FIVE THINGS Student Affairs Professionals Can Do to Support Diverse Students in STEM

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The national conversation on the importance of science, technology, engineering, and mathematics, or STEM, education has taken many forms in recent years. From the Oval Office to state houses across the country, rhetoric and policy initiatives aimed to increase the number of individuals prepared to enter a growing scientific and technological workforce is now mainstream and urgent. Widely cited research out of Georgetown’s Center for Education and the Workforce (Carnevale, Smith, & Melton, 2011) points both to the great presence of STEM professionals and their work in our everyday lives and to the unfortunate reality that despite this reach our nation’s “education system is not producing enough STEM-capable students to keep up with demand both in traditional STEM occupations and other sectors across the economy that demand similar competencies” (p. 10).

Unequal access and participation in rigorous K–12 science and math coursework, which ultimately dictates college readiness in these fields (Kena et al., 2014), contributes to this shortfall. Out of 34 countries, America’s 15-year-olds rank 17th in science and 25th in math (Organisation for Economic and Co-operative Development, 2011). U.S. Secretary of Education Arne Duncan put it this way: “The findings, I’m sorry to report, show that the United States needs to urgently accelerate student learning to remain competitive in the knowledge economy of the 21st century” (U.S. Department of Education, 2010, para. 3). These facts distress the scientific community and policymakers alike, given what is known about the need for a STEM-prepared workforce. In just a few years, 90% of STEM occupations will require some postsecondary training, with 78% of these jobs demanding an associate’s degree or higher (Carnevale et al., 2011).

Trends in STEM enrollment and degree completion are encouraging and discouraging. The often-referred-to STEM “pipeline” has widened, as illustrated by an uptick in the number of underrepresented minorities (Figure 1) and women (Figure 2) completing undergraduate STEM degrees during the last 20 years. And yet this gain is tempered by trends that show underrepresented minority students are less likely to complete STEM degrees than their White peers (Figure 3) and a gap between women and men in certain STEM fields persists (Figure 4).

In just a few years, 90% of STEM occupations will require some postsecondary training, with 78% of these jobs demanding an associate’s degree or higher.
Figure 1. Percentage of STEM Bachelor’s Degrees Awarded by Race/Ethnicity, 1989–2013

Figure 2. Percentage of STEM Bachelor's Degrees Awarded by Sex, 2012–2013

![Bar chart showing percentage of STEM bachelor's degrees awarded by sex and field, with details for All Students (N = 56,499), White (N = 39,160), Asian American (N = 7,621), Latino (N = 3,863), Black (N = 4,695), and Native American (N = 1,160).]


Figure 3. Percentage of 2004 STEM Aspirants Who Completed STEM Degrees in 4, 5, and 6 Years by Race/Ethnicity

![Bar chart showing percentage of STEM degrees completed in 4, 5, and 6 years for All Students (N = 56,499), White (N = 39,160), Asian American (N = 7,621), Latino (N = 3,863), Black (N = 4,695), and Native American (N = 1,160).]

Figure 4. The STEM Discipline Attainment Gap by Sex, 1993–2012

Given our nation’s demographic realities, educators are right to be concerned about STEM achievement gaps across racial, ethnic, and socioeconomic lines. Communities of color already make up the majority in 49 of the nation’s 366 metropolitan regions and in the states of California, Hawaii, New Mexico, and Texas. A full 92% of America’s population growth in the last decade came from people of color, and by 2050 communities of color will be in the majority, representing a projected 53% of the U.S. population (Center for American Progress, 2014). Yet current K–12 preparation, postsecondary degree attainment, and related education trends among communities of color—especially in the STEM fields—mean that unless colleges and universities put forth a concerted, strategic effort to provide access for and ensure the success of diverse populations, our STEM workforce and our nation on the whole will suffer.

Unfortunately, a common narrative among STEM advocates is that women, including minority women, are lost at every transition point along the STEM pipeline—from undergraduate degree attainment, to advanced degrees, to workforce entry. Although the presence of women in STEM majors has increased during the last 20 years, in 2013 minority women represented just 10% of those with a bachelor’s degree and 6% of those with a doctoral degree in STEM (Integrated Postsecondary Education Data System, 2013). Women experience microaggressions, lack role models among the professoriate, and in other ways still confront the field’s legacy of exclusion—all of which have a negative effect on young, up-and-coming scientists and engineers who fail to see their likeness among STEM faculty and professionals. A first-of-its-kind synthesis of empirical research on women of color in STEM for more than 40 years (Ong, Wright, Espinosa, & Orfield, 2011) found that institutional environments and the actors therein present some of the greatest barriers to achievement and advancement in STEM.

Bolstering the call for diverse perspectives in the STEM classroom and laboratory is a current movement toward preparing all students—whether or not in STEM majors—for a world that is increasingly reliant on advances in technology and science, an approach that also thrives on diverse perspectives. Many institutions are embracing a “STEM for all” approach, building new or additional math and science courses into general education requirements alongside the humanities. Some are in fact touting computer programming as the “new cursive.” It’s not just an in-vogue phenomenon. Student affairs professionals in career preparation settings have long been familiar with the demand for talent that aligns with the skills and abilities associated with STEM education, such as critical thinking, problem solving, systems evaluation, mathematical reasoning, and inductive and deductive reasoning.

Fortunately, student affairs professionals are poised to make a difference in how students approach and succeed in STEM fields and are particularly equipped to ensure the success of women, minority students, and minority women. The orientation of student affairs—one that fosters student body community, promotes cross-group collaboration, and celebrates inclusivity—is the perfect foundation upon which to build institutional success in undergraduate (as well as graduate) STEM education. This brief pulls together leading research and practices to describe five ways student affairs professionals can enact change from within institutions that will improve the climate and enhance the success of diverse students in the STEM fields.
1 Challenge Negative Views

Underrepresented students are frequently viewed as lacking or deficient at many colleges and universities. Some of the most damaging discourse on campuses characterizes students of color and women interested in or pursuing STEM degrees as deficient or “at risk” because of differences in academic preparation, opportunity, or life decisions. Such language often leads to a belief system among institutional leaders and faculty that prevents them from seeing how STEM fields can incorporate differences and improve access and success for diverse students.

Student affairs professionals, particularly those with a deep commitment to social justice, can challenge negative language across campus. For example, they can reframe conversations so that administrators and faculty members will explore how the institution can support STEM students with diverse experiences, learning styles, and perspectives rather than assume they will not be successful. In addition, student affairs professionals can highlight and support underrepresented students’ often-overlooked noncognitive strengths and skills (e.g., personal resiliency, sense of belonging, self-esteem) that serve them well not only in higher education but in STEM majors.

2 Understand the Intersections

Some STEM classroom and laboratory settings remain segregated environments. Women in particular are still greatly underrepresented in computer science and most engineering disciplines. Minority women often report being the only woman of color (or one of the only) in these settings. Studies on women of color in STEM reveal they confront sexism and racism, sometimes daily, complicating what has become known as a chilly climate for women in STEM (Ong et al., 2011). Nonetheless, student affairs professionals can do several things to create a positive climate for women of color and other diverse students—all of which can be integrated into the co- and extracurricular support described in this brief.

An important first step to combatting students’ feelings of isolation and even oppression is to provide experiences and facilitate successful relationships that allow students to see themselves as legitimate and valuable members of the scientific community. Recognition by “meaningful others,” such as STEM faculty and professionals, is in fact one of three necessary elements to ensure the persistence of women of color in STEM, as outlined in a model developed by Carlone and Johnson (2007; see Figure 5). The other two steps are competence programs and services improve STEM access and boost success for underrepresented students. One example is the Meyerhoff Scholarship Program (MSP; http://meyerhoff.umbc.edu), one of the oldest and most effective interventions intended to boost the persistence and completion of underrepresented minority students in STEM. A hallmark of MSP is the ability of student affairs practitioners and faculty members to collaboratively support and improve participants’ academic and personal success.
and performance. Competence pertains to how women perceive their grasp of scientific concepts and material. Performance refers to scientific experiences that can be measured; for example, research experience or an exam grade.

Carlone and Johnson’s model reinforces some of the well-known elements of successful STEM support programs, including faculty and peer mentoring and academic supports that bolster students’ academic self-concept through undergraduate research opportunities, for example, and programs that celebrate student success. Race and gender are one type of intersection, which includes the status and experience of minority males in STEM; other intersections include age, family income, and other categories (e.g., being the first in the family to attend college). It is important to inform the STEM community why intersections are meaningful and then decide where to focus needed attention.

3 Work with Faculty

Student affairs professionals are well poised to identify, cultivate, and work with faculty who are champions of diversity. Champions are action oriented and, provided with the right support and venue, can make meaningful contributions and compel their peers to similar action. Faculty champions also model teaching practices that serve diverse learners, such as departing from the strict lecture format to incorporate technology in a variety of forms, provide small-group discussions, and illustrate real-world applications of science—all of which has been successful in retaining women and minority students in STEM.

Inviting faculty to serve on STEM-focused advisory committees is a powerful way to seek their involvement and support, as is partnering on external proposals to secure funds aimed at strengthening support for diverse students in STEM. Faculty are the
practitioners’ most successful spokespeople when it comes to recruiting more faculty to serve as mentors and to provide coveted undergraduate research opportunities. Faculty champions and those who mentor and guide minority students come from a variety of backgrounds and disciplines; they themselves may or may not be from a minority group. Commitment to the success of diverse students is the most important element. Returning to the Carlone and Johnson framework discussed earlier, meaningful recognition is powerful on its own. This is not to say that institutions shouldn’t invest in growing the size of their minority STEM professoriate, but meaningful commitment to diversity is a powerful signal to students and promotes a positive racial climate.

Finally, STEM faculty need information on the support available to students outside the classroom, and they need to recognize how they might themselves be reinforcing bias through their interactions with students, their in-class discussions, and their use of certain texts. Utilizing existing faculty services, such as centers on teaching and learning, student affairs leaders can keep faculty abreast of research and leading practices for working with diverse learners and help them understand the unique challenges certain groups, such as women of color, face.

4 **Think “Task Force”**

The most successful state-based efforts at increasing the economic potential of a growing STEM industry and necessary infrastructure are based on a consortium approach from business, education, government, and community groups. The approach should be no different when it comes to strengthening STEM education on a given college or university campus. The toughest educational challenges—including increasing STEM access and success rates for underrepresented students—require nothing less than a community-wide approach. Such efforts aren’t easy and they don’t happen overnight. Fortunately, student affairs professionals—given their collective reach across the campus community—are poised to make these efforts successful.

A consortium approach necessarily involves a multitude of departments. Though the exact makeup will no doubt differ from one campus to the next, working groups should include the following important stakeholders.

- **Student affairs professionals** from across the institution are critical partners given their on-the-ground perspectives. They can include professionals from multicultural centers, career centers, academic advising, and bridge and transition programs for K–12 and transfer students.
- **Faculty champions** from a variety of STEM departments—including those most successful in graduating women, minority students, and minority women—are necessary partners given the importance of instruction and student–faculty relationships in and outside the classroom and the role of faculty in institutional governance.
- **Teaching and learning centers** can provide leading practices on delivering STEM content for diverse learners, including technology-enabled learning and faculty professional development.
- **Institutional research professionals** can assess where different populations of students (e.g., minority women, minority males, students requiring remedial education) are entering and leaving distinct STEM majors and can help identify both data that are needed and data that have been collected but understudied.
- **Senior administrators** from academic and nonacademic units have the authority and influence to successfully implement consortia initiatives.
• **Students** from STEM disciplines who also serve in leadership positions, such as presidents of STEM-related clubs and those involved in student government, have meaningful connections to large groups of students and can bring their experiences to bear.

• **Admissions and enrollment management and registrar leadership** are institutional gatekeepers for their role in student recruitment, admissions, and assignment of college-level credit for STEM coursework.

• **Community outreach staff** are key to situating institutional goals on diversifying the STEM pipeline into the larger community context and can contribute to thinking on how to form an effective pipeline.

The arts and humanities faculty shouldn’t be left out; in fact, they are important allies given the success in these fields when it comes to the persistence of women and minority students as well as the ability of these departments to complement and infuse STEM content and principles—hence the successful STEAM movement (STEM + Art), which seeks to align the arts through multidisciplinary approaches. Thinking beyond practitioners’ own campuses is also important, and the players mentioned here can make connections with community colleges and other feeder institutions to form and join networks that share promising practices. It is important for student affairs professionals to work with faculty and local employers to provide exposure to STEM careers and to ensure opportunities for employers to provide positive and affirming experiences in support of student success.

### Table 1. High-impact Practices to Improve Recruitment and Retention of Underrepresented STEM Students

<table>
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<th>Practices</th>
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| Precollege programs      | • Academic enrichment  
                          |   • Summer bridge                              |
| Undergraduate research   | • Summer training  
                          |   • Apprenticeship models                      |
| Academic support         | • Tutoring  
                          |   • Facilitated study groups                   |
|                          |   • Supplemental instruction                   |
| Social integration       | • Mentoring (peer & faculty)                  |
|                          |   • Learning communities                      |
|                          |   • Family involvement                        |

Focus on High Impact

The need to shape inclusive campus environments for men and women of color in STEM fields is so pressing that practitioners should always draw on evidence (e.g., high-impact practices) when designing and implementing programs and services. High-impact practices are techniques and strategies proven to enhance student learning and persistence, especially for underserved and underrepresented students. Institutional dynamics will certainly influence the extent to which high-impact practices can be implemented on practitioners’ campuses, but there is no need to reinvent the wheel.

Common high-impact practices involve cocurricular approaches for improving undergraduate STEM education. Being situated throughout campus as senior leaders, program directors, administrators, and committee members, student affairs professionals have the unique ability to advocate for and implement practices based on sound evidence in order to effectively recruit and retain diverse STEM students (see Table 1).

Student affairs professionals should encourage their chief academic officer and other leaders in academic affairs to build institutional capacity in ways that emphasize STEM faculty development and curricular innovation in STEM majors. Other high-impact practices require collaboration with senior leadership and partnership with high schools, 2-year colleges, and community-based organizations to systematically broaden the pipeline of students from diverse backgrounds into postsecondary STEM programs (President’s Council of Advisors on Science and Technology, 2012; Rodriguez et al., 2012).

CONCLUSION

The scientific community is evolving in ways few would have guessed, and yet it still remains exclusive in its membership. The unfortunate reality is that too few students enter and succeed in STEM majors. Given student affairs professionals’ orientation and ability to foster a community-minded approach to student access and success, they can help change the status of diverse students in STEM disciplines. These five strategies serve as a starting point for institutional reform, offering concrete steps to challenge the status quo, identify and partner with allies, and use proven practices to create a campus environment that is inclusive and supportive of all students. We hope practitioners use this brief to guide future conversations on campus and elsewhere about how to best improve STEM education to support diverse students.
RESOURCES FOR STUDENT AFFAIRS PROFESSIONALS

Hashtags

#STEM
#STEMforHer
#BLACKandSTEM
#WomeninSTEM
#STEMed

Websites

Top Twitter accounts compiled by STEMconnector
https://twitter.com/STEMConnector/lists/bcotop50stem/members
A list of essential Twitter STEM feeds compiled by Best Colleges Online

University of Southern California Center for Urban Education STEM Toolkit
http://cue.usc.edu/our_tools/stem_toolkit.html
Features tools that help colleges and universities reflect on how institutional practices and resources, as well as individual actions and behaviors, affect the success of Latino students.

Association of American Colleges and Universities’ Project Kaleidoscope
http://www.aacu.org/pkal
A higher education reform center dedicated to empowering STEM faculty, including those from underrepresented groups, to graduate more students in STEM fields who are competitively trained and liberally educated. Although the website is aimed at faculty, student affairs professionals can become familiar with this group’s activities as they work alongside faculty.

Million Women Mentors
https://www.millionwomenmentors.org
An engagement campaign and national call to action that mobilizes corporations, government entities, nonprofits, and higher education groups around the imperative of mentoring girls and young women in STEM fields.

MentorNet
http://mentornet.org
An online platform for mentoring, MentorNet’s mission is to foster a prevalent culture of mentoring in STEM that empowers individuals to persist and succeed in their fields.

NASPA Assessment, Evaluation, and Research Knowledge Community
https://www.naspa.org/constituent-groups/kcs/assessment-evaluation-and-research
The NASPA Assessment, Evaluation, and Research Knowledge Community encourages and supports student affairs professionals as they assess learning, evaluate programs, and research theory and practice. By providing quality education and networking opportunities, the knowledge community strives to serve as a driving force in the movement toward improved student learning.

Publications


REFERENCES


ABOUT NASPA

NASPA—Student Affairs Administrators in Higher Education is the leading association for the advancement, health, and sustainability of the student affairs profession. We serve a full range of professionals who provide programs, experiences, and services that cultivate student learning and success in concert with the mission of our colleges and universities. Founded in 1919, NASPA comprises more than 13,000 members in all 50 states, 25 countries, and 8 U.S. Territories. Through high-quality professional development, strong policy advocacy, and substantive research to inform practice, NASPA meets the diverse needs and invests in realizing the potential of all its members under the guiding principles of integrity, innovation, inclusion, and inquiry. NASPA members serve a variety of functions and roles, including the vice president and dean for student life, as well as professionals working within housing and residence life, student unions, student activities, counseling, career development, orientation, enrollment management, racial and ethnic minority support services, and retention and assessment.

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