

Sandia spearheads launch of innovative National Institute for Nano Engineering

By [Neal Singer](#)

A radically different type of science education intended to accelerate innovation and involve more US students in the study of technology - in this case, at the intersection of engineering science and nanotechnology - is the subject of a memorandum of understanding signed by Sandia with 20 industrial partners and universities.



The Sandia-led group, called NINE for National Institute for Nano Engineering, already has gathered industrialists, college professors, and administrators, as well as undergraduate and graduate students, to develop a novel approach to teaching nano-engineering that will complement and extend the more standard techniques of university education.

Among those involved are Corning Inc., Exxon Mobil Corp., Goodyear Tire and Rubber, Harvard University, Harvey Mudd College, Intel, Lockheed Martin, Rensselaer Polytechnic Institute, Rice University, Yale University, the University of California at Davis, the University of Florida, the University of Illinois, the University of New Mexico, the University of Notre Dame, the University of Texas at Austin, and the University of Wisconsin.

Students ranging from freshmen to advanced graduate students will be brought together from numerous universities to contribute an unusual variety of viewpoints and ideas. Integrated into research teams that encounter the entire engineering design-to-product cycle, they will experience the excitement of solving real scientific or engineering problems - or even the harder job of formulating the questions to be asked.

Not just yes or no answers

Says NINE program manager Regan Stinnett (1817), "The question isn't, how does a student deal with a question that can be answered 'yes' or 'no.' We want students to experience topics that're too big to throw their arms around. We want NINE's problems large enough that students will explore depths that will eventually lead to innovations."

"The point is to expand the breadth of science and engineering education by transcending the boundaries and tools provided by traditional disciplines," says Justine Johannes (1810), senior manager in the Materials Sciences and Engineering Center.

Says Materials Sciences and Engineering Center Director Duane Dimos (1800), corporate lead for the NINE initiative, "Traditionally, the US has benefited tremendously from the cream of the crop of foreign students staying here after graduation. That may not continue to be the case. We need to grow our own, and they need to be more capable than formerly, to keep our place of leadership in the increasingly competitive scientific and economic world. NINE is an effort to 'raise the bar,' on the one hand, and on the other to make the attractions of science and engineering obvious to students at early stages in their careers."

The prototype institute, funded by \$7.5 million dollars from Sandia, in short is trying to determine the most effective ways to enrich science and engineering education. Students will be involved in technical collaborations that in some ways resemble the old hands-on programs of apprentices doing actual work in the presence of masters.

Freedom and responsibility

Offered the most modern instruments at Sandia to work on national-level problems, students will work with Sandians, faculty from a variety of universities, and industrial scientists from leading companies. NINE students will focus on precompetitive research in an environment that allows them also to explore the commercial realities of their work through industry representatives.

Chatting among themselves in guided groups in summer sessions, students will explore the most off-the-wall nanotechnical ideas that young minds can come up with. The experience is intended to expand their technical, creative, and commercial horizons.

"NINE will jumpstart the careers of our future science and engineering leaders," says Justine.

NINE will provide financial support for students and faculty. In addition to hands-on work in technology, it will expose students to relevant topics in business, law, politics, and society through courses, lectures, and mentoring to aid their eventual success as technology employees or entrepreneurs.

Rick's views

The idea for NINE was triggered by the Committee on Science, Engineering, and Public Policy's study, "Rising Above the Gathering Storm," says Div. 1000 VP Rick Stulen, overall leader of the NINE effort. (The Committee is a joint creation of the National Academy of Engineering, National Academy of Science, and Institute of Medicine.) The report vividly described the increasingly dismal plight of science and engineering in the United States because of the declining numbers of US citizens entering these fields and the decreasing funding for science and engineering research in the physical sciences in the US.

"We took the lead because [at Sandia] we are engineers and scientists and we take it badly that we may fall behind," says Rick. "We see a path forward for the nation in what the DOE labs can do utilizing the unique capabilities already in existence at each site. At Sandia, the nation has made an investment in high-performance computing, microelectronics and microsystems, and engineering that is unparalleled any place else in the country. The combination can accelerate innovation if we can bring the right people together."

He points to the successful Belgium program IMEC's demonstration of the power of educational partnerships in driving innovation. IMEC is founded on a tightly coupled partnership between academia, national labs, and industry. "They're spewing out patents and their students are being gobbled up by industry," says Rick. "KIST, a 10-year-old Korean program, drives the Korean economy."

While a program hosted by one lab can't hope to turn around science education, he says, there are 25,000 PhD and master's degree holders in 17 DOE labs. "If you unleash them into structured programs, it would make a huge difference," Rick says.

A NINE program at each national lab?

"We would like to see a NINE-type program at each national lab, with each lab leading in its specialty," he says. "Each would become a national innovation center."

Congressional support was demonstrated by the recent passage of the America COMPETES Act. This legislation opens use of DOE's formidable science and technology infrastructure in the service of science education. Funding is dependent upon further legislation.

Will it work? "We won't know for several years," says Rick, "but we're working hard to be an example, and we're hopeful of success that will be attractive in changing the direction of US science education as well as increasing the number of students choosing a technology future."
-- [Neal Singer](#)