

DYNA EDITORIAL

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EDUCATING THE ENGINEER OF 2020

The Engineer of 2020 Project centers on an effort to envision the future two decades from now, to use this knowledge in an attempt to predict the roles engineers will play in the future, and to position United States engineering education for what lies ahead, rather than waiting for time to pass and then trying to respond. It is driven by the concern that the engineering students of today may not be appropriately educated to meet the demands that will be placed on the engineer of 2020, and that, without refocusing and reshaping the undergraduate engineering learning experience, America's engineering preeminence could be lost.

For the Project, it is a given that the nation's societal goals will not be met absent a robust engineering community in the country. It asks what the restructuring of a program, what reallocation of resources, and what refocusing of faculty and professional society time and energy are required so that our educational infrastructure can educate engineers who will be prepared to tackle the challenges of the future. It questions how we can more effectively share with students—the current as well as the potential ones—our passion for designing systems, structures, and devices to solve problems and our conviction that engineering is a profession that offers rich rewards for serving the interests of society.

In addressing a summit on engineering education held in conjunction with this Project in July 2004, Massachusetts Institute of Technology President Charles Vest encouraged the educators and stakeholders assembled there to think about students when considering how the engineering education system should be reengineered. He stated, "This is the most period in human history for science and engineering. The explosive advances in knowledge, instrumentation, communication, and computational capabilities create a mind-

boggling playing field for the next generation. . . As we think about the plethora of challenges, it is important, in my view, to remember that students are driven by passion, curiosity, engagement, and dreams. . . Despite our best efforts to plan their education, to a large extent we simply help to wind them up, and then step back to watch the amazing results." Gretchen Kalonji, Professor of Materials Science and Engineering at the University of Washington, expanded on Vest's desire to engage the passion and curiosity of students stating that "[a]s we move forward, I think we need to undertake a far more bold reformulation of engineering education. Bluntly speaking, with existing models, we are losing the battle for the imagination of our youth. . . What I would argue for is a dramatic and fundamental transformation of the educational process."

Originated and chartered by the Committee on Engineering Education of the National Academy of Engineering (NAE), the Engineer of 2020 Project consists of two parts, the first related to the development of a vision for engineering and the work of the engineer in 2020. A report of the first phase was published in the spring of 2004. The second part is an examination of engineering education in the broadest context, and asks what needs to be done in order to enrich the education of engineers who will be practicing in the field in 2020. This initiative is not unique in that other groups have somewhat similar efforts under way or have recently completed them. The work of the NAE differs in that it considers the issues with respect to all the diverse branches of engineering and examines them from the broadest possible perspective. Its principal focus is on the future of undergraduate engineering education in the US, although the NAE recognizes that in order engineering practice and education must be considered within a global context.

A steering committee for the Phase II project was established in February 2004 by the NAE president in order to guide the work. The committee met in July 2004, at the same time as the Summit on Engineering Education, which was held at the National Academies' Constitution Avenue location in Washington D.C., attended by approximately 100 participants. As background information for the summit, a series of papers was prepared by educational experts on a variety of subjects, including: cooperative education, the National Science Foundation engineering education coalitions, the experience of Olin College, diversity, the Greenfield Coalition, the Carnegie Foundation Pedagogies of the Professions Program, accreditation systems, and the history of efforts to realign engineering education.

The summit featured keynote addresses by Ruth David, Charles Vest, Shirley Ann Jackson, and Nicholas Donofrio. Between the plenary sessions of the summit, five breakout groups met to allow more detailed and interactive discussions on various aspects of the engineering education system.

Immediately following the workshop, the steering committee met to review the workshop discussions and was assigned the task of preparing a report. Final review of the report by the steering committee in order to give a critique of its conclusions and recommendations was conducted by e-mail.

It should be noted that the Phase I report posits a statement of aspirations for the engineer of 2020 and closes with a statement of attributes thought to be suitable for the engineer of 2020 that match the aspirations. These aspirations and attributes express a bold optimism for the engineering profession if it is willing to confront the possibilities for the future and to prepare for them.

Ahead lays the challenge of debating and adopting, where appropriate, the recommendations of this

report for adapting engineering education to the new century.

The committee recognizes that "one size does not fit all" and has attempted to suggest a suite of interventions, not all of which will work in every institution. We expect that debate on these interventions will take place over the course of the coming year and we hope that their introduction into the engineering education infrastructure will follow rapidly so that today's students will indeed be prepared to practice engineering effectively in 2020.

Educating the Engineer of 2020: Adapting Engineering Education to the New Century <http://www.nap.edu/catalog/11338.html>. National Academy of Engineering. Of the National Academies. The National Academies Press, Washington DC. www.nap.edu