

A Success Story

Recruiting & Retaining Underrepresented Minority Doctoral Students in Biomedical Engineering

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P E R S P E C T I V E S

When building a URM student presence, nurturing a nucleus of strong students is critical

IN THE EARLY 1990S, there were only a handful of African American doctoral students in all of the math, science, and engineering graduate programs at Duke University. Prior to 1995, the school of engineering had granted only one PhD to an African American. My own department of biomedical engineering (BME), which has a nationally top-ranked graduate program, had never granted a PhD to

an African American in its thirty years of existence. All African American students recruited into the BME doctoral program had either left with a Master's degree or dropped out altogether.

Now, fast-forward. In 2000, the Duke BME program awarded its third PhD to a Hispanic; in 2004, it awarded its first PhD to an African American. By 2005, the underrepresented minority (URM) cohort of thirteen BME doctoral students comprised the highest number of URM doctoral students in all the math, science, and engineering departments at Duke, including the social sciences; more than a quarter of the total URM doctoral students in all of Duke's thirty-two graduate programs in math and natural, physical, biological, and biomedical science; and nearly one-tenth of the total URM students enrolled in all fifty PhD-granting programs at Duke University.

What follows is the story of Duke BME's success in solving one of the most persistent (and touchy) problems in math, science, and engineering graduate education: the recruitment and retention of URM doctoral students.

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Change at Duke

In 1996, I took sabbatical leave at North Carolina Central University, a historically black university in Durham, and immersed myself in the study of minority education in math, science, and engineering. I used this experience to develop a game plan for venturing outside of established recruitment norms. Upon my return to Duke, I was selected to direct a biotechnology training grant from the National Institutes of Health (NIH) that supports predoctoral fellows during their first years of graduate training. Soon thereafter, I was appointed director of graduate studies in BME. This combination gave me the mandate, the authority, and the resources to make a difference.

The central resource was, of course, the graduate school itself. Each graduate program at Duke, based on its size, receives a budget from the graduate school to support student tuition, stipends, and fees, all of which are supplemented by research funds, fellowships, and training grants. Funds from the graduate school are both substantial and largely discretionary because the BME graduate program is one of the largest at Duke University, the BME faculty is well funded, BME graduate students are highly successful in garnering substantial external fellowships, and BME has two NIH training grants to support graduate students. The graduate school also offers two-year fellowships from the Duke endowment to the most highly qualified URM applicants.

Now, the hard part. Graduate students in the sciences are prime vehicles by which faculty accomplish their research agendas. This has led to a "risk-averse" dependence of faculty on student success that does not exist in medicine, law, or business. Nor does it exist in



the humanities, summer research programs, or undergraduate education. This unique student–faculty relationship, when it works, can be a great strength of science education; but, when it fails, it can be a great barrier to success. For URM, it can impose a highly personal burden that is as much about attitude and culture as it is about talent and resources.

I realized that the faculty and departmental “comfort zone” had to be relaxed so that “URM” was no longer a defining characteristic but, rather, a nuance within a larger context.

Duke University

Although the support from the administration



was vital, this cultural transition could not have been accomplished by an administrator or a staff person alone. It had instead to be advocated at the departmental level by a faculty member with (1) successful and productive URM students in his or her own lab, (2) a vigorous research profile, (3) the respect of the other BME faculty, and (4) control over resources for supporting URM students. Proceeding with anything less would have made the effort unsustainable in the long run.

Through a combination of graduate school, Duke endowment, and NIH training grant funds, I was able to recruit a crucial nucleus of two URM graduate students in 1998 and 1999. I mentored one student directly in my lab and the other indirectly through my training grant. Next, I broadened the effort by recruiting a second wave of students and began encouraging other BME faculty to take URM into their research groups. By the end of my term as director of graduate studies in 2003, ten URM graduate students were working in the research groups of seven different BME faculty members. By 2005, thirteen URM graduate students were spread across the BME department, working for ten different mentors. Half of these students received NIH support in the form of a predoctoral traineeship and/or as minority research supplements to NIH grants. The rest received graduate fellowships from either the National Science Foundation or the Duke endowment. Between 2000 and 2005, only one URM student left the BME doctoral program.

Recruiting URM students

The Pratt School of Engineering at Duke has an award-winning outreach program that brings minority and disabled undergraduates to campus for summer research experiences (see www.pratt.duke.edu/about/outreach.php). The majority of URM students come to the program from minority-serving colleges and universities, and roughly 80 percent of these students go on to either graduate or medical school. Yet, even an outstanding outreach program like Pratt's does not necessarily lead to increased URM enrollment—although it clearly has a positive effect on the campus climate. While BME faculty participation in this program is very high, no URM student participant has matriculated into the Duke BME graduate program.

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All graduate training eventually boils down to individual faculty members committing to individual students, and vice versa. It is an absolute certainty that the faculty who recruit students will make decisions that are in their own interests, and so too will the top students they attempt to recruit. Consequently, a faculty member may decide that it is not worth the cost in time and productivity to mentor a student who is seen as a "project." The lack of URM recruitment success fostered by this attitude is often expressed as a self-fulfilling prophesy: "we can find only a few minority students worth recruiting," or "we can recruit them but they won't come anyway." In fact, the best and brightest minority students will enroll in top programs where their presence is viewed as a positive contribution. Addressing this interplay honestly and directly within the resource-limited world of academic research is central to ameliorating stigmas attached to URM students. When building a URM student presence, nurturing a nucleus of strong students is critical.

This, I suppose, is the point at which I may be expected to offer the "silver bullet." But I don't have one, and neither does anyone else. The best I can do is to recommend focusing your recruitment efforts on those things over which you have immediate influence. For me, this was my own graduate program and, even more important, my own research group. I chose not to divert my time and attention by going to minority conferences (although I do send my students), meeting with student groups (Duke has no minority engineering program), or visiting minority campuses (although I did that sabbatical at North Carolina Central University).

Each of the URM graduate students currently enrolled in BME applied directly to the doctoral program and was admitted in the normal fashion—that is, on the basis of strong undergraduate records, test scores, and letters of recommendation. The critical factor was not convincing quality URM students to apply for entrance into the program; rather, it was convincing students and faculty alike that this would work. Until things change significantly, majority faculty members need to step forward and enthusiastically mentor minority students,

and minority students need to be openly receptive to the mentorship offered by majority faculty. The more people see working examples, the more likely it becomes that URM recruitment and retention will succeed.

Two particularly corrosive barriers to program diversification are recruitment by consensus and tapping into funds used to support the overall student pool. Structurally, I had the dual advantage of being a BME faculty member—our tradition is to recruit students individually, without the oversight of an admissions committee—and being the director of graduate studies and the training grant director simultaneously, which allowed me specifically to target funds to recruit and support URM students.

Recommendations

If you are a faculty member who wants things to change, then recruit a minority student directly into your own group and give the student a home from the day he or she walks onto campus. Don't expect an admissions committee or someone else to solve the problem for you. If you are a graduate program director who wants to make a difference, then make personal and selective appeals for open-minded faculty members to recruit specific URM students. Many people will step forward if asked directly. If you are an administrator who wants to help, then provide the willing with the resources and independence to successfully recruit and retain URM students. The availability of supplemental funding opportunities is particularly important.

There are various ways to succeed in recruiting and retaining URM doctoral students; but key to them all is the creation of real student-faculty relationships, which demonstrate by example that diversity and excellence can and should coexist. This cannot be delegated or done indirectly, and no amount of outreach, campus visits, or diversity awareness activities—however well-intentioned—can achieve the effect of positive examples. Ultimately, seeing is believing. □

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