Is It Time to Shut Down Engineering Colleges?

By Domenico Grasso

With the return of students to campuses this month comes annual hand wringing over the lack of diversity in our science and engineering classes. The United States is at a 14-year low in the percentage of women (16.3 percent) and African Americans (7.1 percent) enrolling in engineering programs.

An engineering student body that is composed largely of white males is problematic not only because of its narrow design perspective, but also because failing to recruit from large segments of the population means the number of new engineers we produce falls well short of our potential.

Although this is not a new problem, it is becoming ever more urgent. We are faced with an engineering juggernaut emanating from India and China, with more than 10 Asian engineers graduating for every one in the United States. Educated at great institutions like the Indian Institutes of Technology or Tsinghua University, these engineers are every bit as technically competent as their American counterparts.

So here we sit at the beginning of the 21st century, in the most technologically advanced nation on the planet, with a comparatively small supply of home grown engineers, facing an explosion of technical horsepower overseas.

Why fight the tide? Couldn’t we simply import all the engineering we need? Couldn’t we play the economic advantage and close our expensive colleges of engineering? Do we gain anything by educating engineers in the United States?

I would argue that, with a few exceptions, we really don’t. As they are currently trained, American engineers are at relative parity with their foreign-born counterparts, are more expensive, and offer no
competitive advantage. But there is a way out of this predicament, one that would provide a raison d’etre for American engineering programs, and make for the kind of design the planet now so urgently needs.

Faced with the increasingly complex design challenges of the 21st century — an era where resources of every kind are reaching their limit, human populations are exploding, and global-warming related environmental catastrophe beckons — engineers need to grow beyond their traditional roles as problem-solvers to become problem-definers.

To catalyze this shift, our engineering curriculum, now packed with technical courses, needs a fresh start. Today’s engineers must be educated to think broadly in fundamental and integrative ways about the basic tenets of engineering. If we define engineering as the application of math and science in service to humanity, these tenets must include study of the human condition, the human experience, the human record.

How do we make room in the crowded undergraduate engineering curriculum for students to explore disciplines outside math and science – literature and economics, history and music, philosophy and languages – that are vital if we are to create a competitive new generation of engineering leaders? By scaling back the number of increasingly narrow, and quickly outmoded technical courses students are now required to take — leaving only those that teach them to think like engineers and to gain knowledge to solve problems. Students need to have room to in their schedules for wide ranging elective study.

There is a need for advanced engineering training, to be sure, but the place for that is at the graduate level — in one of the growing number of nine-month masters programs, perhaps.

Teaching engineers to think, in the broadest, cross-disciplinary sense, is critical. Consider two examples of the failures of the old way.

The breach of the levees in New Orleans, which has unleashed a torrent of human suffering, came about not solely because engineers designed for a category 3, rather than a category 4, hurricane. It was caused by decades of engineering and technical hubris, which resulted in loss of wetlands and overbuilding on a grand scale. Would engineers who had studied economics, ecology, anthropology, or history have acted the same?

Or consider Love Canal (or any of a thousand other environmental debacles of the last 50 years). Would designers who had read Thoreau’s *Walden*, studied Beethoven’s Pastoral Symphony, or admired Monet’s poppies have allowed toxic chemicals to be dumped into the environment so remorselessly?

To prepare our engineers to engage in the major policy decisions we’ll face over the next 25 years — many of which hinge heavily on the implications of technological design — we must truly rethink what they need to know when they graduate.

If we do, our progeny stand a fighting chance of having a life worth living. And by giving engineering a larger, more socially relevant framework, expanding it beyond the narrow world of algorithms, the field should prove more attractive to women, minorities, and other underrepresented groups.

Just imagine. A growing and increasingly diverse number of domestically trained engineers — equipped with the broad insight and critical thinking skills the world needs, which will also give them a competitive advantage over their foreign counterparts.

Overhauling the engineering curriculum would be challenging to be sure, but it’s a design worth
building.

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