Cost of an Engineering Major

Must students choose between practical skills and personal growth?
BY GARY LICHTENSTEIN, ALEX MCCORMICK, SHERI D. SHEPPARD, AND JINI PUMA

The demanding credit requirements of engineering may be turning away students who think that the major could limit their personal and social development.

A recent study used data from the National Survey of Student Engagement to assess the undergraduate experiences of students in engineering; computer science; science, technology, and math (STM); arts and humanities; social sciences; business; and other majors. Between 2002 and 2007, nearly 12,000 students were surveyed at 240 institutions during their first year and then again as seniors. In most cases, engineering students reported results similar to other majors in overall satisfaction, hours spent in curricular activities, and community service/volunteer work.

But there were notable exceptions. First-year students and seniors in engineering reported the highest gains in practical competence, and first-year students reported the highest mean on higher-order thinking. But first-year and senior students reported the lowest gains in general education. Seniors in engineering reported the lowest mean on integrative learning and gains in personal and social development, and reflective learning.

Engineering students were like all other majors in how they spent their time each week, including hours relaxing and socializing and time spent in volunteer/community activities. But first-year students and seniors in engineering spent considerably more time preparing for class compared with other majors, and less time working off campus for pay.

Differences between engineering majors and others can be explained programmatically. Engineers typically have the highest number of credit requirements compared to others, which may preclude involvement in activities that foster reflection and personal growth, including independent study and study abroad. We believe that the demanding curriculum forces engineering students to choose during college between acquiring practical and marketable skills and participating in educationally enriching experiences.

We found evidence that this might be the case when we compared students who persisted in engineering all four years with students who left engineering and students who migrated into engineering from other majors.

First-year and senior engineering persisters spent significantly more time preparing for class and significantly less time caring for dependents compared with non-persisters and migrants. Seniors who persisted reported the most frequent participation in co-op/field experiences, while non-persisters reflect significantly more foreign language coursework and independent/self-designed majors than engineering persisters and those who migrated into engineering.

Migrants rated their reflective learning significantly higher than did engineering persisters.

Two factors predicted engineering persistence among seniors: gains in practical competence and hours per week preparing for class. Predictors of non-persistence included gender (women were 35 percent less likely to persist in engineering), gains in general education, reflective learning, and hours spent working off campus.

We wonder whether students who leave engineering — and maybe even those who never enroll who might otherwise have considered the degree — enter other majors believing they can still acquire the practical skills that make engineering so appealing, while giving themselves curricular breathing room for activities that are difficult or impossible to pursue when enrolled in engineering.

Serious consideration of those questions calls for a reconceptualization of engineering programs. Some schools have moved in this direction: Carnegie Mellon reduced major requirements, and the University of Arizona created a B.A. in engineering. But "reconceptualizing" cannot mean making shortcuts to the engineering degree. Engineering faculty and deans should identify the fit between undergraduate curriculum and required professional knowledge, and create a more efficient degree. Academic leaders ought to be able to create engineering curricula that strike a balance between technical sophistication and personal development.

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