

Home

19 December 2005



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Stevens' CIESE director addresses NACME symposium

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Center for Science Writings

Beth McGrath emphasizes universal engineering education for K-12 students

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HOBOKEN, N.J. — Beth McGrath, Director of the Center for Innovation in Engineering and Science Education (CIESE) at Stevens Institute of Technology, on November 16, presented a talk on pre-engineering education strategies at the National Action Council for Minorities in Engineering's (NACME) 2005 Symposium, Forging Partnerships, Sharing Goals: Meeting America's Need for Engineering Talent. McGrath' fellow panelists included John Ferrandino, President of the National Academy Foundation, Dr. Terry King, Dean of Kansas State University's School of Engineering and Dr. James Rosser, President, California State University, Los Angeles. Her talk was based on CIESE's Engineering Our Future, N.J., and focused on universal engineering education for all K-12 students.

"Introducing pre-engineering helps K-12 students see, and helps their teachers make, connections from science and mathematics principles to relevant, interesting real-world problems," said McGrath. "Not insignificantly, pre-college engineering education also helps to dispel negative stereotypes of nerdy engineers working in isolation and to portray engineering for what it is: A noble profession in which people of all shapes, sizes and colors, work together to solve our world's most important problems."

CIESE has launched an initiative, Engineering Our Future, N.J., to integrate pre-engineering into New Jersey's K-12 curriculum and classrooms. Launched with public and private partners, EOFNJ aims to influence public policy to ensure that all students – from elementary through high school – experience age-appropriate pre-engineering curriculum activities as a core part of their educational experience. "Many students have no familiarity with what engineers do, the types of jobs they hold, or the contributions they make to the world around us," said McGrath. "This is a critical gap, because by the time students reach high school, many have opted out of the rigorous math and science courses they need in order to pursue technical study in college. And, as a recent report has pointed out, 85% of US income per capita is attributable to technological change. Therefore, our economy and our future well being depend upon creating a rich pool of engineering talent, which must begin in the elementary years."

CIESE is currently conducting a demonstration project that is introducing engineering and innovation into the elementary, middle, and high school curricula. The study includes 35 teachers from a geographically and socioeconomically diverse range of schools across the state of New Jersey. "Many of the participating schools, including those serving high-need, at-risk populations with high percentages of minorities, find that using engineering as a hook to engage students in inquiry, problem-solving, application of science and mathematics principles to solve real-world problems, is an effective means to increase student motivation and interest in science and mathematics," said McGrath.

She further emphasized the importance of introducing engineering to students as early as possible. She stressed that schools must begin to embrace innovation as a way of thinking. "More attention needs to be paid to presenting students with opportunities to use their creativity to solve open-ended problems that don't have a single solution," she said. "We need to begin that process early in K-12 education so that when students are confronted with an interdisciplinary problem in school or a real-world problem in industry they have developed the habits of mind to use their creativity, ingenuity, critical thinking, teamwork and other resources to come up with the best solution."

McGrath also told attendees, "We need to ensure that pre-engineering is taught ubiquitously by mandating testing of engineering competencies. We should be testing engineering competencies alongside science, math and reading."

She concluded, "We need to educate those outside of the engineering community – students, their parents and teachers – about what engineers do, the contributions they make and important roles they will play in addressing the pressing concerns we as a global community face, in healthcare, energy, the environment, national security and many other problems that will be with us for years to come."

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Schools participating in the Engineering Our Future, N.J., demonstration project include: *high schools*: Tenafly High School (Tenafly), Burlington County Institute of Technology (Westampton), North Arlington High School (North Arlington), Marylawn of the Oranges Academy (South Orange), Marine Academy of Science and Technology (Sandy Hook), Mountain Lakes High School (Mountain Lakes), Secaucus High School (Secaucus), Plainfield High School (Plainfield), Williamstown High School (Williamstown), and Burlington City High School (Burlington); *middle schools*: Great Meadows Middle School (Greater Meadows), West New York Middle School (West New York), Elizabeth School #29 (Elizabeth), Linwood Middle School (North Brunswick), Union County TEAMS Charter School (Plainfield), Benjamin Franklin Middle School (Teaneck), Gloucester City Jr. Sr. High School (Gloucester City), Alfred C. MacKinnon Middle School (Wharton), T Schor Middle School (Piscataway), Egg Harbor Township Middle School (Egg Harbor Township), and Orchard Valley Middle School (Sewell); and *elementary schools*: James J. Flynn School (Perth Amboy), Elizabeth School #29 (Elizabeth), Rumson Country Day School (Rumson), Leonard V. Moore School (Roselle), Chesterfield Township Elementary School (Trenton), Wallace Elementary School (Hoboken), Burnet Street School of Science & Technology (Newark), Lafayette Elementary School (Chatham), Tenakill Middle School (Closter), John F. Kennedy Elementary School (Wayne), and Clarendon School (Secaucus).

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This page was last updated 3 October 2006.