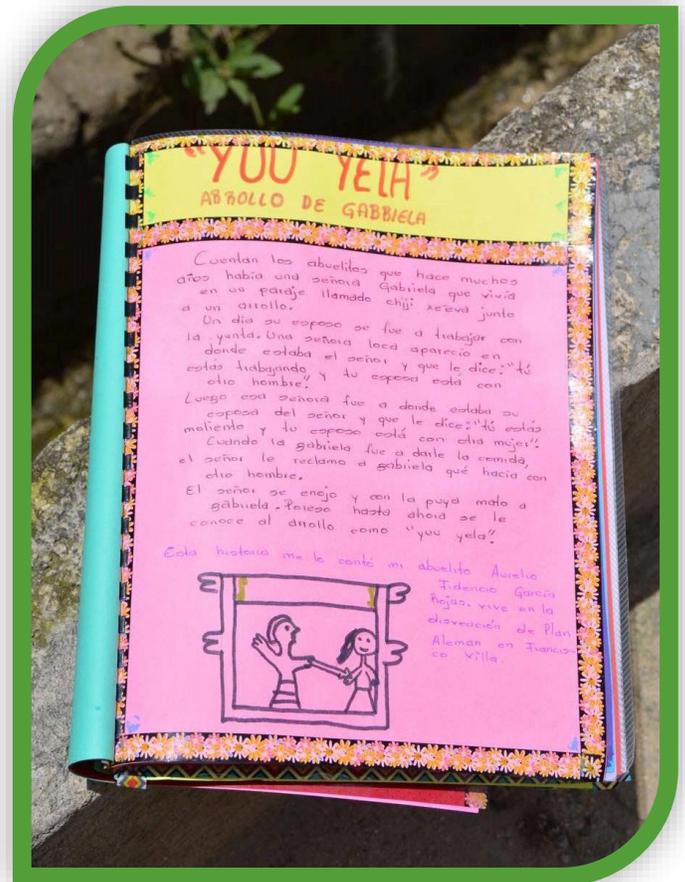


Environmental Science and Mixtec History Courses in Oaxaca, Mexico



Alexandra Matas Calderon, Marina Maria and
Edouard Zaya
2017 McBurney Fellows
McGill Institute for Health and Social Policy



Project Overview

Student name: Alexandra Matas Calderon
 Department: Honours International Development Studies and Geography
 Organization: IEBO and Genaro V. Vásquez
 Location: Santo Tomás Ocotepec, Oaxaca, Mexico
 Mentor: George McCourt, Ethelia Ruiz Medrano
 Fellowship Duration: 16 June – 20 July, 2017

Student name: Marina Maric
 Department: Honours International Development Studies and Latin American and Caribbean Studies
 Organization: IEBO and Genaro V. Vásquez
 Location: Santo Tomás Ocotepec, Oaxaca, Mexico
 Mentor: George McCourt, Ethelia Ruiz Medrano
 Fellowship Duration: 16 June – 20 July, 2017

Student name: Edouard Zaya
 Department: Political Science
 Organization: IEBO and Genaro V. Vásquez
 Location: Santo Tomás Ocotepec, Oaxaca, Mexico
 Mentor: George McCourt, Ethelia Ruiz Medrano
 Fellowship Duration: 16 June – 20 July, 2017

About the McBurney Fellowship Program

Through McGill’s Institute for Health and Social Policy, the McBurney Fellowship Program supports students in international service programs related to health and social policy in Latin America. McBurney Fellows serve abroad in organizations working to meet the basic needs of local populations. One key aspect of this fellowship is its mandate to make a significant contribution to improving the health and social conditions of poor and marginalized populations through the delivery of concrete and measurable interventions. Students and their mentors identify issues, make connections with local organizations, and develop a strategy for the fellowship. The views expressed in this document are the opinions of the fellow, and do not necessarily reflect the opinions of the IHSP.

Contents

Project Overview	1
About the McBurney Fellowship Program	2
Contents	2
Fellowship Rational and Objectives.....	3
Background/Context	3
Activities	5
Challenges and Successes	8
Questions Raised	8
Training and Mentoring.....	9
What did you learn?	10
Community Implications and Further Work	10
Program Evaluation	12

Environmental Science and Mixtec History Courses in Oaxaca, Mexico

Fellowship Rational and Objectives

The current curriculum at the Génaro V. Vásquez middle school does not adequately address local history or environmental education. Through our summer courses, students had the opportunity to apply theories and concepts learned in the classroom across different subjects to address real-life problems encountered in their community.

The summer courses were divided into an environmental and historical component. The former aimed to increase the students' interest in scientific subjects (mathematics, biology, and chemistry) as well as their knowledge of local soils, rivers and biota. Learning in the classroom was then enhanced by encouraging students to draw links between theory and environmental sustainability and conservation, in which they play an important role. This interactive mode of learning diverges from traditional learning because it provides students the space to think critically about their impact on their surroundings and it gives them the agency to control and ideally reduce said impact. This in turn raises environmental concern among younger generations and ensures the preservation of the community's natural resources in the long term. Through the history component, students learned how to study local documents and to use investigative tools to compile different stories about their community and essentially "produce" their own cultural knowledge. Like the science component, this gave students agency over their own histories and the ways in which they are recorded. Students were able to see the value of speaking to community elders and visiting sacred places in maintaining Mixtec cultural heritage alive in their community. Within a context of ever-deepening environmental degradation and cultural erosion that indigenous communities are so often faced with, the ultimate goal of this project was to empower students and foster pride in their land and culture.

Objectives:

Conduct a summer course with local secondary school students. The course would be divided into an environmental conservation and land-based education component, and a Mixtec history and culture component.

Organize tutoring sessions for local high school students, to help them pass their English and mathematics make-up exams.

Background/Context

Santo Tomás Ocotepec is a community located in the region of the "Mixteca Alta" of the Sierra Madre de Oaxaca in Mexico. It is one of the most beautiful and diverse places in the world. How-

ever, the region is also known to have one of the highest degrees of marginalization in the country. This region, along with the state of Chiapas, has the lowest levels of life expectancy, education (7.5 years) (INEGI, 2015), and income (66.8% of the population in poverty) (CONEVAL, 2014) in the country. Community organization is based on a mix of modern forms of government and the concept of *usos y costumbres*, which is the concept of Indigenous customary law. For this reason, the general population is directly involved in government decisions and projects. Oaxaca has been marked by an inadequate and underfunded educational system, as well as cultural rejection, food insecurity and a lack of economic opportunities, which has caused migration in large numbers to other countries or parts of the country perceived to have more opportunities. This migration has had devastating effects and Santo Tomás Ocotepec is just one of many indigenous communities whose cultural heritage is being seriously threatened. As a result, the community has defined a set of objectives for 2020, which include reducing emigration, increasing economic development,



and preserving their traditional identity.

For the past four years, the McGill Spanish and Latin American Student Association (SLASA) has collaborated with the municipal government, the local middle school, and the high school to implement three different programs. The first aimed to reduce the time secondary students spent commuting to school by providing them with bikes, while the second consisted of an environmental education summer course for high school students. In the last year, we introduced history courses, in which students rewrote the community's history by using primary sources from the community.

Our experience working with local students in the past three years highlighted the shortcomings of the quality of indigenous education. In an effort to improve indigenous education, it is essential to find appropriate pedagogical approaches that will motivate students to engage with what is taught in schools. The traditional Mexican curriculum does not take into account relevant subjects for indigenous communities -- students often study urban problems, for example, instead of the rural ones most relevant to them. What this project did was taking a different approach: all the

topics we covered were based on local problems that can be solved through the use of historic knowledge, research and science.

Activities

Having decided that the environment and history courses would be carried out at the middle school, Genaro V. Vásquez, we first met with the school directors to communicate our vision for the summer courses, which entailed a smaller group of twenty-four students. We asked for the teachers' help in choosing the twenty-four, suggesting that they give their more motivated students the chance to work with us, as well as some students that could benefit from more interactive activities. We divided the students into four groups of six and then devised a four-day schedule by which every group of six would spend the day doing one of our four planned activities: Biology, Chemistry, Mathematics, or Soils. Our goal was to give this group of twenty-four students



an idealistic education: enriching activities aimed at contextualizing classroom learning in order to highlight the applicability of the scientific method and to encourage critical thinking. We had two group members teaching each activity for each group of six students, thus ensuring a nurturing 1:3 teacher-student ratio.

We started every day with a 15 to 20 minute yoga session with the aim of centering the

students' focus on the day's activities. In the Biology course, students were introduced to the concept of bioindicators (species that are sensitive to high levels of pollution whose marked presence or absence can help indicate the quality of an ecosystem) and how they can be used to determine the water quality in the local river in Santo Tomás Ocotepec. They were taught how to collect three types of bioindicators found in the river, and later in the lab they analyzed the samples of about 75-100 organisms in order to determine biodiversity and abundance of bioindicator species in the river's ecosystem. Using these parameters, the students were able to determine that the quality of the river is "good", but not "excellent". From this conclusion, they were asked to think about what they could do to in order make the river quality "excellent", and what needs to be done in order to preserve the river's quality in the face of threats by new contaminants. These same considerations of river preservation were made given the results of the Chemistry course, in which the students were introduced to the scientific method, as well as the concepts of pH, temperature, nitrate concentrations, and levels of dissolved oxygen. They were then

brought to the river and taught how to measure each of the four factors after collecting river samples. The students then compared their results to value tables and chemical concepts to determine the quality of the water. In the Mathematics course, the students measured a given section of the river and, after being introduced to the concepts of velocity and cross-sectional area, were able to calculate the stream discharge, which is the amount of water that flows past a certain point in a given time interval (Carlsen, 2004). In the Soils course, the students went on a 2-hour walking investigation of four different ecosystems with different types of soil within the vicinity of Santo Tomás Ocotepec and were introduced to the different factors involved in soil formation. Given a hypothetical situation in which they were searching for a plot of land on which they could successfully plant maize, students were able to choose wisely between various plots based on the quality of the soil.



In the same vein of providing an education that was particularly relevant to the students of Santo Tomás Ocotepec, the second part of our program consisted of Mixtec history courses aimed at renewing and strengthening students' interest in their own history by teaching them to think and research like historians and anthropologists. Our history classes had at their core the lienzo, or a pre-hispanic canvas painting filled with glyphs, used as a map of Santo Tomás Ocotepec in the 16th c. and recently re-discovered in the community archives. The lienzo is of paramount importance to the community because it is the first written document that makes legal the claim by the people of Santo Tomás to their ancestral lands. Our first history activity involved identifying the sacred sites represented by the glyphs on the map and investigating what the stories behind the places were. We were able to identify a number of the sites on the map and the stories behind them, but there were still a number of glyphs that remained unidentified, so for the second part of our activity we visited Don Melchor, former municipal president of Santo Tomás Ocotepec, who has been doing his own research about and compilation of the community's oral history since 1982. This was meant to be an exercise in historical investigation, so students prepared questions in advance. He was able to answer a great deal of their questions about the remaining unidentified

glyphs, which helped the students see the wealth of stories about their people that had been nearly forgotten, and reinforced how necessary it is for them to seek them out and document them so that they would not be lost forever. For our third activity, we asked the students to go home and seek out a family member who could tell them a story about the origins or history of Santo Tomás Ocotepec and to write down that story. The next day in class, we put together a “Book of Mixtec Knowledge” in which every student contributed a page of the book in which they wrote their family member’s story and made their own glyph to represent the story. Our last activity was a day trip to one of the sacred sites represented by a glyph on the lienzo called Cava Ndosó Ñuu.

We established a valuable partnership with an artists collective from the nearby city of Tlaxiaco called Pelota Mixteca. For the fourth activity, the two of the five founders of the collective came



to Santo Tomás Ocotepec and gave a workshop on painting using traditional Mixtec techniques and materials, which included making the pigments by finely grinding various colored soils and combining them with water and egg yolk. This fit both into our history course, given the emphasis on the long history of painting and its uses, and into our environmental education course, given that

all of the materials used were locally sourced. The biggest contribution of the artists from Pelota Mixteca, Jesús López and Fernando Vargas, was leading the creation of a mural of the lienzo in the secondary school, which students from the entire school participated in. The mural was inaugurated on the day of secondary school students’ graduation, so its main goals of starting a conversation about the lienzo amongst locals of all ages and increasing the visibility of the lienzo in order to cement the importance of learning their history and keeping it alive were accomplished.

In addition to the work done with the middle school, we also gave tutoring sessions in English and mathematics at the IEBO, our original partner organization. These tutoring sessions spanned over a week and a half and helped fill in gaps where students had fallen behind for lack of confidence and/or overcrowding in classrooms. We helped students that failed their Geometry, Pre-Calculus, and English exams. There were two teachers for every 25 students, making it possible to go at most students’ pace and ensuring wider understanding of the material being covered.

Challenges and Successes

Initially, the environmental education and history courses were to be taught to high school students as SLASA had done in previous years, but our plans changed along with the needs of the high school's (IEBO) administration. The administration required our help in tutoring students that had failed their English and mathematics final exams. These tutoring sessions were not initially planned and one of our main challenges was planning these lessons from scratch with little material other than the students' textbooks and handouts.

We decided we should try working with the secondary school, Genaro V. Vásquez, for the summer courses and the administration reciprocated our enthusiasm and showed themselves to be highly interested in establishing a long-term partnership. We reformatted the courses' content so it would be adequate for secondary school students and further restructured it as we navigated timing issues given the schools' different time allocations for each class.

Luckily, we were able to accomplish all of our initial objectives as well as additional ones, such as the high school tutoring classes, the mural, and the traditional painting class. This was made possible through the generous support of Genaro V. Vásquez's administration and Pelota Mixteca.

Questions Raised

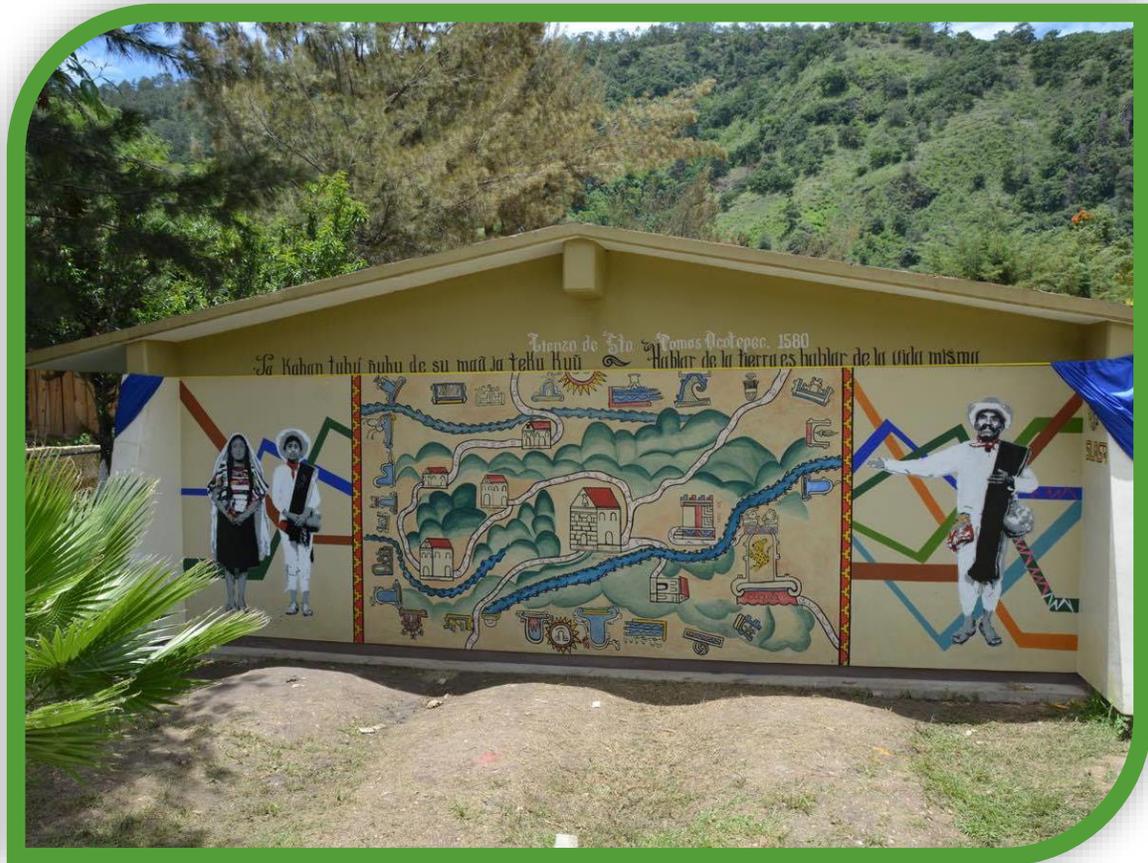
Separating students into smaller groups ensured a more profound learning experience and increased safety during field excursions. As some of the subjects required collecting river samples or conducting experiments with chemicals, having smaller groups of students reduced risks significantly. Smaller groups gave more timid students an opportunity to participate, allowed students to learn from each other, and provided a space for constructive discussions. Combining theory, field excursions, and interactive activities engaged students, raised their curiosity, and allowed them to relate in-class theory to field experiments.

Time constraints forced us to restructure our classes a few times, though these adjustments did not affect the quality of the courses and all students were able to complete the curriculum.

Towards the end of the program we were also affected by the students' exam period. One of our history activities involved interviewing family members to collect stories from Santo Tomás Ocotepec and its surrounding neighbourhoods. However, the activity had to be modified as students were unable to persist in finding community members willing to answer their questions. This was largely due to lack of time, since students had to handle their final exams, their responsibilities at home, and our classes simultaneously.

We had also originally planned to present the "Book of Mixtec Knowledge" to the committee in charge of Communal Goods in hopes of being given the opportunity to show the students the real lienzo. However, since the document is extremely delicate and well-stored in the committee's office, we were ultimately not granted access to the document because we did not have approval from the municipal council. While this was disappointing both for us and for the kids, we were

happy to note that the town was well aware of the importance of the lienzo and was exercising autonomy in carefully deciding who is granted access to this document.



The questions that were raised mainly concern the long-term viability of the summer courses. We would like the project to continue without us and to be incorporated into the school's curriculum, in hopes of eventually including all of the students at the middle school. This year, all teachers were able to attend at least one of our courses and field excursions. The administration also encouraged us to hold a 45-minute presentation of the summer courses' content for all teachers and students that did not participate in said courses. While this certainly was not enough time for these other students to learn the courses' content, it shows the administration's interest in broadening the project and is a small step towards reaching more students and collaborating with the teachers in the following years. At the end of the summer courses, we gave the school detailed lesson plans and all the documents and visual supports used in class. We will continue working with the Genaro V. Vásquez administration and hope that, in the future, local teachers teach the courses and that all students can participate and benefit from the environmental education and history courses' content.

Training and Mentoring

We received the support of Professor Ethelia Ruiz Medrano, from the National Institute of Anthropology and History (INAH). She provided us with a cultural, historical, and political background on the Mixteca Alta and also hosted an on-site workshop to answer all of our questions.

We also counted on the support of Jean-Yves Taranger, who has been working with the community for four years and provided us with invaluable help and mentoring.

Our Faculty Mentor is George McCourt, Senior Faculty Lecturer in the McGill School of Environment. We received feedback, critiques, and ideas from him before departure. We were not in contact with him while on the field since he was on leave. We will debrief with him upon arrival and, with his feedback, improve the summer courses and find more innovative ways to present our class.

What did you learn?

Through this invaluable experience we have learned a great deal about working in a different cultural context, especially one as sensitive as a highly marginalized, Indigenous community, as well as the ins and outs of development work. We learned more about the history and culture of Santo Tomás Ocotepec and received a warm welcome from the community from the first day. It was also an enriching learning experience that highlighted our greatest strengths and weaknesses as we had to respond to various challenges. This experience will guide us as we go forward with our graduate studies and work in the Latin American region, which we are all passionate about.



Community Implications and Further Work

The students are the main beneficiaries of this project: they were actively involved in the project and were exposed to new information and methods in environmental science and history. We hope this knowledge will trickle down and be transferred to the families, future generations of students, and other members of the community, especially if the project is continued by the teachers in upcoming years.

Short Term: We increased the student's motivation in school as well as their interest in scientific subjects and history. We also promoted the love for their land and culture.

Long Term: The activities reinforce several competencies like investigation and analysis. The approach of the environmental education course cements their understanding of biology, chemistry, mathematics, and soils. It provides them with a broader starting point of what science is and how it can be used. In addition, the history course reinforces the uniqueness and value of their Mixtec

background. Ideally, these two combined nurture a desire in students to create environmental conservation and cultural preservation initiatives on their own terms. With these courses and workshops, we intend to counteract the deficiencies in the Indigenous educational system and to find innovative approaches to Indigenous and rural education.

How might your fellowship make a difference for the people you worked with?

The long-term social, economic, and personal gains from education are the key to lifting families out of poverty. Education is the future, as it directly impacts a community's future generation and may open new doors. It does not only impact students, but rather everyone in the community, including family, the municipal authorities, the federal government, and policymakers, amongst others. The parents' council and many members of the community were aware of what we were doing by way of their children, the authorities, or word of mouth. Many were interested in learning more about our project. As education impacts the whole community and most are aware of the shortcomings of rural education, many cared about what we were doing, showed interest, and reacted positively.

Someone outside the community should care as this project could be replicated in other Indigenous rural areas, as long as it is adapted to the local historical and cultural context. We were contacted by neighbouring secondary schools that were interested in working with us. Because of time constraints and our commitment with Genaro V. Vásquez we were unable to, but were happy to see there is widespread interest in what we were doing.

What would the next steps be to translate your findings into policy action?

Being in direct contact with the Secretaría de Educación Pública (SEP), which is responsible for public school programs throughout all of Mexico, would be necessary for any large-scale impact. However, the problem itself stems in part from the SEP and their top-down administration and



generalized curriculum. Therefore, real change would require a grassroots-level initiative by individual communities making changes to the curriculums introduced into their schools by higher governing bodies. This we hope to be a more feasible way of effecting change, given that Indigenous customary law prioritizes local actors as the primary decision-makers for the future of the community. We can already start at the community level by working with other local schools and encouraging administrations to incorporate some of the courses' content into

their own classes. We have already started doing such work with the Genaro V. Vásquez administration. Lasting changes are needed to ensure that higher quality education can be provided in rural Indigenous communities. As education is key to lifting communities out of poverty, it is important to focus on improving it through innovation and community involvement.

Program Evaluation

How did this fellowship further your academic or career goals?

This fellowship has allowed us to observe the inner workings of the Mexican education system and urban-rural inequalities, as well as private-public system inequalities. Many of the issues we observed can be seen not only in Mexico, but also in other Latin American countries. Being exposed to another facet of inequality in Latin America has further awakened our interest in working in the region beyond solely development projects in environmental sciences or cultural preservation.

What did you value most about the fellowship?

We truly value how welcoming the community was. It was wonderful to work with secondary school children for an extended period of time and to count on the generous support and recognition of the school administration and the community's authorities.

Any advice for future fellows?

It is important to come well prepared, having read about the culture and history of the host country and region. That way one can prepare for any broad cultural differences, to maintain respectful attitudes and behaviors towards the host country's cultural norms and values. It is also very important to come with an awareness of all the possible variable factors, in particular key local actors, which will very likely have an impact on the implementation of specific plans. With that in mind, it is vital to come with a flexible mindset that will help navigate whatever obstacle presents itself.

Any suggestions for how to improve the program?

This project was part of a four-year long ongoing partnership between the Spanish and Latin American Student Association (SLASA) and the community of Santo Tomás Ocotepec. The next phase would be meeting with faculty advisors and other fellow students to work on improving the environmental education and history classes. We are very happy with this year's results and are looking forward to seeing the project improve and thrive in the future. Next year, we hope to collaborate with more students, professors and organisations interested in social development in Latin America.

Works Cited:

Carlsen, William S., and Nancy Trautmann. "Protocols: Introduction to Research." *Watershed Dynamics*, Student ed., National Science Teachers Association, 2004, pp. 47–132.