

EDITORIAL

ENVIRONMENTAL ENGINEERING PROFESSIONALS NEEDED FOR EDUCATIONAL OUTREACH

In two recent Forum Articles published in the *Journal of Environmental Engineering*, Silverstein and Glass [124(7); 581–583] and Tumeo [125(4); 304–305] identify the problems of limited diversity in our work force and propose several solutions to make the field of environmental engineering more representative of our diverse population. One issue that was raised several times in these Forum Articles is the need to educate our general population, with a specific focus on children, about the nature of our profession. Young people, especially women and minorities, need to have an opportunity to learn about engineering as a profession. Too often, children's limited perception of engineers depicts a nerd or geek who spends his days on a computer or drafting board. Studies of the career choices of young women show that an increased number of girls choose engineering when they understand its broad range of work opportunities and its relevance to our society.

Engineering is introduced to middle school students in New York State in a mandatory technology class. In our experience, these classes focus on building things, with model rockets and cars propelled by a variety of power sources being common activities. Although these classes tend to be very popular with students due to their emphasis on hands-on-activities, they generally do not incorporate aspects of environmental engineering, nor do they really teach students the value of engineering activities. Thus, while many young women gain experience with design and construction during their technology course, they rarely continue to practice these skills outside the confines of the technology classroom.

As professionals, if we want to increase the number of young people interested in environmental engineering, and especially to increase the percentage of minorities and women in our profession, it is up to us to become involved with K–12 education. Students, especially at the middle school level, need to understand the nature of the work we do and its relevance in their communities and daily lives. In today's world, the availability of clean water and air and the management of solid or hazardous waste are often taken for granted. Neither the general public nor young people appreciate the efforts of environmental engineers in maintaining the quality of our environment. Any effort to increase awareness of our professional roles can only help to increase the numbers of students interested in our profession.

Educational outreach has become a buzzword in Congress and research funding agencies. The director at NSF, Dr. Rita Colwell, has made education at K–12 levels a primary initiative for NSF. (See, for example, her testimony to the House Science Committee, April 28, 1999; http://www.nsf.gov/od/lpa/congress/106/rc90428k_12edu.htm.) She recognizes the need to improve science, math, and engineering education at the K–12 level in order to maintain an adequate and diverse workforce in these fields. She also values the role that professionals in industry and academia can play in education through direct interaction with students and teachers. Because of her initiatives and those in other funding agencies, most notably NASA, educational outreach is now an expected component of many large research grants.

There is a wide range of possible roles we can play in educational outreach. Volunteering time in the classroom or with a scouting troop is the most direct approach. These efforts require the enthusiasm of school administrators and teachers as well as well-planned activities to highlight the value of our profession. Attending one class with a slide show and a discussion of your job is a good start. Expanding your visit to include hands-on activities that illustrate science concepts relevant to environmental engineering is even better. In either case, educational outreach

takes time and repeated contact with students to be most effective.

Finding resources to plan hands-on activities is becoming easy with the World Wide Web. Most professional societies have web pages with activities developed for promoting their industry. The National Science Foundation and teacher organizations also provide a wealth of possible projects. Some examples of materials that can be used in educational outreach programs include:

- Cornell Waste Management Institute has developed numerous in-class activities exploring solid waste and solid waste reduction (<http://www.cfe.cornell.edu/wmi/TrashGoesToSchool/TrashIntro.html>).
- FACETS (Foundations and Challenges to Encourage Technology-Based Science) is a middle school integrated science program, developed by the Education Division of the American Chemical Society with funding from the National Science Foundation. FACETS consists of 24 three-week modules for grades six, seven, and eight, one of which is "Cleaning Water." Students learn the science concepts that they need to know as they investigate this topic (<http://www.acs.org/education/curriculum/facets.html>).
- The Air & Waste Management Association has developed a series of environmental management modules that includes instruction guides, hands-on activities, and multimedia presentations. Modules include non-point source pollution, air quality, ozone, and solid waste management (<http://www.awma.org/awma/educate/educate.htm>).
- The Water Environment Federation has produced numerous videos and booklets to explain wastewater treatment and biosolids management to students and the public (<http://www.wef.org/PublicInfo/index.htm>).
- The Southeast Michigan Math-Science Coalition includes hands-on activities in many areas, including several related to environmental science and engineering (air pollution control, acid rain, contaminated drinking water, glass recycling, the greenhouse effect, making freshwater from seawater, cleaning oil spills, and understanding ground water) (<http://www.eecs.umich.edu/mathscience/mainpage.html>).
- The Advanced Technology Environmental Education Center provides a clearinghouse of classroom activities that have been submitted by educators from around the country. Many topics in environmental science and engineering are included (<http://ateec.eiccd.cc.ia.us/activity.html>).

Many of the activities for school children involve clean water or solid waste issues. Children can grasp the importance of these topics in their lives and community. The Cornell Cooperative Extension Service, for example, has a wide range of solid waste activities. Kids understand garbage generation, but rarely have a concept of the engineering solutions involved with recycling or disposal after it is picked up from the curb. Activities available through the Cornell web site include a number of options, from sorting through trash, to determining degradation rates of materials in their trash. These hands-on activities are geared toward making students aware of their potential impact on the environment and finding solutions for reducing this impact, thereby promoting opportunities for environmental engineering as a career.

So please get involved. Contact your local school principal to find an appropriate class, get your company or professional group to adopt the class, and increase the students' awareness of their opportunities to get involved in environmental engineering and make a difference in their community.

Susan E. Powers
Associate Editor