How often do you read with your child at home?
5. Do you have internet access at home?
6. Which of the following do you read on a regular basis?



The following literacy resources were reported as available at home.

Home Literacy Items Reported by Parents (N = 24)

Item	<u>Number (%) Reported</u>
Books	22 (92%)
Pencils	21 (88%)
Magazines	19 (79%)
Paper	17 (71%)
Crayons	17 (71%)
Newspapers	14 (58%)
Internet Access	09 (38%)

Parent responses to questions regarding reading and writing behaviors utilized in the home are summarized below.

Table 2. Home Reading and Writing Behavior (N = 24)

<u>Question</u>	<u>Yes (%)</u>	<u>Number (%)</u>
1. Do you have easy access to children’s books?	14 (58%)	10 (42%)
2. Do you have a local library that you can go to?	13 (54%)	11 (46%)
3. Do you have internet access at home?	13 (54%)	11 (46%)
4. How often do you read with your child at home?	<u>Response</u>	<u>Number (%)</u>
	Daily	11 (46%)
	Occasionally	10 (42%)
	Rarely	3 (12%)
	Never	0 (00%)
5. Which of the following do you read on a regular basis?	<u>Item</u>	<u>Number (%)</u>
	Books	18 (75%)
	Newspapers	9 (38%)
	Magazines	8 (33%)
	Other	6 (25%)
	Web Text	1 (04%)

The survey evidenced that every home had some resources and every Panamanian parent can support and develop the emergent literacy of their children. Parents attending the sessions were very engaged and interested in learning how to promote reading and writing at home. Most indicated that the instructional session simplified the processes and strategies to promote literacy and stated that they would utilize them at home.

By working with parents in Panamanian schools, I was able to appreciate the degree of student learning that can be accomplished with a half-day system that is very limited in instructional resources and technology. This, however, did not affect parents' interest in promoting their child's literacy and overall education. The experience left me with an attitude that human effort and interaction is the vital component in the education of elementary children.

REFERENCES

- Gunning, T. (2016). *Creating Literacy Instruction for All Students* (9th ed.). Boston: Pearson.
- Steiner, L. M. (2014). A Family Literacy Intervention to Support Parents in Children's Early Literacy Learning. *Reading Psychology, 35*(8), 703-735. doi:10.1080/02702711.2013.801215

ANALYSIS OF WATER QUALITY IN SELECTED SITES IN COCLÉ PROVINCE, PANAMA

Spencer Gray, McMaster Scholar to Panama, 2017-2018

According to the World Health Organization and UNICEF, roughly 11% of Panamanians lack access to improved water, and 5% use open surface water to meet their water needs (World Health Organization and UNICEF, 2000-2015). The lack of piped water, properly dug wells, and basic water sanitation techniques can negatively impact the health of all who use the water by transmitting cholera, dysentery, typhoid, polio, and other diseases (World Health Organization, 2018). A recent study of one hundred children under the age of five in the Veraguas province of Panama found that sixty-one of the children tested positive for intestinal pathogens (Jiménez Gutiérrez, 2014). The overall purpose of this project was to support the people of Coclé by informing them of potential health hazards in their water supply and enabling them to pursue proactive measures regarding their health.



Water sources selected by our community partners were tested for pathogenic bacteria, nitrate, chlorine, phosphate and ammonia levels, water hardness, and turbidity. Colorimetry tests manufactured by Hach allow for rapid quantification of these parameters in a field setting. While in Panama, a total of thirteen sites within seven communities were tested. Upon arriving at each location, several measurements were taken: latitude and longitude coordinates, temperature, and turbidity, as well as photos of the site. If available, a community member was interviewed about community health and potential water quality issues. A labeled sample was also taken. Once all samples had been gathered, chemical

assays were performed on each sample to quantify the presence of target compounds in the water. These results were then compiled, along with qualitative results, and shared with the people of Coclé.

Of the thirteen sites tested, no measurable level of free or total chlorine was found. One site did use chlorination tablets in their water, but those tablets appeared to have no measurable effect. All thirteen sites had very hard water, with no result below 150 mg/L, and three sources exceeding 200 mg/L. Additionally, none of the sites tested reported a measurable level of ammonia. Ten of the sites had high phosphate levels, but none were high enough to pose a health risk. Seven sites (54%) reported levels of nitrates, with one source having a concerning result of 13.2 mg/L. Nine sites (69%) had a turbidity value greater than 1.00, which has the potential to harm water sanitation techniques. Finally, five sites (38%) tested positive for hydrogen sulfide producing bacteria, which shows that pathogenic bacteria are likely to be present in those wells or tanks.

This year, our water testing project was expanded to accommodate the community's wider concerns regarding water sediment. Turbidity testing was completed for the first time which may provide data that can allow the citizens of these communities to lobby for or build filtration systems that improve the quality of their water. Currently, the most significant risk found in the selected sites appears to be the positive pathogenic bacteria result. People who consume water from these sources are at risk for waterborne disease, but chlorination or boiling of drinking water may mitigate this risk. However, each site that tested positive for pathogenic bacteria also had a turbidity value of >1.0, which may hinder chlorination efforts.

The Panamanian government appears to be taking action regarding health and water quality. Government authorities are installing new tanks and providing seminars on cleaning and maintaining equipment. Further actions, such as chlorination projects, must be taken up by Panamanian authorities if real improvements to water quality are to be seen. Many of those interviewed on-site complained of planes spraying pesticides or herbicides on them. It is possible that these chemicals leach through the soil into the water supply and may harm the quality of the drinking water from these areas. Detection and quantification of these chemicals appear to be the next step in ensuring the needs of our community partners in Coclé.

Overall, our water testing was a significant service to the community partners in Coclé Province, Panama, especially considering that this was the third consecutive year that testing results were provided. Our testing has confirmed that there is an inherent health risk in many of the water supplies that can be addressed either by proper chlorination treatment or basic filtration of particulates.

REFERENCES

- Jiménez Gutiérrez, E. P. (2014). Enteric parasites and enteroaggregative *Escherichia coli* in children from Cañazas County, Veraguas Province, Panama. *The American Journal Of Tropical Medicine And Hygiene*, 91(2), 267-272. doi:10.4269/ajtmh.13-0438
- World Health Organization. (2018, February 7). *Drinking-Water*. From World Health Organization: <http://www.who.int/en/news-room/fact-sheets/detail/drinking-water>
- World Health Organization and UNICEF. (2000-2015). *Country - Panama*. From World Health Organization and UNICEF: <https://washdata.org/data>

CPR AND FIRST AID EDUCATION IN PANAMA

Beau Massingill. Panama McMaster Scholar, 2017-2018

Within most areas in Central America, there is a shortage of healthcare professionals combined with a general lack of access to healthcare. Colon-Gonzalez, El Rayess, Guevara, & Anandarajah reported that in five of the eight Central American countries (including Panama) the suggested World Health Organization (WHO) ratio of 25 physicians per 10,000 habitants is not being met (Colon-Gonzalez, 2015). Adding to the healthcare deficit is the fact that the doctors in Panama are heavily concentrated within major cities leaving inadequate healthcare in most rural communities. When healthcare is available, there are still barriers to access including insufficient economic resources and inadequate transportation (Pérez-Cuevas, 2017). In these areas with poor access to immediate care, being able to perform CPR can increase a victim's chance for survival. My project will focus on establishing fundamental knowledge and raising the level of confidence in performing CPR and basic first aid within these communities.

While in Panama I provided several CPR, Heimlich maneuver, and first aid training sessions. In the village of El Congo, I trained a group of 5th and 6th graders on CPR as well as basic wound care. At the Centro Educativo School in the Panama City neighborhood of Curundù, I worked with educators and school employees on the proper adult, child and infant CPR techniques as well as the Heimlich maneuver. The same training was also provided to a group of educators and older students at the Fundación Amaneceres (Panama City) after-school program. Data was collected on students' understanding of, and confidence levels with, major concepts using pre and post-instruction instrument utilizing a standard four-point Likert Scale.

Following instruction in the rural village of El Congo, the entire group of 5th and 6th grade students were able to identify the signs and symptoms of cardiac arrest, as well as the proper amount of compressions that should be performed in one minute. All students were provided with an opportunity to practice chest compressions on a CPR mannequin.

At Curundù the results indicated that the workshop was effective at teaching and reinforcing the basic components of CPR and the Heimlich maneuver. The pre-test assessment indicated that only four of the forty-four participants were familiar with, or had ever received instruction on, CPR. Of those four participants, none of them had ever utilized CPR on a victim. Following the workshop, 95% (42/44) of the participants reported a level of confidence in their own CPR knowledge while 16% (7/44) described themselves as very confident in their own CPR knowledge. Of the 44 participants at Curundù, 96% felt that the workshop increased their confidence in performing CPR and that they would be able to provide help if the opportunity arose.

At Fundación Amaneceres I worked with a group of 28 teenagers and adult women. Upon the completion of the training session, all of the participants reported that their CPR knowledge improved and 96% (27/28) felt confident in their abilities to act in a situation that required CPR.

Overall the workshops proved to be very beneficial to the groups in Panama. The limitation of this study was the narrow time-frame in which to conduct training sessions. While a one or two hour workshop can provide some initial knowledge and techniques for performing these skills, prolonged practice and continued education are necessary to master the skills of CPR and basic first-aid. This project was extremely beneficial to me personally in that I was amazed at how open the



students and teachers were to learning about new topics from a U.S. college student. This experience taught me that no matter what task is required of me, I should approach it with a sense of curiosity and excitement as an opportunity to learn about new things with new groups of people.

REFERENCES

- Colon-Gonzalez, M. C., El Rayess, F., Guevara, S., & Anandarajah, G. (2015). Successes, challenges and needs regarding rural health medical education in continental Central America: a literature review and narrative synthesis. *Rural and Remote Health, 15*(3), 3361.
- Pérez-Cuevas, R., Guanais, F. C., Doubova, S. V., Pinzón, L., Tejerina, L., Pinto Masis, D., & Macinko, J. (2017). Understanding public perception of the need for major change in Latin American healthcare systems. *Health Policy And Planning, 32*(6), 816-824. doi:10.1093/heapol/czx020

CONFLICT RESOLUTION STRATEGIES FOR PANAMANIAN SCHOOL CHILDREN

Cody Nelson, McMaster Scholar, Panama 2017-2018

The purpose of my project was to help Panamanian school children learn new skills to help them deal with conflicts in a less confrontational or combative manner. Our Panamanian community partners expressed a need for such skills to be taught to the school children. By developing better conflict resolution skills, it is hoped that Panamanian children will engage less in criminal behavior, maintain healthier relationships, and decrease instances of bullying.

According to Knoema.com, there were 5,461 assaults in Panama during 2012 which represents an incidence rate of 145.9 per 100,000 people (Knoema, 2015). Comparatively, the United States had an estimated 762,009 aggravated assaults in the year 2012. In 2012, the estimated rate of aggravated assaults was 242.1 per 100,000 inhabitants (Knoema, 2015). In reporting on the day-to-day lives of Panamanian youth, the National Bullying Prevention Center reported a mean prevalence rate of 35% for traditional bullying involvement and 15% for cyberbullying involvement for 12-18-year-old students (Modecki, 2014).

Before arriving in Panama, I contacted our community partners to learn more about the most common types of conflicts that impact kids on a daily basis. Upon gathering this information, I developed conflict resolution scenarios that provided familiar contexts for the various groups.

At the onset of each class, I would give the students a pretest to determine what was already known about conflict resolution. I would then distribute my scenarios and conduct small group learning activities to explore and discuss the proper ways to handle each situation. At the end



of the session, students were asked to identify any new skills they had gained that could help them avoid or better resolve conflicts.

While in Panama City, I presented to two classes of fifth graders (58 students) and two classes of sixth graders (46 students) at the Biblioteca. I also presented at two after-school facilities - Aprojusán, (35 students) and Fundación Amanecerés (25 students); in both locations, the children varied in age. At the Curundú School, I conducted four sessions: two classes of sixth graders (35 students), and two classes of seventh graders (54 students).

In my pretest data collection (238 respondents), I was able to determine that 80% (191/238) of the students said that they had been involved in a conflict and did not know how to solve it. Of the 191 students that indicated they had been in a conflict 83% (159/191) said they wish they could go back and change the way they handled the conflict. Only 26% (63/238) of the students indicated that they had been taught conflict resolution skills before.

In one activity, I gave a scenario to students and asked them to go through five steps to solve the situation peacefully. After I had given my presentation on conflict resolution skills, 95% (40/42) of the groups were able to identify the problem in the scenario. All of the students were able to identify the appropriate feelings as a result of being in that situation. 90% (38/42) were able to give me three solutions to the scenario. All of the students were able to arrive at a mutual agreement to solve the problem presented in the scenario.

One of the strengths I found in my project was that it was pretty easy to deliver. I was able to go into greater or less detail depending on the audience. A limitation I identified with my project was that some groups worked more collaboratively than others. Groups that did not work well together caused my training sessions to last from 30 to 60 minutes. Regarding the skills, knowledge, and attitudes that I gained as a result of this experience, I realized that kids learn at different rates and varying levels of understanding.

In conclusion, conflict resolution is a very important skill that can be learned by students of all ages. The more that students know about the ways to peacefully resolve conflicts, the greater the likelihood that crime will decrease, harmonious relationships will be maintained, bullying will decrease, and an overall climate of happiness will be achieved. Furthermore, these life skills can be taught to family, friends, and others.

REFERENCES

- Knoema. (2015). *Panama - Assault*. Retrieved from Knoema: <https://knoema.com/atlas/Panama/topics/Crime-Statistics/Assaults-Kidnapping-Robbery-Sexual-Rape/Assault>
- Knoema. (2015). *United States - Assault*. Retrieved from Knoema: <https://knoema.com/atlas/United-States-of-America/topics/Crime-Statistics/Assaults-Kidnapping-Robbery-Sexual-Rape/Assault>
- Modecki, K. L. (2014, November). Bullying Prevalence Across Contexts: A Meta-analysis Measuring Cyber and Traditional Bullying. *Journal of Adolescent Health, 55*(5), 602-611. doi:10.1016/j.jadohealth.2014.06.007

MULTI-SENSORY ACTIVITIES

Kaytlyn Williamson, McMaster Scholar, Panama 2017-2018



In 2006, nearly 2 percent of the population or 52,197 Panamanians had been diagnosed with a disability (National Secretariat for the Social Integration of Persons with Disabilities, 2006). Individuals with a disability have trouble getting the help they need due to socioeconomic conditions, parents' lack of knowledge in dealing with disabilities, parents' ages, and the environment (Nigmatullina, 2016). As a result, sensory activities were created to help improve the lives of persons with disabilities by providing them with the tools they may need to express themselves in a social setting (Nigmatullina, 2016). Sensory tools are used in classrooms and in therapy. Sensory activities help lower stress and aggression, help build self-esteem, create positive attitudes, increase focus, and reinforce positive communication (Nigmatullina, 2016). The goal of my project was to develop and demonstrate multi-sensory activities, such as sensory bags, with children that have a disability at Centro Educativo Marie de Pousepin (CEMP) in Curundù and the Biblioteca in Mañanitas, Panama City, Panama.

While in Panama I worked with twenty children that had a wide range of physical, cognitive, educational, and emotional limitations. Each child's background and limitations were different; therefore, the sensory bags varied according to the individual. Before meeting with each child, Lidia, the special education teacher, would

provide me with as much background information on the student as possible, including family backgrounds, behavioral issues, and disability types. I started my project by building a rapport to gain the child's trust. We played in a sensory room, while the child played I asked them a variety of questions to get to know them and to learn something more about their backgrounds. I asked questions such as: "What is your favorite thing to do?" "Do you enjoy school?" "Do you have any siblings?" After approximately five minutes of play time I asked the child if they wanted to see this cool bag that I made, and then I presented my example sensory bag. Based on the information provided by the child and Lidia I explained the goal of sensory bags and how they should be used. For example, if a child had severe behavioral issues I would ask: "What makes you upset?" and "What do you do when you're upset?" I would then explain and demonstrate how they could squeeze and play with a sensory bag instead of hitting someone when they are upset. I would then walk them through how to make a sensory bag.

To make the bags the children put hair gel in a Ziploc bag and added food coloring. Next, I let the kids pick sensory items, such as pasta, Legos, rocks, beads, or sunflower seeds to put in their bag. Finally, I sealed the bag and placed duct-tape around the whole bag to prevent leaks.

I also found that the school children are not only living with multiple kinds of disabilities but with extreme trauma that is causing them to either act out aggressively toward others or is delaying their educational process. The bags will help decrease aggression toward others while increasing opportunities for learning. The special education teachers and psychologists in Panama were all very receptive to the sensory bags. The children enjoyed the sensory bags and were using them in class as soon as we departed from their classrooms. While the sensory bags are intended to help individuals with disabilities, they can also be used to help individuals with mental health issues.

Traveling to Panama has forever changed my life. This year I learned patience and that you may not always be able to fix a solution immediately but you can forever change someone's life by just being present. I learned that everyone has their own story, trials, and tribulations that come with life. I learned to never give up on a person even when they have given up on themselves because someone needs to fight for them. Panama has forever changed my life for the better, and I hope to incorporate what I learned there is my future career as a social worker.

REFERENCES

National Secretariat for the Social Integration of Persons with Disabilities. (2006). Human Rights of People with Disability in Panama. *National Secretariat for the Social Integration of Persons with Disabilities*, 32-33. Retrieved April 2017, from [http://gwweb.jica.go.jp/km/FSubject0601.nsf/03a114c1448e2ca449256f2b003e6f57/f1692ec3188fd280492572f9002bdfcc/\\$FILE/Human%20Rights%20of%20the%20People%20with%20Disability%20in%20Panama.pdf](http://gwweb.jica.go.jp/km/FSubject0601.nsf/03a114c1448e2ca449256f2b003e6f57/f1692ec3188fd280492572f9002bdfcc/$FILE/Human%20Rights%20of%20the%20People%20with%20Disability%20in%20Panama.pdf)

Nigmatullina, I. A. (2016). Features of Correctional Development Work In the Sensory Room with Children with Disabilities. *International Journal Of Environmental & Science Education*, 11(3), 309-315. doi:10.12973/ijese.2016.314





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We would like to acknowledge our many liaisons that work tirelessly with each McMaster Learning Community to support effective collaborations with our community partners and to teach each of us about the culture and the context surrounding our initiatives. Through our McMaster experiences each of us recognizes that our ability to effectively conduct community-based research that can improve the human condition is heavily dependent on the work of our liaisons. Regardless of location these individuals teach our students, make connections, and facilitate the implementation and integration of project work. Our sincerest thanks to those people on site who protect, inform, and inspire the McMaster teams.



BELIZE

Ivan Gillett, Jr. – Ivan Gillett was formerly the head ranger for Programme for Belize at the Hillbank Research Station. Ivan has worked in the rainforest for most of his career and his knowledge of the jungle is evident. He has been and continues to be instrumental in teaching all of us, advising our work, and helping us to effectively engage with a culture far different from our own. His commitment to small villages on the periphery of the Rio Bravo Conservation and Management Area both inspires and facilitates our collaborations in these communities. He has become our trusted friend and his connection to Defiance College spans over a decade.



LOCAL

Troy Slattman is in his fourth year as Principal at the Independence Education Center (IEC), bringing 19 years of administrative experience to the school. He was instrumental in establishing the McMaster Local Community. Troy is passionate about ensuring that all students have “the opportunity to maximize their abilities and [gain] skills to be productive adults.” He and his staff work closely with our McMaster Scholars to develop their projects and find ways to engage with the entire school community.



CAMBODIA

Sophal Leng Stagg (left) – Sophal (Sophie) was responsible for the effective work of the McMaster Cambodia Learning Communities for 13 years. Without her guidance and wisdom the McMaster Cambodia project would not have existed. Sophie is a survivor of the Khmer Rouge and immigrated to the U.S. with her family in 1980. She is the executive director of the Southeast Asia Children’s Mercy Fund and continues to work relentlessly for the people of Cambodia.



Sun Sovichea – Vichea is our trusted liaison in Phnom Penh. He is the son of one of our community partners in Cambodia and served as an advisor and friend to the McMaster Cambodia Learning Community while we were on site. He stayed with our group from our entry into the country through our departing flight and assisted us with translation, transportation, housing, and safety and security.

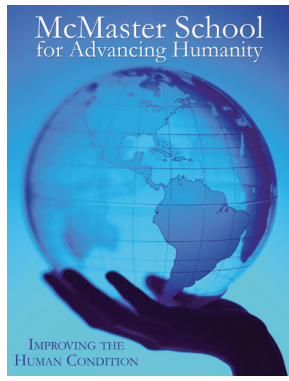


PANAMA

Maria Elena Marquez de Rivera (left) – Maria Elena began working with the McMaster School during the exploratory trip in 2014. From the beginning it was evident that Maria Elena would be instrumental in paving the way for future McMaster initiatives both in Panama City and in the village of El Congo. Maria Elena serves as our liaison, interpreter, and cultural guide, ensuring the effectiveness of McMaster teams’ work in Panama.



Ximena Cambefort and Jorge Pincay joined the Defiance College McMaster Team during the 2016-2017 year in a support role in preparation to assume the role of Team Liaisons during the 2017-2018 year. As Team Liaisons, they are responsible for coordinating the communication and logistics between the five community partners and McMaster Panama Team. Ximena and Jorge’s involvement before, during, and after the trip are important to the overall success of the team in Panama.



McMaster Symposium & Academic Colloquium

April, 2017



Belize Learning Community
2016-2017

Cambodia Learning Community
2016-2017



Panama Learning Community
2016-2017

THE QUESTION OF INDIVIDUAL LIBERTIES AS CRITICAL TO
IMPROVING THE HUMAN CONDITION

McMaster Symposium & Academic Colloquium

April, 2018

Belize Learning Community
2017-2018



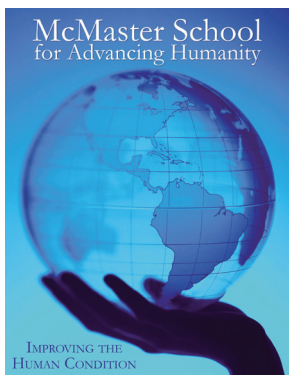
Local Area Learning Community
2017-2018

Panama Learning Community
2017-2018



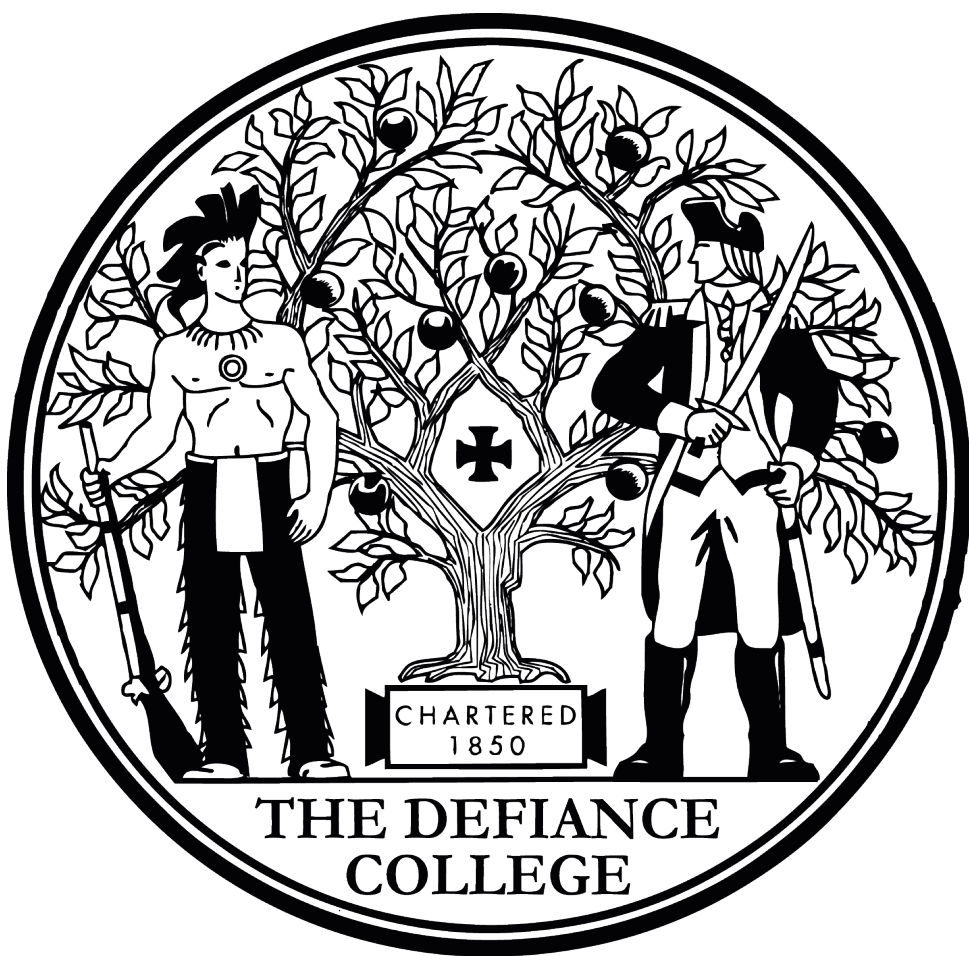
THE QUESTION OF INDIVIDUAL LIBERTIES AS CRITICAL TO
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