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Community Colleges Giving Students a Framework for STEM Careers

SUSAN MUSANTE

Over the coming decade, our country will need one million more science, technology, engineering, and mathematics (STEM) professionals than was originally projected. That is the conclusion of a February 2012 report, *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics* (www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-final_2-25-12.pdf), presented to President Obama by the President's Council of Advisors on Science and Technology (PCAST).

The report stresses the importance of exciting early on students who are potential STEM majors. It notes that our country must "improve the first two years of STEM education in college, provide all students with the tools to excel, [and] diversify pathways to STEM degrees" (p. ii). Because the council found that "high-performing students frequently cite uninspiring introductory courses as a factor in their choice to switch majors" (p. i), the report recommends increasing the retention rates of already interested students instead of trying to recruit new ones.

Those all-important first two years of STEM education for many students takes place at the often-overlooked community-college level. According to the American Association of Community Colleges (AACC), in 2008, community-college students made up 44 percent of all undergraduates and 43 percent of first-year students, including those who went on to pursue STEM careers. According to the National Science Foundation's *Science and Engineering Indicators 2012* (www.nsf.gov/statistics/seind12/c2/c2s1.htm), almost 20 percent of US residents who were awarded science and engineering doctoral degrees and 46 percent who graduated with bachelor's and master's degrees in science and engineering in recent years earned credits at a community or two-year college.

The Biology Department at the Northern Virginia Community College's

(NOVA) Annandale Campus is already implementing multiple strategies to improve student success in their biology courses, says Mary Vander Maten, assistant dean and professor of biology. "We have the responsibility to help all of our students succeed," she says, which is no small task, given that NOVA is the second largest 2-year college in the nation, serving over 75,000 students. Vander Maten's department has 25 full-time biology faculty and 60 adjunct professors, all working toward meeting the needs of a very diverse student body.

Well before the PCAST report was released, NOVA's biology program began to introduce more interactive-learning opportunities and investigative laboratory experiences, as well as general programs to help students learn. "We know that students struggle with fact-based courses such as biology—especially students who come back to take courses for a second career or [who] avoided science courses until now," says Vander Maten. NOVA's Science Learning Center is available to students who want additional help, offering one-on-one assistance from faculty, group study sessions, and spaces for laboratory review. Although much of the PCAST report's contents are not new to 2-year-college faculty members, Vander Maten says that it is helpful. "It allows us to focus on issues such as the unwelcoming atmosphere found in many introductory courses," she says.

Two-year colleges offer a variety of pathways for students to earn STEM degrees. An excellent example of this is found at Lorain County Community College (LCCC) in Ohio. One of 11 effective programs highlighted in the PCAST report, LCCC's University Partnership program allows students "to earn bachelor's and master's degrees from any of eight Ohio universities without leaving the LCCC campus." Rosa Rivera-Hainaj, dean of the Division of Science and Mathematics at LCCC, applauds the report for highlighting the importance

of connections between community colleges and nearby 4-year institutions. These connections are essential to the establishment of agreements for the transfer of college credits. Established relationships between institutions can also lead to opportunities for graduate students to teach at 2-year colleges, which would provide teacher training for these future professors. "We must change the way STEM graduate students are trained. They focus on research discovery and publication and are given little opportunity to learn about student-active teaching," says Rivera-Hainaj.

Vander Maten echoes the need for such partnership programs. "Any 4-year institution that can reach [out] to a neighboring 2-year college is encouraged to do so," says Vander Maten. Like LCCC, NOVA has numerous articulation agreements and pathway programs with regional universities, including their Pathway to the Baccalaureate for at-risk students from 48 local high schools.

Partnerships between 2- and 4-year institutions are extremely important, says Ellen M. Hause, director for innovative learning and student success at the AACC. Although she knows of many programs that are already working to address the report's recommendations, she says that "any report that calls for the need for more STEM graduates is valuable, especially if it translates into increased funding at the federal level." Hause's focus at the AACC is on scaling up programs that are working, instead of trying to reinvent the wheel. Rivera-Hainaj agrees with this approach and emphasizes the need for cross-institutional conversations, stating that "the PCAST report will be effective as long as people take the time to share what works so that others can learn from them."

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