ENGAGE TO EXCEL

HOW TO KEEP STEM STUDENTS FROM JUMPING SHIP?
Of the students who enter college intending to major in science, technology, engineering, or math—the STEM fields—fewer than 40 percent complete a STEM degree. A 10 percentage point increase in retention would boost the ranks of STEM graduates by almost three-quarters of a million in the next decade. That’s close to the goal of 1 million, according to a February report released by the President’s Council of Advisors on Science and Technology (PCAST). Jo Handelsman, who co-wrote the report, explains why it will make a difference.

**Why are we losing so many college students from science?**
Students tell us that they leave science for three major reasons: introductory courses are uninspiring, their math skills are not strong enough, and many students from groups underrepresented in STEM fields cite an unwelcoming atmosphere from faculty who teach the courses.

**PCAST says that keeping students interested in science is the way to go. What changes do you want to see?**
Why not start with the audience already interested who are turning away for completely legitimate reasons that have nothing to do with what science is? College students who engage early in research are more likely to remain STEM majors and to perform well in STEM classes. We need to stop regarding research as only a culmination of an undergraduate education. Let’s capture students with the thrill of discovery and inquiry in their first two years. And we need to address the math gap. If students aren’t prepared for quantitative aspects of STEM studies, they won’t be successful.

**What needs to happen in math?**
We have to accept that students are coming out of high school weak in math: 60 percent don’t have the math skills to do college science. That’s not a small group. Part of the problem is that math is typically not taught well in college. The PCAST working group couldn’t find enough evidence to define a solution, so we proposed launching a national experiment in postsecondary math education to remove the math bottleneck. We want to see new players get involved. The people who use calculus are in math-intensive science and engineering fields. If we can get them to teach calculus, students will see the relevance of math to science.

**Do college faculty want training in how to teach?**
It varies. Some are extremely excited and are demanding it. We have a full house every year at the National Academies Summer Institute on Undergraduate Education in Biology, a one-week immersion course in the science behind successful teaching and student learning. With HHMI support, we’ve launched seven new summer institutes around the country. That said, there’s a large segment, especially at research universities, who don’t feel they can spend any more time on teaching than they already do, and they don’t see any need for change. Many scientists think that, since they came through the system and are successful, the system works. We need to change that self-referential, nonscientific thinking because current faculty are not a model for all students.

**How is this report different from others on U.S. science education?**
I think the biggest difference is that this report went directly to the President, it recommends specific policy changes, and he’s already started to take action. His budget includes more than $100 million in investments by the National Science Foundation (NSF) to improve undergraduate STEM education practices and a joint initiative by NSF and the Department of Education to study how to improve math education. We focused on mechanisms and levers to make change happen. The report recommends a multifaceted approach from government, academia, and industry at many kinds of universities and colleges.

**Do you think you’re at a tipping point?**
Not quite, but we are on a very rapid upward slope. What’s not there yet is getting university faculty on board. Changing a culture is hard. In the report, we discuss that challenge and cite successful efforts that have generated sweeping, cultural change.

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*XERCISE BY CORI VANCHIERI. Jo Handelsman is an HHMI professor at Yale University. The PCAST report is available at: www.whitehouse.gov/ostp/pcast.*