

EDUCATION, OUTREACH, AND CAREERS

Helping students toward satisfying careers in science, technology, engineering, and mathematics is a crucial endeavor in a society and an economy that depend on a strong science and technology work force. AAAS works to improve undergraduate education, provides career information and opportunities, and works to ensure that the STEM work force represents and capitalizes on society's spectrum of diversity.

TRANSFORMING UNDERGRADUATE EDUCATION IN STEM

Engineering and computer science undergraduates at Wright State University often used to face an enormous obstacle between themselves and the careers of their dreams. The roadblock was freshman calculus, and it impeded the progress of about 60% of the undergraduates in those fields.

"Mathematicians have a unique ability to really understand things in an abstract way and appreciate the elegance of math," said Nathan Klingbeil, Wright State senior associate dean and professor of mechanical and materials engineering. Engineers, he said, are oriented toward the physical world. "That is what they can wrap their arms around." With that in mind, Klingbeil and his colleagues have started teaching their students calculus in the context of engineering, applying it as needed without developing the theory behind it. Only after the students are comfortable with the applications do they go back into the straight mathematics curriculum.

Demonstrating a doubling of the graduation rate of engineering and computer science majors after nine years, Wright State's success story was one of many shared at the 2013 Transforming Undergraduate Education in STEM (TUES) conference, co-sponsored by AAAS Education and Human Resources and the National Science Foundation, which funds the TUES program.

At the conference, Bruce Alberts, former editor-in-chief of the journal *Science*, referred to publications, contests, and competitions sponsored by the journal that promote sci-

ence education designed to engage students and encourage their understanding through hands-on application. "We are trying to make science education more similar to how science is conducted," Alberts said, "building upon the best, and making continuous improvement."

VISION AND CHANGE FOR UNDERGRADUATES IN BIOLOGY

Undergraduate science education that includes innovative, student-focused practices such as offering real-world research experiences and team-based projects helps to keep students more engaged, but research presented at a conference co-hosted by AAAS confirmed that faculty in biology and other

Environmental sciences student Akida Ferguson of Delaware State University won first place for her presentation at the 2013 Emerging Researchers National Conference.





At a 2013 conference supported by the National Science Foundation, Shirley Malcom, head of Education and Human Resources at AAAS, advocated for more inclusive, research-based strategies to help undergraduate students succeed in biology.

sciences lag behind their peers in using such techniques.

Only about one-third of biomedical science students complete a bachelor's degree in the field within six years, reported Lorelle Espinosa, who spoke at the 2013 Vision & Change conference on behalf of the Higher Education Research Institute at the University of California, Los Angeles. High-achievers especially, however, do much better at campuses that have embraced a student-centered approach.

At Georgia State, for example, 53% of all students now complete a degree within six years, up from about 32% in 2003, and disparities in that rate across racial, ethnic, and economic lines have been eliminated. The school credits its success to peer tutors, expanded freshman learning communities, financial interventions, and a centralized, data-driven academic advisement system.

Such improvements are sorely needed, said Muquarrab Qureshi, of the National Institute of Food and Agriculture, another of the meeting's co-hosts. Qureshi explained that from a pool of more than 4 million ninth-graders in 2001, only 166,530 had earned STEM degrees by 2011. "That translates into significant gaps for the U.S. Department of Agriculture," he said. "We will have about 54,000 jobs to fill, but only 29,000 students who would be able to fill them."

The Vision & Change conference drew 350 attendees from 178 colleges and universities.

SCIENCE, TECHNOLOGY, AND DISABILITY

Entry Point!, a program of the AAAS Project on Science, Technology, and Disability, placed 41 undergraduate and graduate students with disabilities in top-quality internships in

2013. Twenty-nine of the students worked at NASA, one traveled to IBM Nairobi, and others accepted opportunities at Ball Aerospace, Lockheed Martin, L'Oreal, Merck, Georgia Tech, and at the Institute for Accessible Science at Purdue University.

The internships gave the students an opportunity to experience a real-world work setting in their fields of interest and to network with more experienced counterparts. It also allowed them to participate in and contribute to ongoing research and development.

Entry Point! recruits, screens, and recommends for placement qualified students with disabilities to leading companies and agencies who are its partners in government and industry.

More than 150 qualified candidates applied to the Entry Point! program in 2013. Approximately 90% of the program's alumni go on to receive graduate degrees and/or full employment in a STEM field.

EMERGING RESEARCHERS NATIONAL CONFERENCE

With universities cutting budgets, resources to help early-career scientists find fulfilling jobs in academia, or in less traditional venues, are in high demand. "We want to play a valuable role in helping emerging and new scientists to better understand science careers in a global context," said Yolanda George, deputy director of AAAS Education and Human Resources, "as well as how to 'tool-up,' apply, persist, build networks, and to become leaders in all sectors of the scientific work force."

AAAS and the National Science Foundation hosted the Emerging Researchers National conference in 2013 to give more than 600 undergraduate and graduate students, including underrepresented minorities and persons with disabilities, an opportunity to test their research presentation skills before a diverse panel of judges. More than 900 attended the conference from 174 colleges and universities.