

### ABSTRACT

In 2007, the AEMES (Achieving Excellence in Math, Engineering and Science) programs were launched to increase the success of our underrepresented students in STEM majors at Smith College. Elements of Smith's AEMES programs include peer mentoring and faculty-mentored research opportunities as a means of building community and increasing academic success for underrepresented students. Since the implementation of the AEMES programs, our students of color have shown significant gains in introductory biology and chemistry course GPA as well as greater participation in advanced research in the sciences as a whole, dissolving previously observed gaps between students of color and majority students on each of these measures. Rates of persistence in the sciences as a whole for our students of color were equivalent to majority students before AEMES' launch and remain high, exceeding national rates. Within our institution, work continues to evaluate outcomes across program components. In an effort to propel programming efforts aimed at achieving inclusive excellence in the sciences beyond our institution, we pose a series of questions that, in our experience, helped AEMES' planning and success and continues to move our work forward.

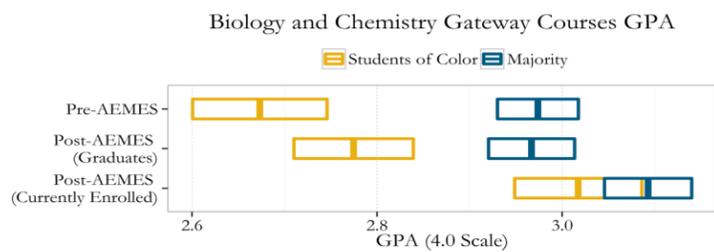
### THE AEMES PROGRAMS

In 2006, a Smith delegation attended the meeting, "Symposia on Diversity in the Sciences," sponsored by the Howard Hughes Medical Institute (HHMI), where participating institutions were charged with analyzing key academic outcomes for its students of color in STEM. At that time, there were gaps between our students of color and majority students on some important measures of academic success. Through the generous support of HHMI and other benefactors, Smith science faculty launched the AEMES (Achieving Excellence in Mathematics, Engineering, and Science) programs in 2007 with the goal of advancing inclusive excellence for our students. One central component of the first AEMES programs was faculty and peer mentoring. The AEMES Scholars program, our flagship initiative, matches admitted students who have declared an interest in a STEM major and are students of color, first generation students, or both to a faculty mentor who provides research and academic mentoring. AEMES scholars receive a rich array of additional resources during their first two years, including a stipend for their work in a research lab. In addition, AEMES scholars are members of the Peer Mentoring Program, which matches incoming students with returning student mentors who offer advice and support through regular contact and face-to-face meetings.

### OUTCOMES AND OBSERVATIONS

Since the launch of our AEMES program, gaps between students of color and our majority students in introductory life science (biology and chemistry) gateway courses (Katz et al., 2015; see Figure 1) and advanced research participation across the sciences (see Figure 2 and Table 1) have disappeared.

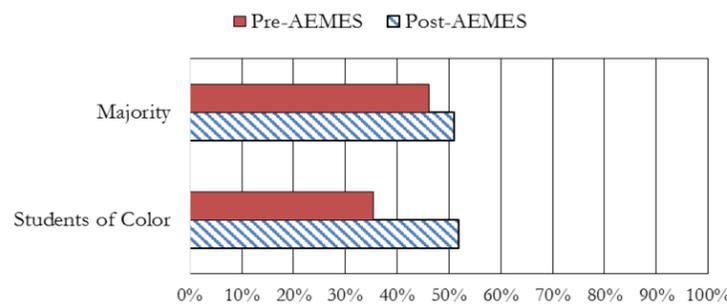
**Figure 1. GPA performance in gateway biology and chemistry courses (from Katz et al., 2015)**



Note. Figure 1 displays means and 95% confidence intervals on a 4.0 scale.

**Figure 2 and Table 1. Participation in advanced research in junior and/or senior years**

### Division III Advanced Research



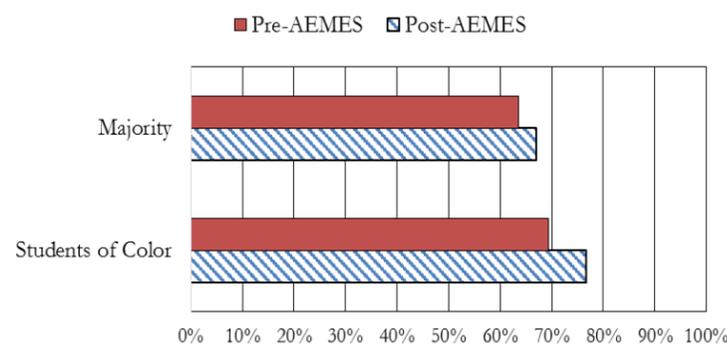
Advanced Research in Division III	Students of Color	Majority
Pre-AEMES Alumnae	35.5% <sup>a, b</sup> (N=141)	46.1% <sup>b</sup> (N=306)
Post-AEMES Alumnae	51.8% <sup>a</sup> (N=137)	50.9% (N=275)

Note. Persistence is defined as student stated interest in the Division III majors at the time of admissions matching a declared Division III major. Pre-AEMES covers first-time first-year students entering 2003-2006 while Post-AEMES covers students entering 2007-2010. No statistically significant differences were found.

Persistence remains high for all of our science students (see Table 3 and Figure 2), exhibiting rates exceeding national averages (HERI, 2010).

**Figure 3 and Table 2. Persistence in science**

### Persistence in Division III



Persistence in Division III	Students of Color	Majority
Pre-AEMES Alumnae	69.4% (N=111)	63.6% (N=242)
Post-AEMES Alumnae	76.7% (N=103)	67.0% (N=203)

Notes: Persistence is defined as student stated interest in the Division III majors at the time of admissions matching a declared Division III major. Pre-AEMES covers first-time first-year students entering 2003-2006 while Post-AEMES covers students entering 2007-2010. No statistically significant differences were found.

This year, we asked students applying to serve in our peer mentoring program to articulate why they wanted to become mentors themselves, providing some insight into the various ways in which mentoring might influence the positive outcomes observed with our AEMES programming (see Table 3).

**Table 3: Student observations about the importance of mentoring**

I have worked very hard to be in my current position, but it would not have been at all possible without the constant support I had from my mentors. I wish to help support another who is going down a similar path as me.

I believe everyone deserves the opportunity to have a reliable resource who is also willing to motivate them when they think things are getting too hard.

Last year, I was a mentee for this program. While I had amazing mentors, I realized at the end of the program that I, myself, was hesitant about asking my mentors for meetings and help because I didn't want to bother them...I was a little disappointed in myself especially because this is such a great program and my mentors were willing to help me. I want to be a mentor so that I can...help incoming Smith students on their new journeys.

I struggled severely last semester in the sciences. I took on too much than I could handle and pretty much shut down. I don't want any other student to have to go through the heartbreak of thinking that they don't belong on Smith's campus or that they aren't good enough to major in STEM.

I think that mentoring is critical for underrepresented students in the sciences. As one myself, I was heavily discouraged when I first came to Smith. I found myself constantly comparing myself to other students who excelled in class and extracurricularly. I learned that everyone's academic path and life are so different that it's not worth fretting about. As a mentor, I think that it's important to remind my mentee that it'll be ok!

At Smith, the sciences are very challenging and to be a minority may make the student feel as if they are helpless and cannot reach out to professors for help.

### DISCUSSION

Smith College, the largest women's liberal arts college in the United States, has a strong commitment to educating diverse women in the sciences. Since the launch of our AEMES programs, Smith has closed gaps between students of color and majority students on important academic measures. Although our AEMES programs take a multifaceted approach to advancing access, we hypothesize that the material and social support provided by its mentoring—from both peers as well as faculty—may play a significant role in creating belongingness and building community while fostering the intellectual and social capital necessary for navigating higher education (cf. Graham et al., 2013). Moving forward, we hope to more deeply assess each pillar of our programmatic efforts and our student outcomes and to think about translatability to other areas

of the college as well as other institutions whose goals are the same as ours.

As we reflect on the past eight years of mentor program building, there were a number of important questions that helped us to hone and develop our understanding of the students we were trying to serve. We share these questions below so that other individuals, programs, and institutions can use them to guide their thinking in their own work in fostering inclusive access and persistence in the sciences. Such investments can contribute to the diversification of STEM fields and allows us to reap the benefits of a broader set of approaches and perspectives (Bianchini, 2013).

### BUILDING PROGRAMS AROUND MENTORING UNDERREPRESENTED STUDENTS

- How do you define student success?
- How are your students from underrepresented populations performing?
- What hurdles to success are there to change at your institution?
- Where is there interest or energy on campus that might propel change?
- Who are your potential partners or allies across campus?
- How can you leverage current resources to address the problems you identify?
- How can you build momentum toward a programmatic effort?

### REFERENCES

Bianchini, J. A. (2013). Expanding underrepresented minority participation: America's science and technology talent at the crossroads. *Science Education*, 97, 163-166.

Graham, M.J., Frederick, J., Byars-Winston, A., Hunter, A.B., & Handelsman, J. (2013). Increasing persistence of college students in STEM. *Science*, 341, 1455-1456.

Higher Education Research Institute (2010). Degrees of success: Bachelor's degree completion rates among initial STEM majors. Los Angeles, CA: Author.

Katz, L.A., Aloisio, K.M., Flores, Y., Horton, N., Joseph, V., Lipp, K., Ly, M., Pruss, S., Queeney, K., Rowen, C., & DiBartolo, P.M. (2015, June). *Improving outcomes for underrepresented women in the life sciences: The Achieving Excellence in Mathematics, Engineering, and Science (AEMES) programs at Smith College*. Poster presentation at the Howard Hughes Medical Institute Studio meeting. "Promoting persistence and access: Adapting promising practices and promoting institutional change," Chevy Chase, MD.

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