An overview of the challenges facing environmental education and training, associated with environmental education accreditation, distance learning, ethics, entrepreneurship, environmental engineering curriculum, sustainability, and outreach.
Environmental education has grown out of traditional engineering disciplines. U.S. graduate-level programs were first introduced in the late 1960s and early 1970s. Environmental programs are now offered at the bachelor’s, master’s, and doctoral levels around the globe. At present, there are 75 Accreditation Board for Engineering and Technology Inc. (ABET)-accredited undergraduate environmental engineering programs and four master’s programs being offered in the United States.

The U.S. Bureau of Labor Statistics projects an 8-percent growth in employment for environmental engineers from 2016 to 2026. Moreover, employed environmental engineers continue to retire at a rapid pace in the public sector. Clearly, the demand for environmental engineers will continue in industry, consulting, and government to fill new openings and to replace retiring professionals.

This issue of EM focuses on the challenges facing environmental education. After reading this issue, one will notice that the environmental education, training, and outreach are interrelated activities. One of the challenges is how do we meet a growing demand for environmental engineers in a rapidly growing economy. The first article by Dr. Sudarshan Kurwadkar, Associate Professor in the Department of Civil and Environmental Engineering at California State University (CSU), discusses the online education opportunities in environmental engineering offered at CSU. The program provides training at the Master’s of Science in Environmental Engineering (MSEnvE) level to meet the demands for environmental professionals in California.

Another challenge is to make sure that environmental graduates are aware of the global impact of their proposed solutions. The University of South Florida (USF) offers an International Development Engineering Program that has so far graduated more than 120 master’s and doctoral students, and focuses on global competency of its graduates. In our second article by Drs. James R. Mihelcic and Maya A. Trotz, both with the Department of Civil and Environmental Engineering at USF, we learn about how environmental engineering students participate in this multipronged approach to building global competency by experiencing firsthand extremely economically challenged communities without access to clean air, improved sanitation, shelter, and safe drinking water, and working with decision-makers to find sustainable solutions.

Environmental education at both the undergraduate and graduate levels at Cleveland State University is the focus of the third article by Dr. Walter M. Kocher, Associate Professor of Civil and Environmental Engineering. The article discusses the changes made over the past four decades in offering environmental education courses and the multidisciplinary approach toward offering’s used at the graduate level.

On the following pages, you will also find information on current environmental outreach initiatives: a student design competition launched by the Ohio Water Environment Association, a partnership between Citizens Energy Group and Indiana universities, and A&WMA’s own annual Environmental Challenge International (ECI) Competition. These examples show the importance of outreach activities to engage current students and to attract future environmental professionals. We hope you enjoy learning more about environmental education in this issue. em

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OWEA's Student Design Competition

In 2017, the Ohio Water Environment Association (OWEA) launched a student design competition, modeled after the Water Environment Federation’s Annual Student Design Competition. (https://www.wef.org/membership/students-and-young-professionals2/student-design/) The purpose of this competition is to promote real-world design experience for students interested in pursuing an education and/or career in water and environmental science and engineering. In addition to gaining real-world design experience, the student design competition provides numerous networking opportunities with young and experienced water professionals in the industry. The judging panel for the competition consists of experts from government and engineering consulting in the water industry.

The inaugural competition was held on April 28, 2017, at Cleveland State University, where three student teams competed and presented their ideas on wastewater and stormwater topics in Northeast Ohio. Young Professionals from OWEA advised the students throughout the process by providing input and feedback on the projects. The judging panel selected Saisantosh Vamshi Harsha Madiraju, Nikitha Shamirpet, Rutambara Sonawane and Venkatesh Kummarakunta, graduate students from Cleveland State University as winners of the 2017 Student Design Competition. The winning team—Saisantosh Vamshi Harsha Madiraju, Nikitha Shamirpet, Rutambara Sonawane, and Venkatesh Kummarakunta, all graduate students from Cleveland State University—presented on “Enhanced Phosphorus Removal to Reduce Algal Blooms in Lake Erie”. The students performed a windshield survey of an agricultural farm in Northwest Ohio to understand runoff discharge from the farm to a nearby stream. The competition was proven a great success and was selected to become an annual event.

The 2018 Student Design Competition was held on April 27, 2018, at Cleveland State University, where seven teams presented their innovative ideas on water safety to a panel of judges from OWEA. Students from Cleveland State University and Case Western Reserve University participated in the student design competition. As part of the competition, the students had the opportunity to visit the City of Solon’s Water Reclamation Facility to better understand the wastewater treatment process and design an optimal treatment process that addresses pharmaceutical constituents. The judging panel selected Aaron Mann, Madeleine Harris, Nicholas Merchant-Wells and William Worsham from Case Western Reserve University as the winners of the 2018 Student Design Competition. The winning team—Aaron Mann, Madeleine Harris, Nicholas Merchant-Wells, and William Worsham, all from Case Western Reserve University—presented on “Please Do Not Feed Medicate the Fish: Pharmaceuticals in WRRF Effluent”. The 2018 Student Design Competition winning team received plaques and award certificates. In addition, all participating students received a free one-year OWEA membership. The winning team also received an all-expense-paid trip to the One Water Ohio Conference in Columbus in August to present their paper. The students had the opportunity to network with water professionals, learn about career opportunities in the industry, and attend various technical sessions on leading water and wastewater topics.
Citizens Energy Group, a broad-based utility service company providing natural gas, thermal energy, water, and wastewater services to about 800,000 people and thousands of businesses in the Indianapolis area, launched its Partnership for Excellence in Research and Learning (PERL) program in 2016 as a means to collaborate with the many talent-rich and internationally recognized universities in Indiana.

The PERL concept was identified by Citizens in 2013 to address the need for extraordinary talent to support long-term business success. Citizens had occasionally partnered with universities in the past for research and learning opportunities; the creation of PERL formalized those relationships and is a more expansive, proactive, collaborative and strategic partnership effort.

To date, PERL has established formal relationships with seven universities in Indiana; facilitated 19 internships; hosted 50 student-participation events; executed 48 collaborations; and engaged more than 1,800 Indiana college students. Those collaborations have also connected Citizens with key universities in other ways, including providing valuable technical resources on cutting-edge issues such as water and air modeling, virtual reality and sustainability concepts.

In addition, PERL has assisted partners in securing millions of dollars in grants, enabling the institutions to spur progress in areas such as sustainability, public health and energy efficiency, among many others.

Get Your Hands Dirty

Students participating in the program engage with PERL in a number of ways, including internships and projects.

PERL’s intern program is robust, experiencing a recent 400 percent increase in intern applications compared to past years that is attributable to strong relationships built through the program. Interns have cross-functional opportunities to serve Citizens departments, including Environmental, Operations, Finance, Corporate Affairs, Gas, Safety and Plant Engineering. The company has even hired recent PERL interns as professional staff in leadership roles.

Projects have included conducting a water treatment plant energy-efficiency audit; designing pumps for a water reservoir in a quarry; exploring options for chilled water thermal energy storage; crafting a wastewater plant expansion design; executing a pump predictive maintenance study; and completing a water residuals testing project. Many have resulted in practical solutions to real problems and presented opportunities for cost savings.

Water for the People

In February 2018, a team of five University of Indianapolis R.B. Annis School of Engineering students presented a prototype of a “water wagon” to be used by Citizens as a way to provide safe, reliable drinking water to the community at public events while supporting its commitment to sustainability by reducing the number of plastic water bottles used and disposed at such events.

Citizens had discussed for several years the possibility of constructing a water wagon, but it wasn’t until the PERL project came about that it became a reality.

The prototype was the product of 10 weeks of planning, design, and testing by the students, who were guided through the project by university faculty and staff. The team operated on the timeline and budget set forth in the project charter, documenting processes, expenditures and challenges they faced along the way, much like they would in a professional engineering role. After 10 weeks of hard work and dedication, the team delivered an on-time, under-budget water wagon prototype.

What resulted from this PERL collaboration was a potentially useable product that could both benefit the community and fulfill a longtime Citizens goal. It was the ideal partnership.

Moving Forward

PERL is a model of an innovative program that has led to real-world opportunities with real-world results for the utility industry, university students, and academic experts. As the program continues to grow and the number of partnerships increases, Citizens remains committed to forming collaborative, mutually beneficial relationships in Indianapolis and throughout the state that also help promote a more sustainable workforce within the Indianapolis region.
A&WMA's ECi Student Competition

A&WMA's Environmental Challenge International (ECi) program is a student team competition to prepare and present an optimal solution to a complex “true-to-life” environmental problem, held annually in conjunction with A&WMA's Annual Conference & Exhibition. The problem is typically a hot environmental topic, representative of the location of the conference, and requires multi-disciplinary approaches for success. The challenge seeks not only technical and scientific analyses, but solutions that are presented in conjunction with the development of appropriate regulatory approaches and resolution of political and community issues.

The goals of the ECi are to:

• involve students in A&WMA's Annual Conference & Exhibition;
• provide experience in solving complex environmental situations in a fun and supportive atmosphere;
• provide students with an opportunity to display their talents; and
• be a premier networking event for students to connect with internship and job opportunities.

The ECi is designed to promote formation of student teams with the broadest feasible range of environmental disciplines, including engineering, planning, policy, economics, and various other sciences. Teams are expected to research the problem background, as well as the technical, social, economic, and political aspects of the given situation. Teams must also stay apprised of ongoing events related to the problem adjusting their solutions appropriately leading up to and during the conference.

Although winning solutions to the proposed problem must have sound engineering and technical bases, the solution does not require a full engineering design presentation. Similarly, all problems pose economic and political issues that must be addressed. Solutions are expected to provide reasonable resolutions applying basic engineering and scientific knowledge to research scenarios and critical questions.

A team of three students from Western University—Jeffery Pratt, Liam Moser, and Jade Shallcrass—won first place in the 2018 ECi Competition in Hartford, CT, for their team recommendations for the fictional Connecticut University Campus Alliance Network on appropriate options for the expansion of campus electric power requirements.

Look for information on the 2019 ECi Competition to be held in conjunction with A&WMA's Annual Conference & Exhibition in Quebec City, Quebec, June 25–28, 2019, to be posted on the Annual Conference website. (https://www.awma.org/ace2019)