

The State of Post-Graduate Environmental Education in the United States

by **Ashok Kumar**

A brief overview of U.S. post-graduate environmental education programs as they have evolved over the past 50 years.

Ashok Kumar is a professor and chair of the Department of Civil Engineering at the University of Toledo, OH. E-mail: ashok.kumar@utoledo.edu.



Increasing concerns related to environmental problems have led to the expansion of education programs in the fields of traditional science, engineering, and technology. Over the past 50 years or so, environmental problems have become more complicated with the gradual evolution of local problems becoming a cause for concern at the national and even global levels. An integrated multimedia approach that includes air, water, land, and society components is essential to finding the solutions to existing environmental pollution problems.

The current emphasis of regulatory agencies is to prevent pollution problems rather than merely controlling them. In view of the population growth and awareness on environmental degradation, environmental agencies are considering the development of new stringent laws and regulations in the areas of clean air and groundwater contamination, thereby increasing the opportunities for employment in the environmental fields. Environmental engineering programs provide graduates with limitless opportunities.¹

The 2012-2013 job outlook report from the U.S. Bureau of Labor Statistics² indicated that the employment of environmental scientists, engineers, and specialists is expected to increase by more than 20% over the next decade. Job growth is likely to be the strongest in private consulting firms. Science and engineering programs at U.S. universities

have responded to these changes by offering a variety of curricula. For example, many schools now offer online programs at the master's degree level.

This article provides an overview of the post-graduate environmental education programs that have evolved over the past 50 years in the United States. These programs can be grouped under three categories: environmental engineering, environmental science, and environmental health.

Environmental Engineering Programs

Environmental engineering has grown out of traditional engineering disciplines (civil, chemical, and mechanical). Programs offered in the late 1960s and early 1970s were initiated at the graduate level. The Web site maintained by the Association of Environmental Engineering and Science Professors (AEESP) lists more than 100 science and engineering programs at both the master's and doctoral levels.³ Detailed information on the admission requirements, degree requirements, courses offered, students enrolled, students graduated, and faculty for each of the 100 environmental programs is available via the AEESP Web site.³

Engineering schools typically offer the following graduate degree programs:

- Master's program in traditional engineering disciplines with a major in environmental engineering

- Master's program in environmental engineering
- Doctoral program

The master's programs in engineering science are also available for students pursuing a traditional science degree.

Graduate programs are generally housed in civil and/or environmental engineering departments. Other departments associated with environmental education are chemical and agricultural engineering. There are 59 undergraduate and five graduate programs accredited in environmental engineering by the Accreditation Board for Engineering and Technology (ABET).⁴ The five accredited master's programs are offered at The University of Arkansas, Fayetteville; the University of Cincinnati; the Texas Tech University, Lubbock; the Air Force Institute of Technology, Wright-Patterson Air Force Base; and the Manhattan College, Riverdale. It would appear there is low interest among graduate schools to receive accreditation of their programs by the ABET.

Environmental Health Programs

Environmental health programs deal with air quality, water and noise pollution, toxic substances and pesticides, communicable disease outbreaks, food outbreaks, severe acute respiratory syndrome (SARS), bio/agro-terrorism, environmental catastrophes, and healthy homes. The graduates are trained to recognize and ensure safe food, water, air quality, and sanitary conditions. Currently, there are seven environmental health graduate degree programs accredited by the National Environmental Health Science and Protection Accreditation Council (EHAC).⁵ However, the Web site www.graduateschools.com lists more than 100 programs related to occupational health/hygiene.

Environmental Science Programs

Environmental science programs are offered in academic departments related to physical sciences, earth sciences, and environmental science/studies. These programs cover the processes and principles of the environment. The Web site www.graduateschools.com provides a comprehensive listing of environmental programs all over the world. Plenty of graduate programs are available throughout the United States. The students graduating from these programs often are being hired by environmental consulting firms to work on projects related to ecological impact, environmental impact assessment, hazardous waste, remediation, and other related areas.

Curriculum Content of Graduate Programs

Environmental engineering graduate programs incorporate engineering analysis (mathematics and applied statistics) courses, core courses in environmental engineering, elective courses in a specialized area, and a thesis or a project. Core courses and elective courses cover both engineering science and engineering design aspects of environmental engineering. Some schools accept course work in lieu of a thesis or a project from practicing engineers. The exact distribution of courses varies from one school to another.

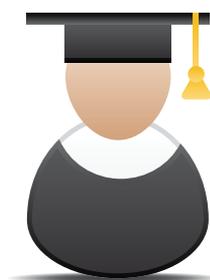
A thesis or a project is an important component of graduate education. A thesis/project requires students to carry out literature review, define a problem, solve the problem, and prepare and present the solution to a committee of faculty members. The student has an opportunity to work closely with a faculty member while working on a thesis/project. Approximately one-third of graduate schools provide an option for replacing the thesis requirement by a project or course work.

Doctoral programs require course work and a dissertation leading to substantial contribution in one of the areas of environmental engineering. The amount of course work varies from school to school, and the students are normally required to take a comprehensive examination after completing the course work.

Environmental science and environmental health graduate programs also have a similar structure to engineering programs. However, course-only programs are available at the master's level for working professionals.

Continuing Education

Constant changes in regulations and technology necessitate regular updates and refresher courses for environmental graduates. Therefore, continuing education courses are offered throughout the country by professional associations, private organizations, and universities. Courses are available in virtually all the environmental-related topics. The frequency depends on demand. Continuing education programs have also become a means to train science and engineering professionals in traditional areas for environmental jobs. Development of continuing education programs helps university professors to introduce new courses at their schools.



A master's degree has become an entry-level degree for many jobs in the environmental field.

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Funding

Back in the 1970s and 1980s, the U.S. Environmental Protection Agency (EPA) provided air and water training grants for graduate students. Other mechanisms for supporting graduate students are through research grants and teaching assistantships. Research funds are available from EPA, the U.S. Department of Energy, National Science Foundation, National Institute of Health, National Oceanic and Atmospheric Administration, industries, and private foundations.

Summary

Education programs are constantly changing in response to the emphasis placed on environmental regulations and the availability of research funds. There is no agreement on uniform course content among U.S. universities. The future of environmental education is bright. During the past

50 years, a number of changes have been observed in graduate education programs that considered the integration of the research disciplines to develop comprehensive environmental programs. These programs emphasize multimedia approach (air, land, water and society components) to solving environmental problems. The current emphasis is on the inclusion of inputs from other disciplines such as sustainability, risk assessment, risk management, toxicology, and epidemiology. Topics such as acid rain, climate changes, air toxics, and ozone pollution are also considered in solving design problems. A master's degree has become an entry-level degree for many jobs in the environmental field. Specialization is provided at the doctoral level. Breadth and depth in curricula will be an issue that will be debated in universities, as well as in industrial organizations, for years to come. **em**

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