Transforming Introduction to Engineering into a General Education Course

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From its inception the engineering program at the University of Southern Maine (USM) offered an Introduction to Engineering (ITE) course to incoming first-year students. The course introduced students to the tools, tasks and culture of engineering. Students worked in teams both in class work and laboratory exercises, used spreadsheets to solve problems and graph results. The course culminated with a team-based project in which student teams designed, built, demonstrated and documented a device, utilizing the knowledge and skills acquired in the early part of the course.

In 2008 USM began phasing in a new general education curriculum, or core. While the old core was based on distribution requirements the new one was focused on outcomes, in line with current national trends. As part of this curriculum all incoming first-year students were required to take an entry-year experience (EYE) course. These courses were to be team-developed and team-taught and were to employ a variety of perspectives to explore a significant question about the interrelationship between human culture and the natural world. Students were expected to develop and employ skills to locate and critically evaluate information relevant to course questions. The courses, to be proposed and developed by teams of faculty throughout the university, were to not only engage students in a particular theme but also to develop skills such as reflective self-appraisal, critical thinking and writing.

An impetus for this particular form of course was the drive to increase retention. It was intended to facilitate the students’ transition to college by engaging them in active and collaborative learning that enhances their inclination and ability to view complex issues from multiple perspectives.

The transition into a new general education curriculum coincided with an initiative from the university system Board of Trustees to reduce the number of credit-hours required to receive a baccalaureate. This presented a quandary; the EYE requirement in the first semester would have to be added to the four required courses already in that semester. Something had to give. That something was Introduction to Engineering. The challenge then was developing a first semester course that would be open to any student but would be of value for engineering majors who would no longer have an introductory course in engineering. The opportunity was to attract new students to engineering as a major.

Introduction to Engineering was used to provide the foundation for the new EYE course, “The Built Environment: Energy” This course focused on the problems and opportunities of the various sources of energy in the 21st century. EYE courses are open to any student in the university so they had to be tractable to students from any discipline, the majority of whom at USM are in non-STEM majors. Much new material was assembled, both from the literature and from faculty with expertise in the field. Thomas Friedman’s Hot, Flat and Crowded was used as the text, around which the idea of sustainability was built. It also served as a vehicle for introducing a series of reflective essays.

Key elements of the old Introduction to Engineering course were retained; basic computations of potential and kinetic energy were utilized to provide a foundation for understanding some simple laboratory experiments involving pendulums and simple D.C. motors. Tracking software was used to analyze motion and introduce non-STEM majors to techniques not known to them. Also retained was a semester capstone experience “The HexA

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Challenge” in which student teams designed, constructed and competed with a car powered by two triple-A batteries (hence HexA).

Developing the course required a critical evaluation of what were the core teachings in Introduction to Engineering and what was the purpose of the new course. ITE courses tend to be computationally and content intensive. EYE courses, in contrast, tend to be experiential in nature. One very valuable holdover from the old ITE course was the emphasis on team experiences and teamwork. Laboratory reports were team, not individually developed. An advantage of the team approach is that students tend to form group bonds which can have a positive effect on retention.

The course is now in its fourth year. Comments from students have been generally positive. One problem is that STEM majors don’t find the course to be particularly challenging. Additional optional assignments have rarely been attempted by those students. One solution may be to put more emphasis on essays, readings and research projects, which do not favor the particular predilections of STEM majors.

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