## **Faculty and Staff Travel and Study Abroad Grant**

## **Final Report**

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In February 2013, I was awarded a grant to travel to the Philippines for the purpose of conducting workshops in the field of Green Chemical Education. I was originally invited to give the workshops in the Philippines in October 2013, but I was asked to delay my trip due to major restructuring at the Central Luzon State University in the Philippines. The trip was postponed to June 2014.

In mid-June of this year I traveled from Vancouver to Manila where I was met by three professors, Drs. Cesar Ortinero, Sharon E. Lazaro, and Rhanney L. Gonzales, from the Central Luzon State University. They drove me 5 hours north to the Science City of Munoz where the university is located.

I was invited by the president of the university to give a plenary lecture at their 50th Anniversary conference whose theme was “Environment, Entrepreneurship, Education, Science, Technology and the Arts in the Context of Agricultural Development”. The title of my presentation was “Changing the Colour of Chemistry: Greener Chemical Education”. The conference was 3 days long and during this time I was able to make connections with professors from Thailand, Vietnam, and Japan, as well as other parts of the Philippines. Although this conference was not part of the original reason I went to the Philippines, it certainly gave me the opportunity to extend my ties to international institutions.

After the conference, I held four days of workshops. The first two-day workshop was geared towards training undergraduate instructors and the second two-day workshop was aimed at high school level instruction. The purpose of the workshops was to train instructors in the field of Green Chemical Education. Green Chemistry focuses on replacing traditional chemical processes and practices with substances and methodologies that are more environmentally-benign and non-hazardous to human health. Green Chemical Education aims at introducing Green Chemical Principals into chemistry education curricula. Training chemistry instructors worldwide in the “greening” of their chemistry programs will result in a decrease of the use of toxic chemicals, the elimination of hazardous waste, the minimization of energy consumption, and lower operating costs.

There were 40 workshop attendees who came from various parts of the Philippines. Both workshops followed the same overall outline. There were four 90 min sessions each day. On the first day, students were first introduced to the theory and concepts of green chemistry, the basics of toxicology and life cycle assessment. This was followed by methods of integrating green chemistry into the classroom curriculum and recommendations on implementing green chemistry principles into teaching laboratories. All topics included worksheet handouts that the attendees did themselves during the workshop sessions. These handouts, in addition to an electronic version of classroom materials, were developed for use by the attendees in their own classrooms, for their students. On the second day, we conducted green laboratory experiments using materials that are appropriate for the low budgets of Filipino educational institutions. These experiments included no-waste experiments, low waste, mini-scale experiments, and experiments carried out with common consumer products. A copy of the workshop outline and materials can be made available to the committee, upon request.

The workshops were very well received, as shown by the anonymous evaluations the attendees filled out at the end of the workshops. All the sessions were rated as either very good or excellent, with the majority rating being excellent (original evaluations and comments available to the committee upon request). The only derogatory comment was that there should have been more time. I must admit that I crammed a lot of information into just two days! Most attendees commented that they would definitely incorporate the materials I had taught and given them into their courses. This was a very rewarding comment for me because that was the main goal of the workshops!

Through this experience, I was able to develop strong ties with instructors at three universities in the Philippines. We have kept in communication via email and they are keeping me updated on the progress of the “greening” of their curricula. At the same time, I am also learning some techniques that they have developed as a result of the workshops. These ties will help me in my goal of having a greener chemistry curriculum at VIU and will contribute towards VIU’s commitment towards sustainability.

Since the workshops were sponsored by VIU, all workshop attendees, as well as students at the Central Luzon State University, became familiar with our university. During my stay, I was invited to cultural events, lunches, and dinners and therefore had the opportunity to become well acquainted with professors, instructors and students, as well as the Filipino culture. The Filipino people are tremendously hospitable!

Picture of myself with the attendees of the workshop “Greening Chemistry Education: Integrating green chemistry into our undergraduate chemistry curriculum”, Central Luzon State University, Philippines, June 2014.

