



LEFT: PURDUE MECHANICAL ENGINEERING GRADUATE STUDENTS WORK ON PROPULSION RESEARCH (PURDUE UNIVERSITY/MARK SIMONS); CENTER AND RIGHT: COLORADO STATE UNIVERSITY ELECTRICAL ENGINEERING STUDENTS PRESENT THEIR CIRCUIT THEORY PROJECTS. (COLORADO STATE UNIVERSITY DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING)

NSF Awards Grants to Reshape Engineering Education

The National Science Foundation has given six educational institutions a total of \$12 million to enact groundbreaking change in engineering education.

The five-year “Revolutionizing Engineering Departments” (RED) grants focused on systemic departmental efforts that also incorporate scalability by design.

According to program director Elliot Douglas, NSF wanted to make a significant investment in a small number of programs that could serve as examples for other schools to adapt. The intended result: the development of well-rounded engineers to solve society’s big challenges.

RED is the first project in the Professional Formation of Engineers effort from NSF’s

Engineering Directorate. PFE aims to “create and support an innovative and inclusive engineering profession for the 21st century.”

To do so, PFE is examining vulnerable “target points,” or transitions, that affect engineer preparation and retention. One of the most critical is the middle two years of engineering education, in which students receive most of their technical education but may be missing real-world context. The RED solicitation thus focused on these years.

Douglas points out that although a lot of good work is occurring in engineering education at the curricular or classroom level, RED’s goal is to drive change on a larger scale.

Teams applying for the grants needed to have a participating social scientist who could advise on developing a culture of change and monitor the process. NSF has also awarded one additional grant to a group that is expert in academic change and will help the 2015 RED teams manage the change process as a cohort. The teams will be able to exchange ideas and build on what the others are doing.

NSF is soliciting for another group of RED grants to be awarded in 2016. Letters of intent are due November 10. Learn more at <http://1.usa.gov/1N8dncg>.

2015 RED Grant Winners

Purdue University, “An Engineering Education Skunkworks to Spark Departmental Revolution”

Purdue is developing an agile, experimental group focused on engineering education research and culture change for its mechanical engineering department, the engineering school’s largest. Teams comprising faculty, staff, and students will be able to rapidly investigate ideas—for instance, a new assessment technology or ways in which departmental policies may conflict.

“What we’re proposing is that you have to...characterize what works and doesn’t for the community rather than the constituents within,” says Edward Berger, engineering education and mechanical engineering professor. “That’s a revolutionary shift in thinking about what innovation really means in an academic environment.”

Colorado State University, “Revolutionizing Roles to Reimagine Integrated Systems of Engineering Formation”

CSU’s electrical engineering department is reengineering courses into modules that integrate topics. They will occur within three threads: fundamentals, creativity, and professionalism, with faculty champions for each. Integration specialists will help ensure students see how pieces interrelate.

“[R]ather than each faculty member having sole control over a single course, it’s much more team-based,” says Anthony Maciejewski, head of the department of electrical and computer engineering.

This is a systems engineering point of view, he notes. “Most failures in large systems occur at the interfaces.”

Oregon State University, “Shifting Departmental Culture to Re-Situate Learning and Instruction”

OSU’s project team wants to make its School of Chemical, Biological, and Environmental Engineering a place where learning is both tied to real life and inclusive. Methods will include realistic problem-based learning that crosses courses, faculty and staff diversity workshops, and student “pods,” or learning communities. In addition, the university is working to revamp promotion and tenure guidelines and the school is changing review processes to incentivize and reward faculty diversity efforts.

Says Jim Sweeney, professor and school head, “We’re looking at wholesale change [with these various pieces].” At the end of the five years, he hopes the program will have built “a very different community and very welcoming place for students.”

Other institutions awarded grants were the University of North Carolina at Charlotte for “The Connected Learner: Design Patterns for Transforming Computing and Informatics Education,” Arizona State University Polytechnic School for “Additive Innovation: An Educational Ecosystem of Making and Risk Taking,” and the University of San Diego for “Developing Changemaking Engineers.”