

July 21, 2005

Dear Colleagues:

In the 1990s, I looked around and saw that there were only a handful of African-American doctoral students in all of the math, science and engineering (MSE) graduate programs at Duke University. Prior to 1995, the School of Engineering at Duke had granted only one Ph.D. to an African-American. My own Department of Biomedical Engineering (BME), a nationally top-ranked graduate program, had never granted a Ph.D. to an African-American in 30 years of existence. All African-American students recruited into the BME doctoral program had either left with a Masters degree or dropped out all together.

Now fast-forward. In 2000 Duke BME awarded its third Ph.D. to a Hispanic-American, and its first to an African-American in 2004. By 2005, the current underrepresented minority (URM) cohort of thirteen BME doctoral students comprises: the highest number of URM doctoral students in all the MSE departments at Duke, including the social sciences; more than a quarter of the total URM doctoral students in all of Duke's 32 math, natural, physical, biological and biomedical science graduate programs; and nearly a tenth of the total URM students currently enrolled in all 50 Ph.D. granting programs at Duke University. A full listing of Duke's graduate recruitment and retention statistics by department, broken down by gender, race/ethnicity and citizenship, is easily found on the web at <http://www.gradschool.duke.edu/About/statistics.htm>.

Here, I write to describe a straightforward success story in one of the most persistent (and touchy) problems in MSE graduate education: the recruitment and retention of URM doctoral students. In spite of all that has been said and written about the subject, there are no definitive sources of common wisdom, and what you can find is mostly anecdotal. What I know now I more or less obtained through sweat equity. My concern is that the lessons learned in accomplishing this transformation, admittedly in one program at one university, will disappear if not reported. In the

end it succeeded through preparation, coordination of resources, alignment with the departmental culture, and the steadfast support of others.

I prepared by taking sabbatical leave in 1996 at North Carolina Central University, a Historically Black University in Durham, NC (a risky professional move I might add). There, I immersed myself in the topic of minority education in math, science and engineering. Academically, I co-authored three papers in the Journal of Engineering Education on minority undergraduate and graduate students (86(1997):241, 87(1998):257), and on “survival skills” in academic engineering (91(2002):133). Most importantly, this experience allowed me to research the topic thoroughly and develop a game plan for venturing outside of established recruitment norms. Upon returning to Duke, I was selected as Director of a NIH biotechnology training grant that supports predoctoral fellows during the first years of their graduate training. Soon thereafter I was appointed Director of Graduate Studies (DGS) 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. Each graduate program at Duke receives a budget (based on program size) from the Graduate School to support student tuition, stipends and fees that are also supplemented by research funds, fellowships and training grants. Funds from the graduate school were both substantial and largely discretionary because the BME Graduate Program is the largest at Duke University, the BME faculty is well funded, BME graduate students are very 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.

Doctoral programs in MSE have remained extremely difficult for URM to penetrate because graduate students in the sciences are prime vehicles by which faculty accomplish their research agenda. This has led to a “risk-averse” dependence of faculty on student success that does not exist in medicine, law or business. It is also not the case in the humanities, summer research programs, or with undergraduate education. This expectation is both science education’s greatest strength when it works, and its greatest barrier to success when it fails. For URM, this 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; rather, it needed to become a nuance within a larger context. Although it was vital that the administration was supportive of change, this transition could not have been accomplished by an administrator or a staff person. It had to be advocated on the departmental level by a faculty member who had (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 else would have been unsustainable in the long run.

Working closely with Dr. Jacqueline Looney, Associate Dean of Graduate Student Affairs, I used a combination of graduate school, Duke Endowment, and NIH training grant funds 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 who embodied this vision to take URM into their research groups. By the end of my term as DGS in 2003 there were ten URM graduate students in BME working in the research groups of seven different BME faculty members. In 2005, thirteen URM students are spread across the BME department,

working for ten different mentors, and flourishing. These students are performing research in biophotonics, biomechanics, tissue engineering, electrophysiology, biosensors, biomaterials, drug delivery, medical imaging and bioinformatics. Half of these students have received NIH support in the form of a predoctoral traineeship and/or as minority research supplements to NIH grants. The rest received NSF or Duke Endowment graduate fellowships. Each is an outstanding student who fits well within the overall departmental profile for academic preparation and talent. From 2000 to 2005, only one URM student has left the BME graduate program, to join her missionary husband.

Fortunately, Duke is a place where this work was not only possible but was strongly supported by a number of key people: BME Chairs Roger Barr and Mort Friedman, Engineering Dean Earl Dowell, Graduate School Dean Lewis Siegel, Associate Dean of Graduate Student Affairs Jacqueline Looney, and the members of the Biomolecular & Tissue Engineering Steering Committee who approved appointment of training grant fellows. All believed in what I was doing, provided critical resources and/or voiced support. I also had the unflinching confidence of the University President Nan Keohane. I further enjoyed the support of BME graduate students and a number of BME faculty members who welcomed URM students. I am particularly grateful to the graduate students in my own group, to Professor Lori Setton who was the first BME faculty member to join me in this effort, and to my replacement as DGS, Professor Barry Myers, for continuing this work with skill and enthusiasm.

Eventually all graduate training boils down to individual faculty committing to individual students and visa versa. It is an absolute certainty that faculty who are recruiting students, and the top students that they are attempting to recruit, will make decisions that are in their own interests. 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 URM recruitment success fostered by

this attitude is often dismissed as “we can find only few minority students worth recruiting” or as “we can recruit them but they won't come anyway.” This prophecy is self-fulfilling. 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 in the resource-limited world of academic research is central to ameliorating stigmas attached to URM students.

An absolutely critical point was the nurturing a nucleus of strong students when building a URM student presence. The NSF is particularly enthusiastic about programs that mainstream students from minority serving colleges and universities. For example, the Pratt School of Engineering at Duke has a nationally award-winning outreach program run by Assistant Dean Martha Absher that brings minority and disabled undergraduates to Duke for summer research experiences (<http://www.pratt.duke.edu/about/outreach.php>). What she does with these students borders on magical. The majority of URM students come from minority serving colleges and universities, roughly 80% of which go on to either graduate or medical school. While BME faculty participation is very high, no URM student who has participated in this program has matriculated into the Duke BME doctoral program. Thus, 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. Having said this, Duke BME currently has four students that came from Spellman, Howard and Florida A&M universities.

This is where I'm supposed to offer “the magic bullet,” but I don't know of one. No one else does either. The best I have is to offer is to focus your efforts on what you have immediate influence over. For me this was my own graduate program, and more importantly my own research group. I also chose not to divert my time and attention by going to minority conferences (although I do send my students), meeting with student groups (there is no minority engineering program at Duke), or visiting minority campuses (although I did a sabbatical at NC Central).

Each URM graduate student currently enrolled in BME applied directly to the BME doctoral program and were admitted in the normal fashion on the basis of strong undergraduate records, test scores, and letters of recommendation. The critical point was not whether quality URM students were applying; rather, it was convincing students and faculty that this would work. Until things change significantly, this means majority faculty stepping forward to enthusiastically mentor minority students, and minority students being openly receptive to the mentorship offered by majority faculty. The more people see working examples the more it will spread.

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 admissions committee oversight), and being both DGS and training grant director (allowing me to target funds to recruit and support URM students). My recommendation? If you are a faculty member who wants things to change, then recruit a minority student directly into your own group and give them 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 an administrator and want to help, then provide the willing with the resources and independence to successfully recruit and retain URM students. It is particularly important to make available supplemental funding opportunities. Here, the Duke Endowment Fellowship accomplishes this. At the NIH, this is accomplished by Minority Research Supplements to existing NIH grants.

How success is accomplished may vary, but the central element is creating real student-faculty relationships that are positive examples that diversity and excellence can and should coexist. No amount of well-intentioned outreach, campus visits, or diversity awareness activities can replace

this (although people regularly try). This is not something that you can delegate or do indirectly.  
Ultimately, seeing is believing. If done mindfully, others will follow.

Sincerely;

William M. Reichert, Ph.D.

Professor of Biomedical Engineering and Chemistry

Director, Center for Biomolecular and Tissue Engineering

Duke University

Durham, NC 27708-0281

(919) 660-5151

[reichert@duke.edu](mailto:reichert@duke.edu)