Forum

Charles M. Vest

Engineering Education for a Changing World

I believe that *engineering education must now return closer to the roots of engineering practice.* I do not say this easily, because I have spent most of my own career at the boundary between engineering and applied science. Starting in the late fifties and sixties, the engineering science revolution occurred. The remarkable tools of modern science, mathematics, and, later, computing became major components of what and how we taught engineers. The results were phenomenal and of great value to the nation and the world. We produced engineers capable of creating the revolution in computing and communications, developing vehicles to explore outer space, and leading in many ways in scientific and technological innovation.

But the curriculum has been essentially unchanged for thirty years. It has, of course, been continuously improved and fine-tuned, but its basic structure and philosophy have been rather constant. The world in which engineering is practiced, on the other hand, has changed rapidly in recent years.

Take, for example, the decline in the United States' ability to compete in the world marketplace for many manufactured goods. The reasons for this are complex, but a major issue has certainly been the attitude of industry and of engineering schools toward the design and manufacture of consumer products. If we are to compete in the international marketplace, we need to place a new emphasis on basic engineering for design and production. We must, of course, do so armed with the tools that engineering science has provided for analysis and simulation, but we must instill a respect for—indeed a passion for—effective, efficient, and socially responsive design and production.

In the process, *we must recognize, teach, and participate in the development of the new techniques of lean production, total quality management, and continuous quality improvement.* Beyond these buzz words lies a core of important new concepts. We must expose our students to these concepts and to more teamwork, as well as educate them in the basic and applied sciences. We must prepare engineers who have self-discipline, analytical skills, and problem-solving abilities, and who are also prepared to work and lead in the management sector. To put it curtly, we need to educate students who combine the attention to precision, design, and manufacturing that is often associated with German and Japanese engineers with the innovative and analytical skills that characterize American engineers.

I want to strike a further theme that is very important in my view. All of higher education, and especially engineering education, requires a growing diversity of programs and of kinds of institutions....I believe that for too long we have all been striving for a single model—the comprehensive, Ph.D.-granting research university.

We need different styles of education to meet the needs of different students. We do not all need to be the same. Similarly we need a wide variety of [programmatic] experiments...and we need the flexibility to develop new educational approaches for the twenty-first century....I view the accreditation process of the Accreditation Board for Engineering and Technology as a hindrance to the educational innovation and experimentation that the nation needs. The process must become sufficiently flexible to promote change and experimentation, or it will be left in the dust.

Acknowledgment

The following is excerpted, with permission of the author, from an address by Charles M. Vest to the American Society for Engineering Education 1992 Annual Conference, June 23, 1992.