# Keeping Black students in STEM

For years, STEM programs have tried to attract Black grads and undergrads. There's a new push to retain these students—and emulate the university program that seems to have had the most success.

Melissa Suran, *Science Writer*

The science curriculum at Akeema Onalaja's high school in South Los Angeles, CA, ended with biology. Yet she pursued a career in biochemistry, knowing that becoming a researcher—let alone one who is Black—wouldn't be easy. Initially, she did well at Mount Saint Mary's University, Los Angeles in CA. But after an unexpected death in the family, her grades plummeted sophomore year. "I came from a single-parent household where drug abuse made it so I couldn't even go home on the weekends...there aren't a lot of professors who can relate," says Onalaja, recalling only one of her all-White and seemingly middle-class professors asking about the drop in her grades. Persevering, Onalaja graduated with a 3.0 GPA. She still aspired to attend graduate school, although it would turn out to be a tall order.

"I knew some of the conversations that my teachers had with other students applying to grad school, and I felt like I didn't get the same level of care," Onalaja says. "That made me believe I really couldn't make it, and getting my first rejection letter from grad school solidified what I had thought." After being denied admission to a graduate program, Onalaja left the science, technology, engineering, and mathematics (STEM) research track in 2014 for a science-related sales position. She takes responsibility for this turn. Had Onalaja been more open about her struggles, she says she perhaps could have received the moral
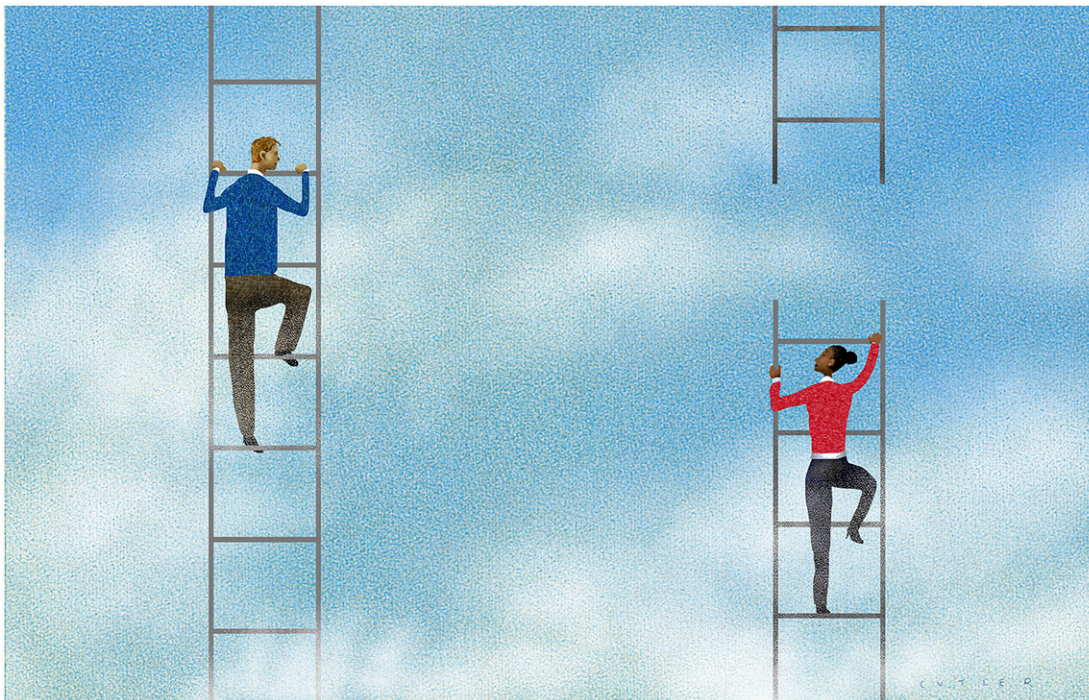
Despite attempts to level the playing field, Black college students continue to leave STEM at higher rates than their White peers. Several university programs are trying to change that trend. Image credit: Dave Cutler (artist).

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Freeman Hrabowski cofounded UMBC's Meyerhoff Scholars Program, which has had its share of success in retaining students of color in STEM. Image credit: Marlayna Demond (University of Maryland, Baltimore County, Baltimore, MD).

support she needed. And although Onalaja is proud of her biochemistry degree and loves her job, she sometimes wishes that she would have made a meaningful contribution to her original field of interest—cancer research.

Despite decades of attempts at leveling the playing field, Black college students continue to leave STEM fields at higher rates than their White peers. According to a 2019 *Educational Researcher* study of undergraduates, 40% of Black students switch out of STEM majors, compared with 29% of White students (1). And in a SimpsonScarborough survey that examined the effects of coronavirus disease 2019 (COVID-19) uncertainties on college enrollment, 41% of high school seniors from historically underrepresented groups reported that they might not even attend college during their fall semester (2).

"If you're Black, you may have the drive, you may have the passion, but you also have deficiencies that were born of differential opportunities," says Shirley Malcom, director of STEM Equity Achievement Change, an initiative of the American Association for the Advancement of Science in Washington, DC, that supports making institutions diverse and inclusive.

These differential opportunities limit students from honing their skills and demonstrating their strengths, adds Malcom. Too often, she says, "the focus is on fixing the student rather than fixing the system."

The Black Lives Matter movement has refocused discussions about representation in the classroom—not to mention outright racism—stirring poignancy and creating urgency: figuring out how to give Black students on a STEM path in college a greater chance of making it to and through graduate school. As researchers and institutions try to monitor racism and racial imbalances in academia and pinpoint their roots, there's increased interest in scholastic programs aimed at boosting retention. Universities are looking to replicate the successes of existing efforts—and find ways to remedy their shortcomings.

A Model Program

Freeman Hrabowski, president of the University of Maryland, Baltimore County (UMBC), is synonymous with the Meyerhoff Scholars Program—perhaps the most successful endeavor focused on increasing STEM diversity. Hrabowski cofounded the program with philanthropists Robert and Jane Meyerhoff in 1988. Three decades later, it boasts undergraduate STEM retention rates of more than 90% (3). The program aims to change the climate and culture of academia as well as address widespread practices that make it difficult for underrepresented students to succeed.

By incorporating elements such as personal counseling, research internships, and a summer program to prepare high school graduates for college-level coursework, UMBC created a model to help students of various backgrounds earn STEM degrees. "We have folks who've never stepped foot in a lab and had challenges in high school," says Meyerhoff's director, Keith Harmon. "But they have a passion for STEM, and that's a big part of what we look for in our students."

No matter the skill level, everyone receives tutoring and mentoring; Harmon says that's part of the Meyerhoff program's emphasis on community. "It's difficult to do well when you're isolated, and isolation in STEM is still a major issue for people of color," he cautions. "We tell our students early on that they can and should ask for help, and even our best students seek help and get support. Nobody should be doing this alone, because when you're in a community, you can attack issues like stereotype threat and imposter syndrome."

So Meyerhoff recruits mentors who physically resemble the scholars. It's a key move. A 2018 Strada-Gallup survey of 5,107 college graduates, which investigated life during and after college, found that graduates from underrepresented groups are less likely than their peers to identify a professor as their mentor (4). The survey report also referenced previous research suggesting that underrepresented students "often seek mentors of the same race/ethnicity and find information more helpful when their mentor is of the same race/ethnicity."

While Meyerhoff student cohorts may be a melting pot, UMBC—like many universities (5)—lacks a diverse STEM faculty. And although several professors are dedicated to the Meyerhoff mission, Harmon says it's important for students to see that achievement isn't contingent on skin color. That's why numerous Meyerhoff mentors are based at institutions outside of UMBC. Mentors have a range of experience, from tier-one universities to national labs, and are typically part of the alumni network.

Leaving STEM

Of course, not all Meyerhoff scholars remain in STEM—often for the same reasons that other early-career researchers leave the research track: a brutal path in academia, a change in interests, or a realization that their science skills might aptly transfer to a potentially more fulfilling or lucrative arena. Cheryl Matthews attended UMBC specifically for the Meyerhoff program—as did her brother and sister. Only Matthews' brother,

currently a graduate student studying aerospace engineering at Stanford University in CA, stayed in STEM. Now a staff attorney at the US Court of Appeals for the Ninth Circuit in San Francisco, CA, Cheryl made the transition to law after earning a biopsychology degree from UMBC in 2006.

For her, science research just wasn't the right fit. "I think there's sometimes pressure to stay on a path that you shouldn't necessarily continue on because there aren't many of us in STEM," Matthews says, referring to Black students. "Before I graduated, I knew that I didn't want to continue doing research in behavioral science, but I didn't know how to say it without letting a lot of people down. I had this great community and all these resources, and I didn't want them to think that I was taking it all for granted."

Matthews ultimately pursued work that she felt was more fulfilling. "What drew me to law was that I felt like I could have a direct impact on people's lives, and I could actually see it," she says. "I'm using the same skills that I would use in science for research questions or hypotheses, but now I'm in the trenches."

Although Matthews left STEM after college, a 2019 edited volume of original research titled *Talking about Leaving Revisited: Persistence, Relocation, and Loss in Undergraduate STEM Education* (*TALR*) showed that 80% of all undergraduates who switch out of STEM majors do so by the end of sophomore year (6). Compared with 13% of their White peers, 26% of Black STEM majors drop out of college altogether at some point during their undergraduate career (1). Exacerbating the problem is what has come to be known as weed-out culture, in which institutions design introductory courses to be exceptionally arduous. This often compels STEM majors to withdraw. "You get a lot of Black students weeded out in those intro courses," says Malcom, who served on the President's Committee of Advisors on Science and Technology under Bill Clinton. "You look around the following year, and they're not there anymore."

TALR analyses of undergraduate transcripts suggest that African American students are approximately 1.6 times more likely than White students to withdraw from or receive D's, F's, or incomplete grades in STEM weed-out classes (7). According to Malcom, it's because Black students often come from neighborhoods where schools don't provide quality education. And "in too many cases," she says, "support is not provided by higher education institutions to help move smart and underprepared students forward."

Challenges and Lessons Learned
The Meyerhoff model has attracted the interest of other institutions—and to an extent, has started to pay dividends. In 2014, the Howard Hughes Medical Institute (HHMI) in Chevy Chase, MD, began the Meyerhoff Adaptation Project, in which it provided funding for five years to learn how the model might be adapted at The Pennsylvania State University in University Park, PA, and The University of North Carolina at Chapel Hill (UNC). The outcomes demonstrated that the Meyerhoff model works elsewhere, as the GPAs as well as graduation and retention rates of adaptation project cohorts paralleled those of UMBC's Meyerhoff program (3). However, there's a challenge: ensuring that new Meyerhoff efforts synergize with other diversity initiatives. Whereas the Meyerhoff model may be a perfect fit for UMBC, it must be tailored to the culture of a given institution.

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>
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Thomas Freeman, a chemistry professor at UNC who coauthored an article on the adaptation project's results (3), notes, for example, that UNC promotes individual achievement, whereas Meyerhoff emphasizes cohort collaboration. "The practice at UMBC in its math course was to have an entire group. . .receive the lowest-scoring student's grade on some assignments," he explains. "The purpose is to motivate all students to help the least-prepared students perform at their best." Nevertheless, UNC adjusted to the Meyerhoff mindset. Some students opposed "having their grades determined as a result of group work in our summer courses," says Freeman. "But the instructors and program staff helped the students understand and eventually appreciate the benefits of this approach."

Another obstacle was making clear how the new program differs from other initiatives. "If you already have several programs on your campus, how do you ensure that [a Meyerhoff-based program] will be prominent and really make a difference in a way that the other programs could not?" asks David Asai, senior director for science education at HHMI. The Meyerhoff program is far more extensive—and expensive—than many diversity-focused campus initiatives at places like UNC. So the university had to integrate existing initiatives into its adaptation of Meyerhoff's model and deduce what pieces were still required. Case in point: a preestablished, interdisciplinary summer program for new students acclimating to college.

"That program's leader helped us figure out the logistics of running our own summer program," Freeman says. "Conversations between these groups and our partners at UMBC helped us understand what we were missing and then try to gather the resources or adjust our policies [and/or] practices where needed."

Through their five-year project, HHMI concluded that the key to successfully adapting the Meyerhoff model is for institutions to comprehend the purpose behind Meyerhoff's 13 cardinal elements, which incorporate advising, community, family involvement, and financial support. According to Asai, it's imperative that administrators understand the goals of each element

and how every component contributes to different aspects of student accomplishment. Addressing related matters has helped HHMI take the next step.

In 2019, the adaptation project ended, and HHMI announced its Driving Change competition, through which it would fund six institutions to create inclusive STEM environments inspired by the Meyerhoff program. Applicants weren't only required to explain plans for using the grant money but also to reflect on their ability and ongoing efforts to achieve cultural change. Although finalists have been selected, the competition is suspended for now because of the COVID-19 pandemic.

Echoes of the Past

Such programs, regardless of their aims or implementation, take place in the shadow of systemic racism that's persisted for centuries. Malcom sees eerie similarities between the challenges she faced as a Black college student during the 1960s and those of Black undergraduates in STEM today. A former straight-A student, Malcom was ill-prepared for college. Her Alabama high school didn't invest much in STEM—let alone other subjects. As one of the few Black individuals enrolled in the University of Washington in Seattle, WA, Malcom felt isolated on campus; even her teaching assistant was the only Black graduate student in the chemistry department. But Malcom persevered and went on to earn a doctorate in ecology. Now, owing to seismic shifts in public discourse about race, she believes the tides are turning.

"Black students are being buffeted by reactions to systemic racism and police brutality, which have been plastered across every screen you can imagine, and we've gotten to a place from which I don't think we can go back," Malcom says. "Institutions are being put in a position of decrying what they've seen and supporting Black students who have lived this every day."

Yet racism takes on many forms, from overt hate speech to subtle microaggressions (8). For instance, a 2020 Association of American Medical Colleges survey found that around 40% of all medical students experience mistreatment, including racial discrimination (9). Matthews didn't encounter explicit racism at UMBC; she did, however, notice an attitude shift elsewhere. "When I first came to Boston University for a research fellowship, no one wanted to talk to me; no one had any work for me," Matthews says. "Once they realized I was a Meyerhoff, they rolled out the red carpet. I felt like they saw me as a Meyerhoff—not as this little Black girl who might not know what she's doing."

Future Prospects

Recent years have seen a greater awareness of systemic racism in academia. Coverage of race-related incidents is widespread, and administrators are taking action to move the needle on inequality. "We are hopeful that this is now a Sputnik moment and that a greater commitment will be made on the part of all of us in society and the scientific community to implement recommendations that have been made for years," says Hrabowski, who chaired the President's Advisory Commission on Educational Excellence for African Americans under Barack Obama.

Immunologist Kenneth Gibbs, a program officer for diversity efforts at the National Institute of General Medical Sciences in Bethesda, MD, believes the solution to retaining Black individuals in STEM is, to an extent, straightforward. "Black students need what all other students need: opportunity, resources, and respect," says Gibbs, a Meyerhoff alumnus. "Do we have the same opportunities? Are we given the same resources in terms of relationships, space, and funding? And are we given the respect that everybody else gets? We're told 'yes' even though we know the answer is usually 'no,' and then we're blamed for having less favorable outcomes."

There's no panacea for STEM retention, but Freeman highlights that the Meyerhoff Adaptation Project taught the value of recognizing each individuals' unique obstacles. This allows students to obtain resources suited to their specific needs. According to Freeman, professors should help students "change the things that they can while supporting them as they grapple with the things that they cannot."

Another way to foster retention of underrepresented students is to reinforce one of the most important—and simplest—notions of the Meyerhoff model: The students are not alone. "We listen to the scholars and treat them like adults, empowering them to make their own decisions and giving them a sense of belongingness," says Freeman, now executive director of UNC's Meyerhoff spinoff—the Chancellor's Science Scholars Program. "By the time they get to their second year, nearly all of them know that they can do this."

Next on Meyerhoff's nation tour: California. In 2019, the Chan Zuckerberg Initiative (CZI), started by Facebook cofounder Mark Zuckerberg and his wife, Priscilla Chan, donated $6.9 million to bring the model out West via the University of California system. CZI funding has already begun to aid students, and Meyerhoff components such as academic coaching and programs that ease the transition from high school to college have been modified virtually during the COVID-19 pandemic. And in May 2021, billionaire Michael Bloomberg gifted $150 million to support diversity initiatives for underrepresented graduate students in STEM. Most of the funds will be allocated to Bloomberg's alma mater, Johns Hopkins University in Baltimore, MD. Although it's not certain how successful such endeavors will be, the intent is clear.

"We began to view this program as a means of encouraging and promoting some cultural shifts on campus," Freeman says. "While such change is slow, I do feel that we are making significantly positive contributions to how the campus is approaching its commitment to diversity, inclusion, and equity."

Gibbs also hopes that with the current racial reckoning will come profound change in academia. "People usually don't want to deal with racism in all its various forms, but I'm heartened that I've seen more attention given to issues that Black people face in science over the last few months than I have in the last 10 years," he says. "What would be even more heartening is turning those sentiments into action. Talk alone doesn't bring change—resource allocation and policy do."

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