

Promise: Maryland's Alliance for Graduate Education and the Professoriate Enhances Recruitment and Retention of Underrepresented Minority Graduate Students

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Abstract

PROMISE: Maryland's Alliance for Graduate Education and the Professoriate (AGEP), sponsored by the National Science Foundation, is a consortium that is designed to increase the numbers of underrepresented minority (URM) PhDs in science, technology, engineering, and mathematics fields who will pursue academic careers. A strength of PROMISE is its alliance infrastructure that connects URM graduate students on different campuses through centralized programming for the three research universities in Maryland: the University of Maryland Baltimore County (the

lead institution in the alliance), the University of Maryland College Park, and the University of Maryland Baltimore (UMB). PROMISE initiatives cover graduate student recruitment, retention, community building, PhD completion, and transition to careers.

Although it is not a fellowship, PROMISE offers professional development and skill-building programs that provide academic and personal support for URM students on all three campuses. PROMISE on UMB's campus includes the School of Medicine, which sponsors

tr-campus programs that promote health and wellness to accompany traditional professional development programs. PROMISE uniquely and atypically includes a medical school within its alliance. The PROMISE programs serve as interventions that reduce isolation and facilitate degree completion among diverse students on each campus. This article describes details of the PROMISE AGEP and presents suggestions for replicating professional development programs for URMs in biomedical, MD/master's, and MD/PhD programs on other campuses.

Historically, U.S. racial and ethnic minorities earn a disproportionately small percentage of the doctoral degrees granted in science and engineering fields. In 1975, only 3% of U.S. science, engineering, and mathematics doctoral degrees were awarded to African Americans and Hispanics. By 1999,

the numbers were still low, revealing that even though African Americans represented 12% of the population, they only earned 4% of the PhDs granted in science, engineering, and math fields.¹ Recent numbers of doctoral degrees awarded to underrepresented minorities (URMs) within biomedical sciences are also low. In 2010, out of 418 U.S. institutions granting research-doctoral degrees, fewer than 1,000 PhDs in the medical or biological sciences were awarded to URMs.² From 2006 to 2009, there were 29,660 PhD recipients of all races in the 34 reported fields for biological sciences. Of those, 703 were African American and 995 were Hispanic.³ During the same time period, there were 3,805 PhD recipients of all races from the medical sciences, of whom 218 were African American and 100 were Hispanic. The numbers of graduates from Native American/Alaska Native backgrounds continue to be so small that the numbers of graduates are suppressed in the data charts. This disclosure control protects the identities of the graduates, but reiterates that this group is severely underrepresented in the sciences.⁴

The low numbers of ethnic and racial minorities in both science, technology, engineering, and math (STEM) education and in the STEM workforce are troubling, especially given concerns about the United States' decreasing global competitiveness in innovation.⁵ The America COMPETES Reauthorization Act of 2010 now directs the National Aeronautics and Space Association (NASA), the National Oceanic and Atmospheric Administration, the National Science Foundation (NSF), and the National Institute of Standards and Technology to support increasing the participation of underrepresented populations in STEM education and research.^{6,7} In addition, organizations such as the Alfred P. Sloan Foundation,⁸ NASA,⁹ the NSF,¹⁰ and the National Institutes of Health (NIH)¹¹ have established programs to increase URM students' access to advanced degrees in STEM disciplines. The NSF's Alliances for Graduate Education and the Professoriate (AGEP)¹² and the Louis Stokes Alliance for Minority Participation (LSAMP),¹⁰ along with NIH's MARC U STAR (T34 award) and Bridges to the Doctorate (R25),¹¹ are

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specific examples of these scholarship and capacity-building programs.

Encouraging Diversity Among Maryland's STEM Students

Past efforts to encourage diversity

The University System of Maryland (USM) has been engaged in efforts to improve diversity among its STEM students for many years. The USM's NSF-funded LSAMP program, launched in November 1995, provided scholarships for URM students studying STEM disciplines at the undergraduate level on our campus, the University of Maryland Baltimore County (UMBC), as well as the University of Maryland College Park (UMCP) and the University of Maryland Eastern Shore. The USM LSAMP contributed to more than doubling the number of bachelor's degrees awarded to URMs studying STEM fields in the USM from 201 to 502 between 1994 and 2000. In addition, UMBC's own Meyerhoff Scholars¹³ program and Meyerhoff Biomedical Graduate Fellows program¹⁴ have provided resources and support to URM students pursuing STEM degrees since 1988 and 1996, respectively.

Between academic years 1996–1997 and 2001–2002, an average of 35 U.S. citizen URMs (defined as African Americans, Hispanics, American Indians, Alaska Natives, and Native Hawaiians or other Pacific Islanders) per year enrolled in UMBC's science and engineering graduate programs compared with an average of 535 per year for graduate students of other races (including international students) in the same fields. During the same time period, the combined number of MS and PhD degrees earned by URMs in science and engineering averaged 8 per year compared with an average of 171 MS and doctoral degrees in science and engineering awarded to U.S. and international students of other races. In 2002, UMBC applied for an NSF AGEP grant with the goal of improving recruitment, retention, and graduation rates of underrepresented students in STEM disciplines at the graduate level.

Proposing a new strategy

The national AGEP, comprising 22 alliances throughout the United States, was developed to increase significantly the numbers of URM U.S. citizens

receiving doctoral degrees in STEM fields and to support these individuals' pursuit of academic careers.¹² AGEP supports alliances of doctoral-granting institutions to

employ creative administrative strategies, develop infrastructure, and engage in substantive partnerships with nondoctoral-granting institutions (many minority-serving institutions) to enhance recruitment, retention, and advancement [of URMs in STEM fields].¹²

UMBC partnered with the other two public research universities in Maryland—UMCP and the University of Maryland, Founding Campus (UMB, in Baltimore, which includes the medical school)—to apply to become an AGEP alliance.

UMBC built on successes from previous USM diversity programs to develop an AGEP proposal. Our AGEP proposal included best practices for mentoring students, based on UMBC's Meyerhoff Scholars program¹³ and plans for community-building activities for graduate students based on the Meyerhoff Graduate Fellows program.¹⁴ The proposal further included examples of graduate student peer mentoring and minority recruitment activities from the Center for Minorities in Science and Engineering at UMCP, and training workshops from NIH-funded summer programs for minorities at the University of Maryland School of Medicine at UMB.

Sharing resources to promote success

The AGEP program was awarded to UMBC (lead institution) and partners UMCP and UMB in 2002. Our AGEP, dubbed "PROMISE," is not a fellowship program but, rather, recruits URM graduate students to pursue studies in STEM disciplines and provides professional development activities to facilitate retention and successful graduation of diverse PhDs in all STEM fields.

PROMISE's major recruitment and retention activities for URMs began in 2003, and the program has received \$4.6 million dollars of NSF funding over the last 10 years, spread over three funded grant proposals and in-kind institutional investments from UMBC, UMCP, and UMB. By fall 2003, PROMISE offered support services to all URM master's and doctoral students in STEM disciplines on

the three campuses. In fall 2003, UMBC had 148 STEM URM students (11% of total STEM) with a total graduate population of 2,226, UMCP had 550 STEM URM students (13% of total STEM) with a total graduate population of 9,833, and UMB had 25 STEM URM students (8% of total STEM) with a total graduate population of 1,072. PROMISE includes all STEM disciplines and differs from other AGEP programs in the nation because it includes a medical school within its alliance. Today, PROMISE on UMB's campus includes students in pharmaceutical sciences; biochemistry and molecular biology; epidemiology and human genetics; gerontology; molecular medicine; molecular microbiology and immunology; neuroscience; pharmacology; physical rehabilitation science; and toxicology. PROMISE now serves as an umbrella program of general support and professional development for URM graduate students in all STEM programs at UMBC, UMB, and UMCP.

In the following sections, we detail the development of the PROMISE program, its administrative structure, program components, and outcomes. We then discuss the challenges we faced in developing and implementing PROMISE and offer recommendations based on our own experience for conceiving and maintaining a successful program to enhance diversity in STEM disciplines.

The PROMISE AGEP

The goals of PROMISE are to recruit, retain, graduate, and transition students to STEM careers, with special emphasis on the professoriate.^{15–18} PROMISE differs from other programs that serve URM graduate students in Maryland because it is not a fellowship program and is not tied to one campus. Instead, the program's collaborative model brings together students from all three participating campuses and focuses on joint professional development activities involving interconnected access to faculty, mentors, and graduate students from the other institutions. PROMISE connects a larger critical mass of URM students in a region who share the common goal of pursuing advanced degrees, and provides administrators on the three campuses with opportunities to share resources (e.g., staff, facilities, materials) and facilitate intercampus collaboration.

PROMISE was not developed to replace other programs that focus on singular fields of study but, rather, to supplement fellowship programs with professional development workshops and provide an umbrella to support students from several departments. PROMISE works because of the physical proximity of participating institutions, efforts on individual campuses to address underrepresentation, dedicated administrative leadership from the graduate deans, hands-on involvement from the associate and assistant deans, interest from faculty on all three campuses, and agreement to collaborate. Previous successes of the Meyerhoff undergraduate and graduate programs at UMBC, the LSAMP program at UMBC and UMCP, NIH programs at UMB, and other NSF- and NIH-sponsored initiatives on the campuses facilitated in the implementation of the AGEP program in Maryland.¹⁹

Development and implementation

After the grant was awarded in fall 2002, the three coprincipal investigators (co-PIs) from UMBC, UMCP, and UMB formed a search committee to hire a program director to coordinate the program, cultivate new students, and implement the recruitment and retention projects that were outlined in the funded proposal. The program director, hired in spring 2003, worked with the founding co-PIs to meet with faculty, administrators, and URM graduate students on each campus to introduce the program. The director was given an office and a campus identification card for each school in the alliance to facilitate meetings with faculty, administrators, and students. This arrangement also allowed the director to become familiar with the departments, personnel, and administrative structure of each campus.

We worked with the campuses' administrative offices to develop electronic listservs to contact URM graduate students and developed brochures that were distributed by faculty and administrators in the respective departments throughout the alliance. URM graduate students received e-mails that described the initiative, and during the spring 2003 semester, they were invited to a series of office hours to meet the new director and discuss their needs.

Building on the successful "Summer Bridge" of the Meyerhoff programs

for undergraduate and graduate students (high-school-to-college and undergraduate-to-graduate-school transition activities), the first "tricampus" activity for the new Maryland AGEP was a two-week program in August. This program, called "Success 2003," included seminars and study sessions on each of the three campuses. Students traveled to the different campuses by bus, and the seminars were led by faculty throughout the alliance. The two-week program did not continue with the same multicampus seminar structure after 2003. However, components of this early program such as "Understanding Your Advisor's Expectations" and "Understanding the Differences Between Undergraduate and Graduate School" are still in place today as part of the annual two-day Summer Success Institute (SSI, described below) and a series of one- or two-hour Success Seminars that are held on the campuses throughout the year. The evaluators for the undergraduate Meyerhoff Scholars program assisted us with developing formative and summative evaluations for the program. We used results from the surveys and focus groups to streamline the offerings to best meet students' needs.

Stakeholders, decision makers, and administrative structure

University administrators, faculty, and graduate students all play important roles in PROMISE. UMBC's provost, the university's chief academic officer, serves as the principal investigator (PI) for the AGEP. The PI provides administrative oversight for the tricampus alliance. Each campus has one or two co-PIs at the levels of dean, associate dean, or assistant dean, and all co-PIs have full-time, affiliate, or adjunct faculty positions. Co-PIs provide administrative leadership for their respective campuses and serve as campus liaisons between faculty and graduate students. The tricampus PROMISE director, funded by UMBC, coordinates centralized activities that serve participants at all three institutions. Each campus also has a PROMISE coordinator who is served by additional support staff within the respective graduate schools. Faculty co-PIs for PROMISE provide up to 10% time on the project and oversee program activities and participants on the respective campuses. They work with the director to implement and assess the initiatives that will increase enrollment, retention, and graduation rates of URMs.

Activities and initiatives

PROMISE initiatives across the three campuses provide opportunities for professional development, community building, and dissertation completion for students on each campus. Table 1 provides a comprehensive picture of PROMISE activities available to students. Of particular importance are the annual Community Building Retreat, SSI, and "Dissertation House." The SSI provides workshops on understanding differences between undergraduate and graduate studies, long-term engagement in research, choosing an academic career, and achieving career-life balance. This two-day program in August draws 200 participants, bringing together incoming and continuing URM graduate students, URM faculty and staff from each campus, URM postdoctoral fellows and STEM professionals, and URM faculty from other states. The Dissertation House is a multiday writing workshop that includes mini-lectures, defense preparation exercises, five hours of writing per day, and individual coaching.²⁰⁻²⁶

Also of note, recognizing that graduate students may be susceptible to suicide attempts,²⁷ we added a health and wellness component to mitigate risks related to depression and anxiety. UMB's School of Medicine leads this PROMISE initiative for all three campuses. The Reflections Health and Wellness series features physicians and clinical practitioners who lead workshops on addiction, sleep deprivation, cancer prevention, nutrition, and relaxation techniques.

Program outcomes

Results from focus groups and surveys have shown that PROMISE played a role in students' professional development and presentation skills, helped them secure funding from university or external sources for their education, supplemented weak departmental advising, and helped them stay on track and motivated. Results from a recent informal survey of program graduates from the UMB medical campus revealed that PROMISE provided emotional support, an ability to share with others with similar backgrounds and experiences, and a sense of support from leaders who were associated with the program. Graduate school can be an isolating experience^{28,29}; however,

Table 1

Current Activities of PROMISE: Maryland's Alliance for Graduate Education and the Professoriate, University of Maryland, Baltimore County (UMBC), University of Maryland, College Park (UMCP), and University of Maryland, Founding Campus (UMB)

Activity	Components	Audience	Time of year
Recruitment		Undergraduate students	
Campus visitation conference	<ul style="list-style-type: none"> • UMBC Summer Horizons • UMCP Preview Day • UMB visits to campus 		<ul style="list-style-type: none"> • UMBC: July • UMCP: November • UMB: year-round
Training seminars on graduate school preparation and recruitment at national conferences	<ul style="list-style-type: none"> • Society for Hispanic Professional Engineers • Society for the Advancement of Chicano and Native American Scientists • National Society of Black Engineers • American Indian Science and Engineering Society • Ana G. Mendez University System–Puerto Rico–Undergraduate Research Symposium • Annual Biomedical Research Conference for Minority Students 		National conferences held throughout the year
Networks	<ul style="list-style-type: none"> • National GEM Consortium* • Institute for Broadening Participation† 		Year-round
Retention		Graduate students	
Professional development seminars and workshops	<ul style="list-style-type: none"> • Graduate Student Success Seminars (topics include IRB submissions, applying for fellowships, financial management, leadership, public speaking) 		Year-round
Research conferences	<ul style="list-style-type: none"> • Practice sessions for presentations at campus-based and external conferences, encouragement and assistance with finding funding to present research at national and international conferences 		Year-round
Community building	<ul style="list-style-type: none"> • Tri-Campus Fall Harvest Thanksgiving Dinner with delineated tables by broad discipline to encourage connections within disciplines • Community Building Weekend Retreat • Summer Success Institute (SSI) • “Reflections” Health and Wellness Workshops 		<ul style="list-style-type: none"> • Thanksgiving Dinner: November • Retreat: March • SSI: August • Reflections: year-round
PhD completion		Graduate students	
Dissertation completion mini-conferences and workshops	<ul style="list-style-type: none"> • Dissertation House • Access to a dissertation coach • Mentoring and consulting hours with coach and PROMISE coprincipal investigators • PhD completion project workshops • Thesis and dissertation review • Dissertation defense practice sessions • Online dissertation support groups 		<ul style="list-style-type: none"> • Dissertation House: Four days in January and July, one day in August • All others: year-round
Conferences	<ul style="list-style-type: none"> • Participation in the Southern Regional Education Board's Institute on Teaching and Mentoring/ Compact for Faculty Diversity‡ 		Year-round
Transition to career		Graduate students and postdoctoral scholars	
Preparation for postdoctoral positions	<ul style="list-style-type: none"> • Networking workshops • Review of cover letters and CV • Introductions to faculty and hiring managers 		Year-round
Professors in Training (PROF-it)	<ul style="list-style-type: none"> • PROF-it workshops on campus • Access to external Preparing Future Faculty conferences§ • Membership in Professors Beyond Borders¶ 		Year-round

*The National GEM Consortium. About GEM. <http://www.gemfellowship.org/about>. Accessed July 31, 2012.

†Institute for Broadening Participation. <http://www.ibparticipation.org/>. Accessed July 31, 2012.

‡The Institute on Teaching and Mentoring. The Compact for Faculty Diversity. <http://www.instituteonteachingandmentoring.org/Compact/index.html>. Accessed July 31, 2012.

§Preparing Future Faculty. The Preparing Future Faculty Program. <http://www.preparing-faculty.org/>. Accessed July 31, 2012.

¶Professors Beyond Borders. <http://www.professorsbeyondborders.org/home.html>. Accessed July 31, 2012.

these alumni, often the only URMs in the department, experienced a reduced sense of isolation through PROMISE by using information from seminars to build relationships with other students in their departments. They were also able to build connections with URMs in other departments and at other universities in the alliance at the PROMISE workshops. These connections created a larger critical mass of URMs that provided the students with motivation to persevere and persist toward completion of the doctoral degree. A survey of African American PROMISE-graduate PhDs in STEM fields,³⁰ along with other formative evaluations from our programs, indicates that participants in PROMISE felt that they had received benefits of confidence, networks, enhanced skills, and career advice by participating in an alliance program that provides encouragement, role models, mentoring, professional development, and preparation for academic careers. These responses echo other calls for universities to provide programs that clarify career pathways for graduate students, prepare future faculty, and encourage future professionals.^{31–33}

Data demonstrate that our alliance has experienced recent success with recruitment, retention, and graduation of URM STEM students. Lead PROMISE institution UMBC averaged 112 URM STEM enrollees per year between 2002–2003 and 2008–2009 (up from an average of 35 per year between 1996–1997 and 2001–2002). UMBC also achieved an average of 27 URM STEM MS and PhD graduates per year (combined, up from 8) during the same time periods. Comparing the five-year span before the implementation of PROMISE (academic years 1997–1998 to 2001–2002) with the five-year span after the start of the program (2003–2007), we have found that, across the alliance, URM applications, enrollment, and PhD graduates have seen 45%, 44%, and 45% increases, respectively.

Prior to the receipt of the first Maryland AGEP award and implementation of the PROMISE AGEP activities (2000–2001 to 2002–2003), the three universities in the current PROMISE alliance produced 81 URM PhDs in STEM fields. During the early years of PROMISE (2003–2004 to 2005–2006), the project invested in recruiting URMs to graduate school and began to develop mechanisms for

retention, producing 96 URM PhDs in STEM fields across participating institutions. The next three years (2006–2007 to 2008–2009) mark the end of the first AGEP award and the beginning of the second award, and it was during this period that we firmly established PROMISE retention and training programs such as the SSI and the Dissertation House. This latter time period produced 127 URM STEM PhDs across participating institutions.

Addressing challenges

PROMISE has grown to enjoy many successes, but we met our share of challenges along the way. When we implemented PROMISE, we assumed that students would readily participate in support initiatives, find motivation in numbers, and persist in a group structure. We also assumed that faculty would be receptive to PROMISE and that they would encourage their students to participate. During the early years of the program, however, some students and faculty incorrectly assumed that PROMISE was a remedial program. This assumption hindered participation of some students. Likewise, some faculty discouraged their students from participating because they felt that students did not need additional mentoring or professional development from sources that were external to the laboratory or the department.

We employed a number of strategies to change the initial perceptions of faculty and students. We identified the Meyerhoff Scholars program as a good model for PROMISE because their program experienced success by developing a critical mass of underrepresented students in undergraduate STEM fields, collaborating with faculty, and focusing on student achievement. The Meyerhoff program also fostered an atmosphere of academic excellence in the classroom and in the laboratory that extended to the rest of the campus. We wanted to promote a similar climate for graduate students. In addition to initiatives surrounding the Meyerhoff program, many faculty members on all three of the campuses were involved in their own diversity efforts (e.g., grant-funded summer programs, department-based committees on diversity). These prior efforts primed the graduate-level diversity discussions among faculty and administrators. As an

example, in 2003, early discussions about the implementation of the PROMISE AGEP were formal agenda items at monthly meetings of UMBC's President's Council, Provost's Council, and graduate program directors. The associate dean of the graduate school introduced the new PROMISE director to the faculty at each meeting and gave a short presentation about national underrepresentation in STEM disciplines, underrepresentation among the graduate population on campus, and plans for increasing diversity with funds from the PROMISE grant. Faculty were asked to participate in the PROMISE recruitment programs by conducting laboratory tours and having lunch with groups of prospective URM graduate students who were visiting from other schools. Faculty also received travel funds through the PROMISE grant to attend conferences to recruit diverse graduate students for their departments.

As an additional initiative to connect students and faculty, we made special efforts to invite women faculty and URM faculty, both underrepresented in STEM, to participate in seminars in workshops for graduate students. These efforts provided the students with opportunities to meet more underrepresented faculty and see them in mentoring roles. Participating in the workshops also provided the faculty with opportunities to meet other colleagues from different disciplines. These processes for engaging faculty provided a basis for developing a more inclusive community for graduate students.

A PROMISE for Tomorrow: Next Steps and Recommendations

The program has been sustained on three campuses, and in 2011, we began the two-year planning and pilot process to formally expand PROMISE to all 14 institutions in the USM with the purpose of training URM STEM graduate students and postdoctoral fellows for the professoriate. Full expansion is expected to be implemented in 2013. In addition, as a service to the broader community, we are redesigning the project to offer professional development workshops to all graduate students and postdoctoral fellows regardless of race, citizenship, or discipline, with the purpose of cultivating an inclusive, collaborative, and supportive community. In addition, we have gained a number of insights during our experience

with the PROMISE program that may be useful to those implementing similar efforts at other institutions.

Planning success amidst budget constraints

When we have faced gaps in funding or periods in which our NSF directorate did not post opportunities to apply for AGEP funding, we have scaled down services to sustain the program. When the budget has been constrained, we have polled students to identify seminars that they wanted to keep, and what they were willing to release. Once the students identified activities that they felt were necessary for the program's survival, we modified the activities to fit the existing budget. When existing programs change, it is important to give students a voice in the decision making. It is equally important to explain budget constraints, changes to levels of services, and the alternatives in advance of the scheduled modified program. In accordance with students' feedback, we cut costs by changing several seminars that formerly included a funded lunch to "brown bag/bring your own lunch" seminars, and converted a community-building weekend retreat into a two-hour Saturday "Community Building Lunch." Similarly, we scaled down a residential Dissertation House weekend at a hotel to a three-day commuter program on campus.

Limited budgets can be leveraged by partnering with other campus units that already have funding to provide programs for the general population. Other campus entities may have budgets to bring in excellent speakers to provide training, but they may need a captive audience to justify the cost of the program. A partnership can provide the other unit with an audience while giving students in a program like PROMISE the opportunity to participate in a meaningful event. PROMISE has partnered with the Meyerhoff Graduate Fellows program to provide targeted activities (e.g., URM Postdoctoral Speaker Series, Graduate Horizons URM recruitment day). In these cases, we split costs for refreshments, room and equipment rental, and speaker honoraria. Such partnerships can lead to stronger awareness of campus resources among students, collaborative funding proposals for future initiatives, and better staff connections across campus to facilitate needs of URM students.

Starting small, replicating promising practices

When a campus or department is starting a new program to serve URMs, it is important to establish a foundation that will lead to the success of the program. As an initial step, the person who is spearheading the effort should have the support of her or his supervisor (e.g., dean, department chair) and a team of colleagues within the department or college who will join the effort. When planning a new program, (1) identify the need for the initiative, (2) present research along with national and campus statistics that bring to light the problem of underrepresentation, (3) tie the initiative to the university's existing mission or policy on diversity, (4) determine funding sources, sponsors, or collaborative opportunities that will finance the initiative, and (5) investigate ways to identify and reach the target audience (e.g., obtaining access to student demographic information and contact information, garnering associated permissions from entities such as the graduate school or the Office of Institutional Research). These promising practices can open discussions for developing a new program for URM support on campus.

We have learned that staff members who have the requisite skills and capacity to assist with the development and implementation of the program are major contributors to its success. Program staff should include a coordinator (part-time or full-time, depending on the budget and size of the effort) or a consultant hired to implement specific initiatives. A short-term consultant can jump-start a program without having to hire a coordinator up front.

We have found that it is best to first establish small events that require a small budget, light staffing, and a simple program based on previous assessment of an unmet need. Examples might include a brown bag lunch for URM graduate students to introduce them to funding opportunities and targeted conferences, or a panel of faculty to meet with students to discuss academic careers. The events can be open to all members of the campus community, but ensuring the presence of URMs might require targeted outreach to these individuals. Soliciting assistance from student leaders and cultural organizations on campus can

also play a part in encouraging URMs to attend an event.

Additional recommendations

On the basis of our experiences with PROMISE, we present three final recommendations for developing programs that will improve the retention and successful graduation of URM PhDs in the STEM fields: (1) Build capacity by increasing numbers of students to provide shared emotional support, (2) identify internal and external leaders and advocates for the program, and (3) build community among URMs and other students to reduce isolation.

Building capacity. To increase the number of graduate students from underrepresented groups, cultivate them at the undergraduate level by establishing connections with other schools and programs that focus on URMs in undergraduate STEM programs. The three PROMISE institutions brought minority undergraduate students on campus for research, hosted visitation days on campus that included introductions to faculty and tours of laboratories, established collaborative programs with local minority-serving institutions, and recruited at conferences that had large numbers of minority undergraduate students presenting STEM research. Once students express interest in the institution, faculty and program administrators should invite them to apply to their departments and continue to follow up with them throughout the application process. URMs should be informed of funding opportunities and support systems before or during the application process. Once students are accepted, faculty and program administrators should continue to reach out to invite them to attend the institution for their graduate studies.

Identifying leaders and advocates. It is important to identify and engage faculty and administrators who are dedicated to diversity or willing to learn more about issues that affect diverse students. Once these faculty and administrators have been identified, we suggest three specific strategies for engaging them: (1) discussing the issue at meetings of graduate program directors, soliciting thoughts and opinions on diverse issues, and continuing discussions on individual or small-group bases, (2) soliciting volunteers for a diversity task

force, committee, or institutional grant proposal, and (3) providing faculty with opportunities to support URM (e.g., grant-writing assistance for proposals that seek to broaden URM participation, travel funds to recruit at conferences with large numbers of URM in their respective fields).

Maintaining consistent connections with supportive faculty is imperative to support diversity initiatives and to support faculty members' interests that may come under the auspices of our respective offices (e.g., enhanced dissertation counseling for students in a particular professor's lab, special training seminars for equipment or software that may benefit a department). Making these kinds of connections and facilitating relationships on an administrative level has led to collegial interactions that have contributed to faculty tenure and/or promotion, improved the climate for the URM, and enhanced the environment for graduate students in the broader community.

Building community. To create environments that reduce isolation for URM, we recommend hosting events that bring students together in casual or informal environments on campus. Current URM graduate students can serve as peer mentors to others just starting out and can encourage participation in events. Programs do not have to be expensive, but they must be frequent and consistent to allow students to make regular connections with others who share their backgrounds and experiences. Community-building activities can include both professional development and social activities. Campus-wide or departmental programs such as orientations, research symposia, and colloquia should be supplemented with monthly activities that build skills and promote in-person opportunities for students to cultivate friendships. Examples include an off-site team-building exercise or attending a conference as a group. Use of social media can also facilitate announcements of events and sharing experiences online.

A Support System for All Students

We hope that our experience and recommendations will be useful to others seeking to provide programmatic support for URM in STEM fields. However,

with the ultimate goal of increasing the numbers and diversity of professors in academic medicine, we recommend professional development for graduate students that will include a critical mass of URM and extend beyond experiences that are provided by courses and research laboratories. All students pursuing graduate degrees, including URM, should have easily accessible and fully functioning systems of support in place for building and practicing skills, networking, career advice, and emotional well-being.

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