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Making a Case for Diversity in STEM Fields

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When we were in college some 40 years ago, neither of us ever had an African-American or Latino professor. Unfortunately, even today many students at major American research universities have the same experience. Departments in science, technology, engineering, and mathematics -- the STEM fields -- are typically the least diverse. Not only is that situation dismaying for those of us who lived through the civil rights movement, but it is also a big policy problem for our country.^[1]

At a time when STEM fields are increasingly important to our national security, health, and competitiveness we are neither supporting the research nor producing the diverse pool of scientists and engineers we need to fuel our future.

Programs to broaden the pool of STEM students are being scrutinized, and some have been eliminated. Beyond the obvious logic of numbers -- the more people in a field, the more likely it is that talented practitioners will appear -- research suggests that a diversity of perspectives enriches science and makes engineering more responsive to a global pool of clients. For example, Anthony Lising Antonio, et al. reported on a study of college-student discussion groups in an August 2004 issue of *Psychological Science*. According to the research,^[2] students working in a more diverse group setting were influenced by the different perspectives of minority participants and demonstrated enhanced complex thought processes as a result.

This is especially relevant in the STEM fields, where students are often required to work collaboratively and where thinking about a problem in new and different ways is central to developing solutions. In a friend-of-the-court brief^[3] pertaining to the Supreme Court cases on affirmative action at the University of Michigan, Massachusetts Institute of Technology, Stanford University, DuPont, IBM, National Academy of Sciences, National Academy of Engineering, and the National Action Council for Minorities in Engineering submitted an argument documenting that "the importance of diversity is heightened in the fields of science and engineering."

As an engine of our economy, the STEM disciplines and the diversity of that workforce should give us great pause. Although only 5 percent of American workers were employed in STEM occupations as of 2006, their impact on the national and global economies^[4] is disproportionately large.

In both academe and the workforce, those fields look the least like America, with much smaller proportions of women, African Americans, Native Americans, and Latinos. Although the overall student population has become more diverse, at the undergraduate level members of these minority groups are underrepresented among all STEM majors, with women underrepresented in

many STEM fields. At the graduate level, there is an additional problem: a declining percentage of U.S. citizens. In many departments of physics, computer science, and engineering, it is difficult to find a graduate student who is a U.S. citizen. Across the STEM fields, the situation for faculty members is even more dire.

To achieve better representation in our colleges' STEM departments, we must deal with three issues.

First, we must clearly articulate the educational case for diversity, showing how students and society benefit from it. After that, we can determine how best to reach diversity: What policies should be altered, what practices endorsed, what structural changes made, and what resources committed? In biomedical research, for instance, we must not assume that whites and males are typical of all patients and develop treatments only for them; when scientists who are not white males are present, that assumption is more likely to be challenged. [5]

Second, we need to think more holistically about diversity in STEM, including the need for everyone on our campuses -- undergraduates, graduate students, and faculty and staff members -- to be exposed to diverse ideas and worldviews. For example, in the high-tech industry, the composition of work teams now mirrors the consumer market for company products. No such practices pervade STEM units on campus, although research in many areas ultimately impacts consumers, and many students and faculty will someday operate in the private sector. To reach this goal, we may need to re-examine functions like admissions, financial aid, and faculty recruitment and advancement. What are the criteria by which decisions are made in each case? By reassigning accountability for those functions to a central office, promising and creative practices can be shared throughout the institution, with rewards for STEM units that are diversifying. A campus-wide repository of data, as well as college-specific tools, for monitoring and managing levels of diversity, is essential. Innovative examples can be found in many universities -- Harvard University on faculty searches [6], the University of California at Berkeley on undergraduate support [7], Georgia Tech on promotion and tenure [8] -- which honor excellence while seeking to diversify participation in STEM education and careers.

Third, we must acknowledge that stereotypes still matter, and that they affect perceptions of quality and expectations for performance -- regardless of gender, race, or ethnicity. Studies show [9] that humans use irrelevant external cues and group attributes in our judgments of people -- noting, for example, the race or ethnicity of a doctor before evaluating the extent of her medical knowledge. Assuming that diversity on a campus is just the result of affirmative action or special pleading reveals a different kind of bias. The Supreme Court has ruled that although colleges can consider race/ethnicity as one factor in developing policies such considerations may not carry undue weight relative to other aspects of individual qualifications. Opponents of affirmative-action programs can always claim that their emphasis on group characteristics -- race and sex -- override the required focus on individual characteristics. It seems illogical to operate special programs for the numerical majority -- women and members of minority groups. But special programs remain a valuable source of "intelligence" in guiding the transition to institution-wide approaches. Only leaders, including presidents and trustees, can begin institutional transformation in support of diversity. Though such broad change needs to start at the top, it must also be embraced and carried out at all levels. [10]

So-called race-neutral programs -- created in response to new laws that undercut the use of affirmative action or consider socio-economic status as a proxy for race and ethnicity -- are increasingly advocated by the federal government. But they cannot be the only policy tool used

to right that moral wrong. Instead, we must move toward strategies to transform an entire institution -- to serve the needs of all students and faculty members, regardless of discipline, not just those with certain characteristics. Even those who decry affirmative action should applaud an institution-wide approach that gives students what they need to succeed. Yet, this is not the same as providing "equal" treatment.

Judicial retreat on diversity in primary and secondary education is making it more difficult to diversify institutions of higher education. For example, in spring 2007 the Supreme Court struck down ^[1] voluntary local strategies to desegregate schools in Seattle and Jefferson County, Kentucky. The rulings asserted that American society is color blind and the playing field is level -- assertions that are both naïve and self-deceptive.

Americans born with the "right" sex, race, or social class still receive advantages at birth. And residence patterns can compound those advantages, as some public schools have the money to buy new technology and hire seasoned educators while others do not. Data from the College Board show that SAT scores are closely linked with zip codes. In the words of Isabel V. Sawhill, a senior fellow at the Brookings Institution, "At virtually every level, education in America tends to perpetuate rather than compensate for existing inequalities." She notes, "It takes about five generations for the advantages and disadvantages of family background to die out in the United States."

Meanwhile, the fact remains that the United States is already importing talent and outsourcing technical jobs. Although that may make sense for our society in the short run, it is risky policy in the long run. Sooner or later, a white male science, engineering, or medical-school graduate will sue his alma mater -- not because he was denied admission to a special program, but because his education in a homogeneous environment left him ill equipped to function in his chosen career. His lack of cultural competence will have impaired his contributions to the productivity of a diverse team, to satisfy a diverse client market, or to treat a diverse group of patients.

Let us not deceive ourselves. The legacy of *Brown v. Board of Education* may be in danger in the courts, and thus race-based affirmative action may no longer represent a viable national strategy for providing educational opportunity to all Americans. But our colleges and universities have an obligation to teach science, technology, engineering, and mathematics to a racially and ethnically diverse group of U.S. citizens -- for our own good.

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[1] http://www.nytimes.com/2008/01/08/science/08conv.html?_r=1&pagewanted=print&oref=slogin

[2] <http://www.stanford.edu/%7Eaantonio/psychsci.pdf>

[3] http://supreme.lp.findlaw.com/supreme_court/briefs/02-241/02-241.mer.ami.mit.doc

[4] https://www.cpst.org/STEM/STEM8_Report.pdf

- [5] <http://jama.ama-assn.org/cgi/content/full/300/10/1135>
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