2006-1705: RECRUITING FOR THE ENVIRONMENTAL ENGINEERING PROFESSION: IMPROVING THE IMAGE OF THE DISCIPLINE

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Recruiting for the Environmental Engineering Profession: Improving the Image of the Discipline

Making a career field recommendation? According to the McKinsey Global Institute "engineering still looks like a winning profession for Americans."[1] This opinion is supported by the National Association of Colleges and Employers in their 2006 Job Outlook report that identified employers were most interested in applicants with business, engineering and computer-related skills.[2] Of the engineering disciplines, environmental engineering is one of the fastest-growing with a future international growth rate (in terms of annual investment growth) at somewhere between 12 and 15%."[3] The United States Bureau of Statistics reports the "employment of environmental engineers is expected to increase much faster than the average for all occupations through 2014."[4] Forecasts such as these paint a rosy picture for the engineering profession as a whole and environmental engineers in particular.

Despite the current strong market for engineering professionals, the supply of engineering graduates ready to assume these positions is questionable. Part of the problem is that the educational enrollment cycle lags behind the driving employment opportunity cycle. A May 2002 Engineering Trend report recognized that a push by industry that began in 1993 to shore up the number of engineering graduates resulted in an excess supply of engineering majors (Figure 1).[5] In recognition of this excess supply of graduates, Engineering Trends in 2004 predicted a decline in engineering enrollments starting in academic year 2005.[6] The depression in the engineering job market though was relatively short lived. In a study prepared by Sir James Hamilton, the number of available engineers worldwide falls short of demand not only in the United States but also in the United Kingdom, Germany, and most Western Countries.[7]

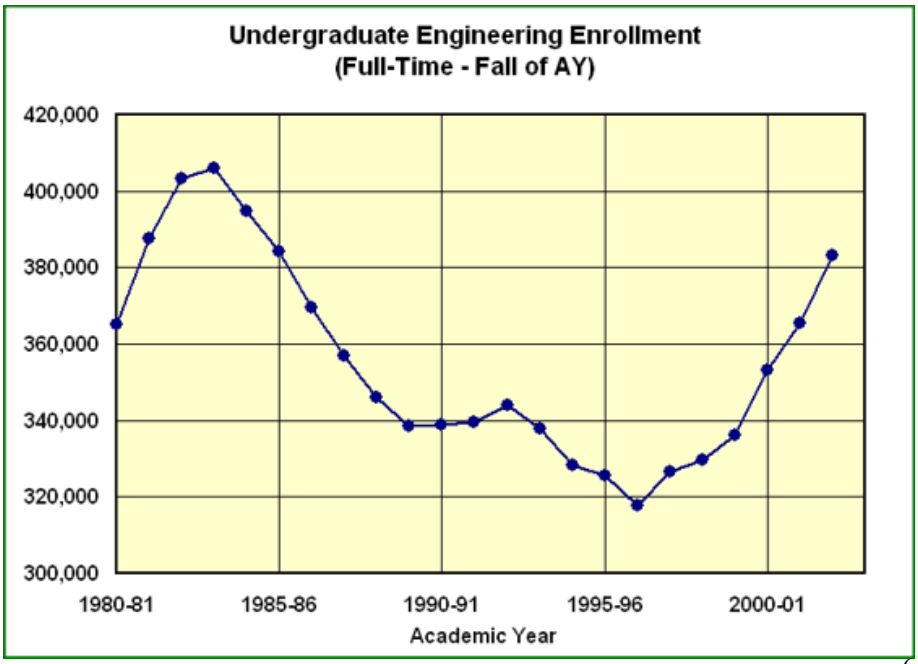

Figure 1. Engineering Trends Undergraduate Engineering Enrollment[6]

Every engineering discipline did not see the increase of enrollments experienced during the mid-nineties (Figure 2).[8] As the figure shows declining enrollments in environmental engineering lasted longer than those experienced by other engineering disciplines. An American Society of Engineering Educators 2002 report identified that U.S. environmental engineering enrollments declined by around forty-four percent between 1997 and 2001.[9] This shortage in environmental engineering undergraduate enrollments exists both domestically and internationally.[10,11,12]

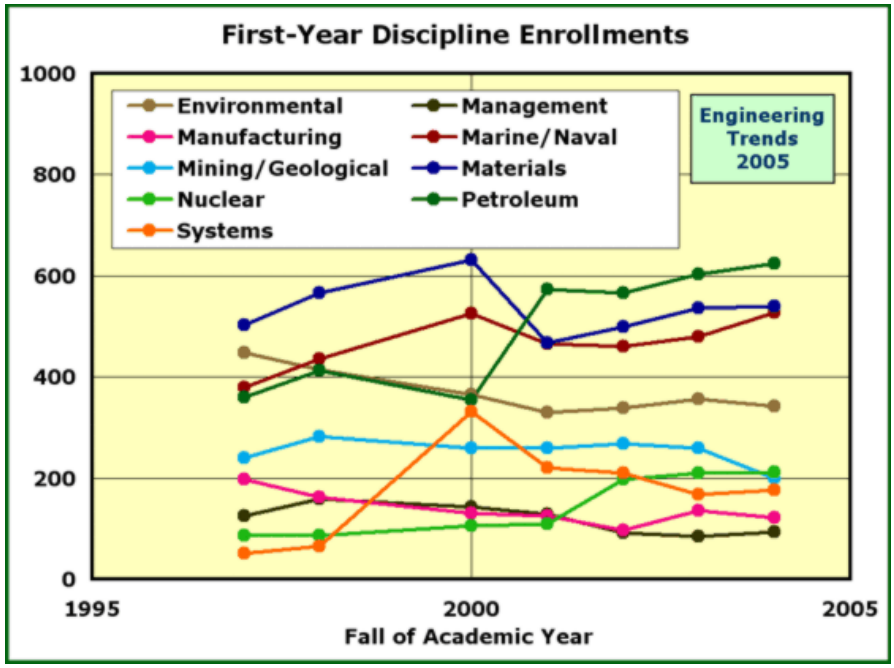

Figure 2. First Year Enrollment Trends for Smaller Engineering Disciplines[8]

What factors potentially contribute to the decline in environmental engineering enrollments and what recommendations can be offered to stop this downward spiral? A Massachusetts Institute of Technology enrollment study prepared in 2002 identified several key issues that affected how undergraduate students selected a major. Two of the major motivators were job market concerns and the image of the engineering discipline. Given that enrollments do not reflect job opportunities, the role that image has on enrollments in the environmental engineering major is worth exploring.[9]

The general image that something presents to the public is in part the picture that comes to mind framed by its definition. The environmental engineering discipline does not have a uniformly accepted definition. In one sense an argument could be made that this permits maximum flexibility in describing the profession to others. In another sense, as long as the inclusion of the term "environmental" remains popular for advertisement purposes, the lack of a common definition "allows everyone who works on environmental problems to call themselves an environmental engineer.'"[12] It is common to find biologists, chemists, chemical engineers, civil engineers, and other types purporting to be environmental engineers or scientists.[13] What is the reluctance for individuals to adopt a single definition? Participants in a workshop on the evolution of environmental engineering felt that part of the problem was that other engineering disciplines have established fundamental principles and core knowledge that define them while environmental engineering still tended to be defined by the types of problems worked by

environmental engineers.[14] Another explanation is that environmental engineering roots and specialty areas within the discipline are many. Multiple feeder disciplines combined with so many specialty areas within the environmental engineering field makes a common definition hard to formulate.[15] Using a University of Dayton survey of engineering students in the departments of chemical engineering and the department of civil and environmental engineering as an example, 48% of students surveyed did not understand what environmental engineering entailed.[16] If a student doesn't understand what environmental engineering is then having a good image of it and wanting to pursue it as a profession is unlikely.

Part of an engineering discipline's image also comes from the professional society that represents it. Major U.S. engineering societies are the only voices that can effectively take on the task of working to protect the interests of the engineering profession.[17] Environmental engineering is represented by multiple small organizations focusing primarily on specialized niches. With the absence of a primary engineering society to provide identity, it is not uncommon for a person affiliated with environmental engineering to be a member of multiple professional organizations. Examples of some of the many professional organizations attractive to environmental engineers include the American Society of Civil Engineers, the American Institute of Chemical Engineers, the American Society of Mechanical Engineers, the American Chemical Society, the American Water Works Association, and the Air and Waste Management Association. The first in this list are major disciplines with environmental engineering as a sub discipline or specialty area while the latter are unique organizations representing different aspects of environmental engineering. The environmental engineering image end ups being splintered out without a unified voice that speaks for the entire profession to address relevant issues (such are recruiting and education) or bargain with external agencies or organizations.[14]

Another part in shaping an image is a discipline's visibility to the general public. Examples of how engineering disciplines can gain public visibility include the children's toy "Bob the Builder" and television series like the Discovery Channel's Mega Machines or the National Geographic Channel's Megastructures. "Unlike most engineering disciplines, environmental engineers are not normally producing a product that can be sold or easily seen."[18] This is not to say that public and K-12 education has not been successful in raising environmental awareness. This awareness though has not translated in to a recognition of environmental engineering as the method by which solutions to environmental issues are formulated.[19] The absence of a good environmental engineering "show and tell" tool creates a weakness in attempts to create an image by which to explain and generate excitement in this discipline among young students.[12]

A positive image isn't any easier to portray based on how environmental engineering programs and curriculum are structured. There are basically three schools of thought on how environmental engineering education should be administered. The first says that students should have a strong background in a discipline like civil or chemical engineering followed by study in specialized topics in environmental engineering. A second acknowledges the fact that environmental engineering is very multidisciplinary and recommends that environmental engineering be taught by an "interdisciplinary committee or center" to concentrate the right combination of faculty with appropriate credentials and backgrounds to support a given curriculum. A third recommends that environmental engineering be a administered as a stand alone program in a separate department.[16] Multiple approaches to program structure by various

colleges and universities create an unnecessary burden for someone contemplating selecting environmental engineering as a major. Would this multi-faced image devalue the major and hence reduce the number of student enrollments?

Collectively these examples show why a poor environmental engineering image exists despite a positive employment outlook for the discipline. A negative or blank image about environmental engineering can inhibit excitement and interest in the major by students beginning their undergraduate education. Different recommendations have been offered and tried by those who are concerned about the vitality of the environmental engineering discipline. Disunited actions though will not result in long lasting results. Missing is the formulation and execution of a master plan run by a professional society and backed by practitioners, researchers, and academia. Components of an image enhancing master plan are identified below.

Professionals now practicing environmental engineering who have roots in other engineering disciplines should stand behind environmental engineering as their primary discipline and stop viewing it as a sub-discipline or specialty area. Environmental engineering needs its own identity. What will help is that "there is a growing number of graduates who will consider environmental engineering to be their primary discipline rather than a specialty area within another engineering discipline as time goes on.[14] The idea is to not isolate environmental engineering from cooperation with other disciplines but rather remove the blur of professional responsibility that now exists among them.

In addition to societies that are specific to their area of expertise, environmental engineers should also put their support and financial backing behind a professional society that represents the discipline as a whole. The American Academy of Environmental Engineers has already begun implementing recommended changes to their organization to be this all inclusive professional society.[20] Will such an organization be supported by other societies? If the American Institute of Chemical Engineers is any indicator, the answer is yes. In their own words "we at the Environmental Division of AIChE should not be threatened by the potential formation of an environmental engineering association (whatever form it may take). We should be fully engaged in the endeavor so as to ensure that the best interests of the AIChE and the Environmental Division are served."[21] It is now incumbent on other organizations to support this initiative and work to build it stronger.

The unifying professional society should propose both a succinct and detailed definition for environmental engineering that is unique and inclusive enough to capture what all recognized environmental engineers do while separating out those activities that should rightfully be seen as sub-specialties of other engineering disciplines. This definition should be holistic and include sustainability[10] as well as societal, legal, natural, and financial aspects[22] because environmental engineering practice requires competence in all these areas.

Academia should take this definition and along with the Accreditation Board of Engineering and Technology and the National Council of Examiners for Engineering and Surveying reassess what should be component criteria in accrediting environmental programs and granting of professional licensure. Simultaneously these organizations should take steps in removing these criteria that uniquely define environmental engineering from assessment of other disciplines for licensure or

accreditation. Doing so would also aid in identifying a single school of thought on how environmental engineering education should be supported and structured.

Environmental engineers should continue to be involved in K-12 education to stimulate an interest in engineering and overcome problems that steer students away from engineering.[23] Participation in and results from efforts such as Engineers without Borders should be better advertised to the public. Perhaps even a Discovery Channel series touting how environmental engineers are sustaining the environment and human quality of life. These positive media blurbs can contribute to a better understanding of the role environmental engineers fill and the image they portray.

Environmental engineering as a profession will never be without work. One could argue that if other engineering disciplines were more environmentally conscious the need for environmental engineers would disappear. Emissions of contaminants to the environment though will never be totally alleviated and the search for structural and nonstructural solutions to issues involving human health and the health of our ecosystem will always be present. What will change is the technologies and the methods by which environmental engineers perform their role in enabling the sustainability of life. Communication skills is often seen as a weakness for engineers but it must be a strength for environmental engineers not only in communicating with the public they serve but in creating a positive image to aid in recruiting for the discipline.

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