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Why Science Majors Change Their Minds (It's Just So Darn Hard)

By [CHRISTOPHER DREW](#)
Published: November 4, 2011

LAST FALL, President Obama threw what was billed as the first White House Science Fair, a photo op in the gilt-mirrored State Dining Room. He tested a steering wheel designed by middle schoolers to detect distracted driving and peeked inside a robot that plays soccer. It was meant as an inspirational moment: children, science is fun; work harder.



Politicians and educators have been wringing their hands for years over test scores showing American students falling behind their counterparts in Slovenia and Singapore. How will the United States stack up against global rivals in innovation? The president and industry groups have called on colleges to graduate 10,000 more engineers a year and 100,000 new teachers with majors in STEM — science, technology, engineering and math. All the Sputnik-like urgency has put classrooms from kindergarten through 12th grade — the pipeline, as they call it — under a microscope. And there are encouraging signs, with surveys showing the number of college freshmen interested in majoring in a STEM field on the rise.

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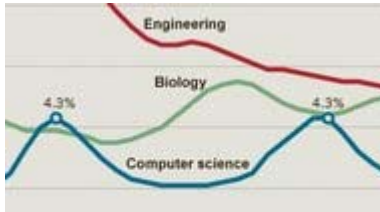
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Gretchen Ertl for The New York Times

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Olivier Douliery/ABACAUSA.com, via Bloomberg

SUPPORT SCIENCE President Obama toured a White House science fair last year. Younger students have been put under a microscope but college is where excitement fades.

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But, it turns out, middle and high school students are having most of the fun, building their erector sets and dropping eggs into water to test the first law of motion. The excitement quickly fades as students brush up against the reality of what David E. Goldberg, an emeritus engineering professor, calls “the math-science death march.” Freshmen in college wade through a blizzard of calculus, physics and chemistry in lecture halls with hundreds of other students. And then many wash out.

Studies have found that roughly 40 percent of students planning engineering and science majors end up switching to other subjects or failing to get any degree. That increases to as much as 60 percent when pre-medical students, who typically have the strongest SAT scores and high school science preparation, are included, according to new data from the University of California at Los Angeles. That is twice the combined attrition rate of all other majors.

For educators, the big question is how to keep the momentum being built in the lower grades from dissipating once the students get to college.

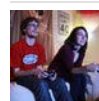
“We’re losing an alarming proportion of our nation’s science talent once the students get to college,” says Mitchell J. Chang, an education professor at U.C.L.A. who has studied the matter. “It’s not just a K-12 preparation issue.”

Professor Chang says that rather than losing mainly students from disadvantaged backgrounds or with lackluster records, the attrition rate can be higher at the most selective schools, where he believes the competition overwhelms even well-qualified students.

“You’d like to think that since these institutions are getting the best students, the students who go there would have the best chances to succeed,” he says. “But if you take two students who have the same high school grade-point average and SAT scores, and you put one in a highly selective school like Berkeley and the other in a school with lower average scores like Cal State, that Berkeley student is

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at least 13 percent less likely than the one at Cal State to finish a STEM degree.”

The bulk of attrition comes in engineering and among pre-med majors, who typically leave STEM fields if their hopes for medical school fade. There is no doubt that the main majors are difficult and growing more complex. Some students still lack math preparation or aren't willing to work hard enough.

Other deterrents are the tough freshman classes, typically followed by two years of fairly abstract courses leading to a senior research or design project. “It's dry and hard to get through, so if you can create an oasis in there, it would be a good thing,” says Dr. Goldberg, who retired last year as an engineering professor at the University of Illinois at Urbana-Champaign and is now an education consultant. He thinks the president's chances of getting his 10,000 engineers is “essentially nil.”

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Christopher Drew covers military technology for The Times.

This article has been revised to reflect the following correction:

Correction: November 13, 2011

An article last Sunday about low attrition rates in science education misstated the surname of Notre Dame's engineering dean at one point. As the article correctly noted elsewhere, he is Peter Kilpatrick, not Kirkpatrick.

A version of this article appeared in print on November 6, 2011, on page ED16 of Education Life with the headline: Why Science Majors Change Their Mind.

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