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Today's News

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Why Engineering Schools Are Slow to Change

By PAUL BASKEN

Laurence J. Jacobs, an associate dean at the Georgia Institute of Technology, didn't need the latest report from the Carnegie Foundation for the Advancement of Teaching, on engineering education, to tell him that he and his engineering colleagues have a problem.

The National Science Foundation, the National Academy of Engineering, and others have been warning for at least two decades that American engineering education is too theoretical and not hands-on enough.

The new Carnegie report, "Educating Engineers: Designing for the Future of the Field," reinforces those warnings. Based on a study of 40 American schools of engineering, the report concludes that a widespread emphasis on theory over practice, common at many of the nation's 1,740 college-level engineering programs, discourages many potential students while leaving graduates with too little exposure to real-world problems and ethical dilemmas.

Mr. Jacobs already knows this. Colleges aren't satisfying either students or employers who want a more relevant curriculum, Mr. Jacobs said in an interview. Meeting that demand, however, is proving a stubbornly tough job.

The primary problem is faculty members who "are very, very protective of their curricula," he said. Changing faculty attitudes is the key, said a co-author of the Carnegie report, Sheri D. Sheppard, a professor of mechanical engineering and associate vice provost for graduate education at Stanford University. Another problem may be accreditation practices that reward colleges for having a traditional curriculum.

Old Ways Die Hard

The science foundation has offered millions of dollars through a coalition of universities to try to break up old styles of teaching and still couldn't overcome the "cultural issue of change" among faculty members, Ms. Sheppard said.

One exception to this pattern is Georgia Tech's biomedical engineering program. The

university started it from scratch, incorporating many newer teaching approaches.

The “problem-based approach” in biomedical engineering includes asking sophomores to spend an entire semester exploring a big-picture question, such as how to keep the blood supply safe from the AIDS virus, Mr. Jacobs said.

That sort of approach helps attract and teach many types of engineering students, especially women, who have been traditionally reluctant to consider engineering as a concentration, he said. The enrollment in biomedical engineering at Georgia Tech last fall was 39 percent female, compared with 9 percent female in electrical and computer engineering, and 12 percent female in mechanical engineering.

“They’re looking to solve problems that are of help to society,” Mr. Jacobs said of female students. “And the way that engineering is traditionally taught, it’s very abstract.”

The science foundation, an independent federal agency, is trying again, financing a panel of the American Society for Engineering Education that is expected to report this summer on strategies for encouraging the necessary changes at American engineering schools.

The Institute of Electrical and Electronics Engineers, the professional association known as IEEE, has also been looking at the problem. It may, however, take a noticeable overall decline in student enrollment before schools in the United States taking meaningful action, said Moshe Kam, head of electrical and computer engineering at Drexel University and a former vice president for educational activities at the IEEE.

That day may soon arrive. Figures issued this month by the science foundation show that the United States has fallen behind most of the world’s 23 developed countries in the percentage of college degrees awarded in engineering and the natural sciences.

Not Enough Women

Much of that appears attributable to the lack of interest among women. While 7.5 percent of freshmen nationwide in 2007 expected to major in engineering, men outnumbered women more than 5 to 1, according to figures compiled by the University of California.

Part of the problem is that too many colleges, at least until now, have had enough engineering students so they don’t see the need to invest in more expensive hands-on methods of teaching, Mr. Kam said.

Accreditation practices also make change difficult, Mr. Kam said. More ambitious methods of teaching can lead to more complicated processes for proving compliance with accreditation standards, he said.

An example of that problem is the “alarming uniformity” in engineering curricula, he said. “That means stagnation” in teaching approaches, he said.

Mr. Kam's assertions sound too much like an excuse, Ms. Sheppard said. ABET, the chief accrediting agency for college-level engineering programs, has overhauled its approach to

encourage innovative teaching styles, she said.

“It may be more hassle” to change both teaching methods and accreditation procedures, Ms. Sheppard said. “Yet if you really believed it was a better way, you’d do it.

“It’s not clear to me,” she said, “that enough thought leaders are convinced that the system is not optimum, if not broken.”
