Environmental Education at Cleveland State University: Challenges and Opportunities

An overview of the multidisciplinary approach toward environmental education offered at Cleveland State University.
Staying at least one step ahead of the students perhaps should not be a challenge for a professor, but it has proven to be just that to me for about 30 years now. I had the “traditional” training in graduate school at Drexel University in the 1970s—“sanitary engineering”. When I became a faculty member at Cleveland State University (CSU), they already had someone to teach sanitary engineering, but they needed someone to teach environmental engineering. The new courses that needed to be taught included air pollution abatement, solid waste engineering, hazardous waste engineering, and hazardous site remediation—none of which were offered when I was in graduate school. I knew the basics of environmental engineering, and I had taken extra science courses, which definitely helped, but it was a challenge to stay ahead of the students. Teaching is the best way to learn, as I found out.

In the 1990s, we started to emphasize proactive solutions, rather than end-of-pipe treatment—waste minimization and pollution prevention. What a wonderful concept. I embraced it and had to include it in all of my courses. Then, we needed to deal with the political football known as global warming, greenhouse effect, and eventually climate change. I became more familiar with politics, whether I liked it or not. The most recent adjustment has been to focus upon sustainability and sustainable design. This made the most sense to me—looking at our environmental problems from a systems perspective. In addition to inserting this approach into all of my existing courses, I had to create a new course which focused upon pollution prevention and sustainable design. Now we’re heading in the right direction.

**Multidisciplinary Education**

At CSU, we considered pursuing the creation of an accreditation for an undergraduate environmental engineering program through the Accreditation Board for Engineering and Technology (ABET). Although a lack of enrollment proved to be the major obstacle, we questioned if we could get all of the necessary courses into a four-year program. We concluded that a 4 + 1 program (civil undergraduate plus environmental engineering graduate degree) was a much better way to train future professionals. Other undergraduate degrees have proven to be just as valuable, including chemical engineering and mechanical engineering. Non-engineering degrees can work as well to get into the environmental engineering graduate program, but there is a need to “catch-up” with some of the engineering course materials.

We have a multidisciplinary approach to environmental education at CSU, this is emphasized at the graduate level. Three graduate environment programs (environmental...
engineering, environmental science, and environmental studies) from three different colleges (engineering, science, and urban affairs) cooperate to provide cross-training for students. Students enrolled in one of the programs must take at least one course from each of the other two programs. I teach the environmental technology course to the environmental science and environmental studies students—that is more of a challenge than you might think. Their backgrounds, especially in math and science, are very different. I seek balance. I tell the students that I am not trying to make them all engineers, but to prepare them to participate fully in a project meeting with all three (engineers, scientists, and policy-makers) in the room. That is multidisciplinary diversity—and is much needed to properly address environmental issues today.

We offer a graduate environmental projects course to students of all three programs. One faculty member from each program is co-teaching the course, and we adopt one or more real-world environmental problems as the topic of the semester-long project. Then we mold the teams (each of three-to-five students) to include at least one student from each of the backgrounds and programs. The students submit a written report and present their findings as a team. This is both a challenge and a wonderful opportunity.

Last spring semester, an environmental projects contest was used for the projects. This course was a collaboration with the Northeast Section Ohio Water Environment Association (NESOWEA). Students were given a choice of two contest topics relating to water issues. Both topics—pharmaceutical contaminants in water resource recovery facilities and innovative urban stormwater treatment technologies—represent modern environmental concerns, and promote open-ended systems thinking. Multidisciplinary teams of students approached the problems from a much more holistic perspective than can be afforded by a lecture course.

The combination of addressing a current environmental issue with a multidisciplinary team seems to be an excellent approach.

**Online Education**

CSU is currently undergoing a big push toward online courses. With engineering, the graduate courses seem more amenable to the online approach because much of the “hands-on” aspects have been included in their undergraduate training. I am currently developing an online course in air pollution abatement. It is my experience that engineering faculty rarely have a formal background in education (I simply imitated my favorite engineering professors), but the additional educational requirements of an online course provide quite the challenge. Faculty are now being offered a course in how to prepare and teach online. I took such a course last summer, and there was more to learn than I expected.

There is a trend toward the student convenience of an online curriculum, and the competition between universities for the online student is very real. Environmental educational has quite ways to go before a full program could be offered, but we have started moving in that direction.

**Extracurricular Activities**

There are some very good environmental contests available for students to compete, internationally as well as locally. Entry to those contests seem to work best as part of a CSU student organization, and provides a faculty advisor as part of the requirement for official student groups.

We are also combining some of these contest activities with the required Senior Design Project, which is not so difficult given the well-organized and detailed design requirements of some contests. Having the project leaders in the related senior design group adds another layer of commitment—a
grade hinges on their effort. Although their grade does not depend on a contest prize, the quality of effort usually rises with the overlap of a senior design project.

The CSU Student Chapter of A&WMA is planning to compete in the 2019 Waste-management Education Research Consortium (WERC) (https://iee.nmsu.edu/) environmental design contest. This contest allows both graduate and undergraduate students to participate. This past year, one of the contest tasks was to develop a stack-testing drone, equipped with appropriate sensors to measure emission of particulate matter and volatile organic compounds. This project also qualified as an Internet of Things project. The students on this team were a diverse group, and included undergraduate civil engineering students, graduate environmental engineering students, as well as students with a chemical engineering bachelor’s degree, and undergraduate students in the computer engineering and mechanical engineering programs.

I strongly encourage my students to become active in their student organizations of interest, and compete in these contests if at all possible. The experiences are incredibly valuable. So my students and I remain challenged, and the opportunities to learn and grow are exponentially magnified by the level of the challenges.

To learn more about the environmental education offerings at Cleveland State University, go to https://www.csuohio.edu/.