

Work in Progress: An Engineering Student Leadership Program for the Future

Diane Rover¹, Krishna Athreya², Sarah Walter³, and Loren Zachary⁴

Abstract – The College of Engineering at Iowa State University has partnered with 3M to launch a new leadership program that will prepare students for life-long leadership roles in industry as well as public service. The program will complement the engineering skills and knowledge students acquire during their academic careers to better prepare them for leadership and collaborative roles in their professional careers. Program development began in Spring 2006, focusing on student development, leadership development, and community development. The program is part of a larger engineering policy and leadership initiative with a goal to create an environment that encourages technically minded students, faculty, and staff to develop and improve their leadership skills and become engaged in the development of public policies related to technology. This is a Work In Progress, and program and curricular developments are highlighted.

Index Terms – Leadership development, policymaking, experiential learning, integrated program

INTRODUCTION

The National Academy of Engineering in its *Engineer of 2020* vision describes several needs and goals related to engineering and public policy, with the following excerpts: [1]

“By 2020 we aspire to engineers who will assume leadership positions from which they can serve as positive influences in the making of public policy and in the administration of government and industry.

...

The engineering profession recognizes that engineers need to work in teams, communicate with multiple audiences, and immerse themselves in public policy debates and will need to do so more effectively in the future.

...

For example, engineers will need to understand the policy by-products of new technologies, and public servants will need to recognize the engineering implications of policy decisions. ... Today, engineers indirectly pursue connections to public policy... . It is both the responsibility of engineers and important to the image of

the profession that engineers make a better connection in the future.”

The College of Engineering at Iowa State University has partnered with 3M Corporation to launch a new leadership program to prepare students for life-long leadership roles in industry as well as public service. The program will complement the engineering skills and knowledge students acquire during their academic careers to better prepare them for leadership and collaborative roles in their professional careers. Objectives for the new leadership initiative include:

- Instill among students the desire and ability to work in leadership and collaborative roles in their professional careers;
- Encourage innovative thinking, leadership development, team building, and peer mentoring among high-ability students;
- Enable students to tailor a program of study to match professional and life-long learning goals; and
- Enhance students’ academic experiences by offering interdisciplinary and experiential learning opportunities.

PROGRAM OVERVIEW

Engineering Leadership Program development began in Spring 2006, focusing on student development, leadership development, and community development. A learning community has been formed using an initial cohort of upper class students as partners in designing the educational/experiential elements. The incoming cohort of first-year students – i.e., 3M Scholars – will have opportunities to participate as a group in interactive seminar sessions around leadership principles and skills. They will create a leadership portfolio plan with service and service learning elements integrated into the plan. They will be expected to revise and update their plans and action items as they progress through the years of study. Mentoring up and down and laterally will be infused into the leadership experience. Faculty and graduate students will be invited to interact with the student-leaders in informal educational settings (e.g., dining and discussion series, partnerships for curriculum development, independent study options, etc.). Alumni, political, social and corporate leaders will be invited to interact and engage in the leadership learning community.

¹ Diane Rover, Associate Dean, College of Engineering, Iowa State University, drover@iastate.edu

² Krishna Athreya, Director, Engineering Leadership Program, Iowa State University, ksa1@iastate.edu

³ Sarah Walter, Student, Mechanical Engineering, Iowa State University, phys2sw@iastate.edu

⁴ Loren Zachary, Assistant Dean, College of Engineering, Iowa State University, zach@iastate.edu

Work is in progress to identify measurable outcomes related to leadership skills and competencies.

Student development within the program is focused on fostering an interest and expertise in technical public policy issues among engineering students. Learning experiences will emphasize technical communication and policy analysis skills and provide opportunities for engineering students to actively pursue technical policy research on present day topics. Learning experiences under development range from credit-based courses to modules integrated within other courses to non-credit co- or extra-curricular activities that complement the program of study. Mentors provide direction and insight on academics, extracurricular activities, career paths and life skills. Each student has an option to participate in an off-campus internship related to leadership development.

Several programs have emerged within universities to promote student leadership development and public policy within engineering. Examples we have considered include those at the University of Maryland [3], RPI [4], and Carnegie Mellon University [5]. The 3M Engineering Leadership Program has some elements in common with the Roden Leadership Program at the University of Texas [6], although the latter has its roots in entrepreneurship. A unique aspect of our program is the involvement of student-leaders as partners in designing and managing program elements. We continue to review related programs and use them to inform and support our curriculum.

The program is part of a larger engineering policy and leadership initiative to create an environment that encourages technically minded students, faculty, and staff to develop and improve their leadership skills and become engaged in the development of public policies related to technology. Several goals in matching student activities with the larger initiative are listed below; these are a work-in-progress.

- Independent learning experience every year through research and/or service experiences and self study.
- Communication skill improvement every year with increasing levels of sophistication, media, and audiences.
- Leadership experience every year with increasing levels of responsibility, including a multi-year social or public policy oriented project involving non-engineers.
- A mandatory social/policy/government/communications experience off campus.

EVALUATION

Evaluation activities are coordinated through the Research Institute for Studies in Education (RISE) at ISU. RISE will evaluate project outcomes and has initiated a study to evaluate student leadership development. The study is outlined below.

The objectives for the project (given above in the Introduction) are being formed into specific outcomes and explicit research questions. For example, to what extent are students prepared for leadership roles in the public sector? To what extent has student awareness and/or interest in technology policymaking been heightened? To what extent do students understand the impact of policy, diversity, and ethics on engineering and technology? These and other research

questions will be investigated using statistical analysis methods. Throughout the analyses, the central concern is to test to see whether there is a statistically significant main effect of the leadership program on student development. A control group will consist of students at comparable levels of coursework who are not participating in the program.

The evaluation program has been developed by organizing key evaluation questions through the a-e-I-o-u framework [7], which has been shown to be useful in education evaluation research by organizing evaluation questions into five areas: (a)ccountability, (e)ffectiveness, (I)mpact, (o)rganizational context, and (u)nanticipated outcomes. The evaluation strategy includes both formative and summative assessment. The primary objective of both assessment efforts is to measure the effect on student learning.

PROGRAM STATUS

A program director, student director, and student team began program development during Spring 2006. The student team members are serving as developers and also mentors to incoming students. The first cohort of freshmen students begins Fall 2006; seventeen were selected out of over 110 applications. Every 3M Scholar receives a four-year engineering scholarship. A leadership retreat begins the fall semester, and a leadership seminar continues throughout the year. During the first year, students will participate in the learning community as well as an informal discussion series, service learning projects, and curriculum development. Program elements for subsequent years are under review. Upon completion of a set of program activities, students receive a leadership certificate, similar to the University of Wisconsin program [8].

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