

U.S. HIGHER EDUCATION

Minority Retention Rates in Science Are Sore Spot for Most Universities

A few universities have demonstrated what it takes to help more minority students earn science degrees. But their efforts are only beginning to be widely replicated

CATONSVILLE, MARYLAND—Yohance Allette didn't panic when he hit a "rough stretch" of science courses last year as a sophomore at the University of Maryland, Baltimore County (UMBC) here. He knew that, as a Meyerhoff Scholar, he could lean on what he calls his "friends and family"—older students, faculty members, and university staff—to help him make it through organic chemistry, physics, and genetics.

Having such a support group is a big reason why Allette, a biology major, and other Meyerhoff scholarship students are twice as likely to earn a bachelor's degree in a science field, and five times as likely to enroll in graduate study, as their peers who were accepted but chose not to enter the program. "It's like being able to talk with your older brother or sister," says Allette, whose parents are from the Caribbean.

Begun in 1989, the Meyerhoff program has tried to address a glaring failure of U.S. higher education: the high attrition rates among minority students (predominantly African-Americans and Hispanics) who declare an interest in science, technology, engineering, and mathematics (*Science*, 31 March 2006, p. 1870). Although minority students entering U.S. colleges are just as interested as their

white peers in these STEM fields, they are only two-thirds as likely as whites to earn bachelor's degrees in those fields within 6 years. (Asian Americans, who are not considered a minority in STEM fields, are more likely than whites to earn such degrees.)

"Most institutions have the *intent* to improve retention rates; they simply don't



A team approach. John Matsui and students in the Biology Scholars Program at UC Berkeley.

know how to do it," says mathematician Freeman Hrabowski, UMBC's president. He's also a standard-bearer for the program, backed by Baltimore philanthropists Robert and Jane

Meyerhoff. Their family foundation supplies two-thirds of the program's \$3.5 million budget for 2008–09.

On the West Coast, the 16-year-old Biology Scholars Program (BSP) at the University of California (UC), Berkeley, has also succeeded in helping underrepresented minorities make it through college. Since 2000, 69% of its 650 students have graduated within 4 years, topping the 61% rate for the rest of the student body. Among African-American students—some of whom take more than 4 years to complete their studies—scholars have a 93% graduation rate versus 73% for their nonprogram peers. Only 0.15% of biology scholars are dismissed for poor academic performance, notes evolutionary biologist John Matsui, who directs the program, compared with 3.5% for all UC Berkeley undergraduates. The program's annual budget of \$1.5 million comes from the Howard Hughes Medical Institute (HHMI) and, since 2004, the Gordon and Betty Moore Foundation.

Although the two programs differ in many respects, their ability to lend minority students a helping hand at the right time seems to be critically important. For his first 2 years

at UC Berkeley, Eric Octavio Campos, a graduating senior, says, "I was very much alone on this huge campus, and there were so few Latinos or African Americans in my science

Following the Leaders

Several institutions have begun to imitate aspects of the Meyerhoff program at the University of Maryland, Baltimore County, and the Biology Scholars Program at the University of California (UC), Berkeley (see main text). However, none has published comprehensive data on what has been accomplished.

Five years ago, Louisiana State University, Baton Rouge, began a program to serve disadvantaged science students. LA-STEM tries to replicate Meyerhoff's tiered mentoring and summer programs but without the same level of financial aid. With this month's graduation, 46 students have completed the program, with a retention rate of 90%. Even so, its driving force, vice chancellor and analytical chemist Isaiah Warner, admits that "we are far behind Meyerhoff in terms of getting and measuring results."

This past summer, about 50 incoming engineering students at the University of Michigan (UM) joined a new academy that includes a summer program, mentoring, research internships, and modest student grants. "Our challenge was, How could we put a Meyerhoff-like model to work in a large research institution?" says Derek Scott, who directs UM's multicultural engineering program.

The UC Berkeley program has been an inspiration for two other UC campuses, and in 2007, Cornell University embraced its name and concepts to tackle its attrition rate among minorities in biology, says virologist Laurel Southard, who directs the department's undergraduate research and outreach. The Cornell program takes in 20 to 25 first-year students each year, offering them mentoring, special events, and research opportunities. Southard is seeking outside support to supplement a small budget provided by the department and the vice provost's office.

The biology department at Harvard University offers a Howard Hughes Medical Institute–sponsored program that each year enrolls about 40 freshmen students from disadvantaged backgrounds. "We stick with them for all 4 years," says biologist Robert Lue. "They are assigned to a faculty lab and mentored by faculty and others." In 2006, Harvard started a wider effort—the Program for Research in Science and Engineering—that offers summer research opportunities to undergraduates from all of the sciences. Lue says that the number of women and underrepresented minorities majoring in the life sciences has risen by 16% over the past 4 years. He's now analyzing the program's impact on attrition rates.

—R.K.

classes.” But joining the Scholars program “gave me a sense of community and helped advise me on how to get where I wanted to go in science.” This fall, Campos will enter a Ph.D. program in biology at the University of Washington, Seattle.

Good intentions, scant data

UMBC and UC Berkeley often figure prominently in discussions of how to bolster the numbers of minorities entering STEM fields. It’s a perennial topic among those who worry about whether the United States is producing enough scientists and engineers. Michael Summers, a biochemist at UMBC who has been active in the Meyerhoff program, wondered why more universities haven’t been able to match its success.

Summers took his concerns to HHMI, which supports Summers’ lab as an HHMI investigator. With help from the institute and contributions from the National Institutes of Health, Summers and colleagues invited diversity specialists from 75 research universities and leading 4-year colleges to discuss undergraduate STEM diversity and retention.

Summers recalls that many administrators who attended the group’s first meeting in 2004 at Harvard University “were shocked at how low STEM retention was among disadvantaged students” and by how few institutions actually tracked dropout rates from STEM fields.

They vowed to do better. Educators met again in 2007 and 2008 to report on their progress, including the status of new programs.

But Summers says few have developed good empirical data. “Most institutions don’t track their students and thus don’t know their own performance when it

comes to retaining and educating underrepresented minorities,” he says. And it will take years to collect and analyze the data at institutions that have begun to do so.

One problem, says John Slaughter, president of the National Action Council for Minorities in Engineering in White Plains, New York, is that most universities that care about diversity have concentrated on entry points rather than completion rates. “We need to focus more of our attention on outcomes like retention and graduation rather than simply enrolling more minority students,” he argues.

Another issue is the paucity of good studies of what Matsui calls “the sociology of science diversity.” Conventional wisdom values summer bridge programs for incoming freshmen and the chance to do undergraduate research, for example, but Matsui says “we need more rigorous study to understand what works, for which students, and under what conditions.” Such comparisons are hard to make when most programs preselect students, notes social psychologist Martin Chemers of UC Santa Cruz, who adds that the lack of control groups hinders empirical studies.

A third problem is the absence of data on what happens after students graduate. “We have no idea whether most of these programs are working or not,” says Willie Pearson Jr., a sociologist at the Georgia Institute of Technology in Atlanta who studies science education. “There’s a great need for follow-up data.” The National Science Foundation hopes to address that need, says Kellina Craig-Henderson, a manager within NSF’s cognitive sciences program, with an initiative, labeled “The Science of Broadening Participation,” that would fund research on effective programs and how they can be scaled up.

Different approaches

The UMBC and UC Berkeley programs take different paths to help their target populations. UMBC recruits high-achieving



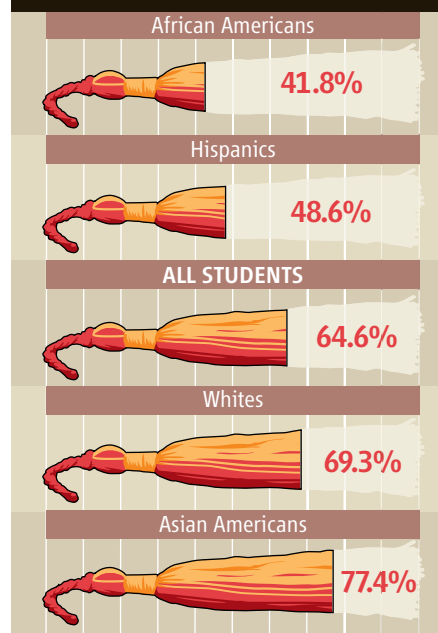
Success in situ. Yohance Allette says the Meyerhoff program has helped him stay in biology.

high-school seniors, two-thirds of them underrepresented minorities, gives them generous financial aid, uses a summer bridge program to create group cohesion, plunges them quickly into research, and surrounds them with mentors. Rather than focus mainly on what he calls “high flyers,” Matsui looks

for “those on the margins, who will succeed if given the right environment and opportunities.” The UC Berkeley program offers mentoring and group cohesion but does not include a summer program, offer a separate stipend, or require freshmen to do research.

Meyerhoff’s results are impressive. Seven of eight graduates (more than 650) have earned degrees in STEM fields, and they have gone on to receive 53 Ph.D. degrees, 74 medical degrees, and 21 combined degrees. Hrabowski says that makes UMBC, with an enrollment that is 14% African-American and 3% His-

STAYING THE COURSE



Elusive degree. A minority of African-American and Hispanic students who begin as science majors actually graduate with a STEM degree.

panic, “one of the few predominantly white universities producing significant numbers of African-Americans who go on to get Ph.D.s.”

UC Berkeley’s program, which has helped 2000 students, can’t match those retention numbers: So far, about 70% of BSP students have graduated with biology degrees. Matsui is proud of having created what he calls a sense of community among students, advisers, and “culturally sensitive” faculty members. “The network of close-knit students and mentors gives you a basis to succeed,” says UC Berkeley senior Dannielle McBride, an African American who joined Matsui’s group after four part-time years at a community college.

Although they disagree on some of the necessary ingredients, Hrabowski and Matsui are both passionate about collecting and analyzing data to evaluate and improve their programs. They are also eager to share their knowledge with other universities. “We place a great deal of emphasis on evaluation, and other institutions should also,” says Hrabowski, who chairs a National Research Council panel for the National Academies that is assessing minority STEM education.

Allette, a rising senior who hopes to earn a combined M.D.-Ph.D. degree, says programs like Meyerhoff provide students with the support they need to persevere. “The challenge for science majors is not so much, ‘Do I want to do it?’ as ‘Can I do it?’ Once you are confident of success, you can go far.”

—ROBERT KOENIG