Not your typical study abroad – acid rain, ruins, culture and more

by Deanna Ding, College of Letters & Science

The paint has faded and the surface is crumbling on many Mayan ruins, but these effects aren't just the result of the passage of time. As groups of UWM students are learning first-hand, acid rain is accelerating the normal aging process and putting archaeological treasures at risk throughout Latin America.

Students at Oaxaca

Since 2010 and each year since, the College's Atmospheric Science program has offered *Mexico: Air Pollution and Ancient Cultures* during the UWinteriM term between fall semester and spring semester. Led by a faculty member, students in the course hop a plane for sunny Mexico City shortly after the New Year's holiday.

For two weeks, they travel throughout southern Mexico learning about not just the corrosive effects of acid deposition on the limestone surfaces of archaeological sites, but also aspects of Mesoamerican history and anthropology. This unique blend of the natural sciences and the social sciences is a model not often found in traditional study abroad courses, and having a study abroad class originate out of an atmospheric science program is unprecedented.

Jonathan Kahl, a professor in the atmospheric science program, remembers the day in 2008 when the director of the College's Center for Latin American and Caribbean Studies (CLACS) asked him if he had considered teaching a study abroad course on acid rain and its effects on Mexican ruins. His reflexive answer – "We don't do study abroad in atmospheric sciences" – was quickly challenged by CLACS director Kristin Ruggiero. "Why not?" she queried.

"I'm so thankful Dr. Ruggiero pushed me to think bigger. Why not indeed? I had no defensible argument. It certainly was possible, and I knew it could be tremendously beneficial to the students in our program as well as students in other majors. I began planning how to make this a reality, and, two years later, we were able to offer our first study abroad course," says Kahl.

In the class, open to both atmospheric science majors and non-majors alike, as well as to students attending other colleges and universities, the academic content is delivered via lectures and labs, guided tours of museums and archaeological sites, visits to Mexican universities, and hands-on measurements and analysis. The diverse cultural delights of Mexico, including archaeological sites, cuisine and the arts, also are sampled as much as possible.

Students in the laboratory

Students keep a journal with reflections on related social science issues such as:

- The buildings at Teotihuacan were once vibrantly colored with painted stucco. If their original appearance could be determined via historical accounts, do you think the buildings should be restored to their natural appearance? Why or why not?
- Like all expenditures of limited public funds, funding for archaeological restoration/preservation necessarily means that the expended funds will not be directed toward other public programs. Large projects, such as the excavation and restoration of the huge temples at Palenque, are extremely expensive. Do you feel such expenses of public funds are justified? Why or why not?
- At El Tajín, as at many other archaeological sites in Latin America, there are numerous unexcavated mounds. The natural turf covering of unexcavated mounds protects the artifacts within from the corrosive effects of air pollution and acid rain. New archaeological finds thus present an interesting dilemma. Should they be excavated to reveal their clues about past civilizations? If so, they will begin to deteriorate instantly as they become exposed to air pollutants and acid rain. Or, should they remain unexcavated and protected, at the expense of failing to reveal the secrets within? Can you suggest a solution to this dilemma?

Brad Wells took the class in 2011 as an atmospheric science major. The combination of laboratory science topics and social and cultural discussion was what drew him to the opportunity. "One of the reasons this trip appealed to me so much is that it combined a scientific and cultural experience," he said. Now studying atmospheric science at the graduate level at Colorado State University, he went on to add, "Through a class like this, the understanding that all these different fields of study influence one another becomes apparent. It became clear to me how the desire to understand history requires us to seriously study how air quality effects what is around us and how we can better preserve these ancient monuments. Without historical and cultural context, I feel that students wouldn't be able to grasp the big picture or understand that history, culture and science are intertwined."

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Mary Ghaly

Mary Ghaly also was part of the 2011 class. Currently at GE Healthcare in their Operations Management Leadership Program but at the time a UWM industrial engineering student, Ghaly values the benefits of both the diverse subject matter and the diverse class make-up. "Being in engineering, it was nice to get science credit while also learning about the history and culture of a country. Not only was I able to learn a broader range of topics, but since people on the trip were all coming for different reasons and from different backgrounds, it made for better discussions within the group," she said.

The course begins in a UWM classroom for two days of instruction on the Spanish language and basic science techniques that the students will use to conduct their field experiments. Lectures on the meteorological aspects of acid rain and the environmental corrosion of stone prepare students for what they can expect to see on site.

On the third day, the class travels to Mexico City and Teotihuacan – The City of the Gods – located just outside of the metropolis. Other archaeological sites, including Papantla, Oaxaca, and Palenque, are also are part of the itinerary.

"These sites were selected in order to sample a range of different pre-Hispanic civilizations, as well as diverse climates, site architectures, and archaeological reconstruction and preservation methodologies," explains Kahl. At each site, a tour by a licensed, English-speaking guide provides contextual insight into the history, life and culture of the civilization that once inhabited the site.

The program also includes stops at the National Autonomous University of Mexico in Mexico City and the Autonomous University of Carmen in Ciudad del Carmen, Campeche. Faculty members at these universities actively investigate air pollution and material degradation and graciously provide presentations, hands-on workshops, and campus tours to the UWM class.

On top of the academic value provided by the visits to the Mexican universities, students find the social interaction with Mexican students equally rewarding and beneficial. Students make long-lasting friendships that enable them to better understand their own cultural biases and develop more sophisticated ways of viewing the world.

Reflecting back on his experiences, Wells clearly sees the advantages of these interactions. "I really began to focus more on how both our culture and Mexican culture were related, rather than different," he notes. "There were obviously stark contrasts between the two that caught my attention, but in our day-to-day routine I focused more on how similar we both are. As cliché as it sounds, none of us – U.S. students and Mexican students – were all that different. We all have similar dreams, interests, and worries."

After returning to Milwaukee, the learning continues back on campus. Students apply the HYSPLIT atmospheric trajectory model to determine the possible sources of the contaminants in a rain sample they collect while in Mexico. This lab experiment forms part of the student's grade, along with the journal and a paper on limestone's formation, erosion, and role in pre-Hispanic civilizations.

Students collect rain samples in Mexico

In 2013, the course cost around $3,000, which included tuition, airfare, accommodations, in-country transportation, and some group meals. Students also receive assistance from UWM's Center for International Education preparing their travel documentation and other logistical needs.

Overwhelmingly, participants found the course a true bargain and a phenomenal experience. Ghaly sums it up best. "I value the experiences I had and the lessons I learned on this trip much more than the cost of it. There's no comparison. I'm not going to remember the dollars spent on this trip, but I'll always cherish the memories I've made on it. Those are mine to keep long after the money is spent."