

The Value of Peer Mentoring Networks for Developing Leaders and Inspiring Change

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ABSTRACT: A peer-mentoring network, funded by the National Science Foundation ADVANCE program, profoundly impacted the career trajectory of five women chemistry faculty at predominantly undergraduate institutions. By providing each other support, encouragement, information, and accountability, we advanced our careers, became leaders in our own right, and implemented change at our institutions. To extend this benefit to more women STEM faculty, we have developed and implemented a model to support 74 faculty and administrators representing 51 institutions across the country.



■ BARRIERS AND CHALLENGES

STEM faculty who identify as female leave academia at twice the rate of those who identify as male, and those who stay do not attain the rank of Professor or positions of institutional leadership at the same rate as their male counterparts.^{1–6} Women make up approximately 30% of the STEM (as defined in Figure 1) faculty in universities and 4-year colleges. However, faculty who identify as women only hold the rank of Professor in 12% of the engineering and 24% of the faculty positions in the remaining STEM fields.¹ Additionally, barriers to gender equity are not the same for all women. The extent of gender inequity varies among STEM disciplines and is impacted by other intersectional identities, including, but not

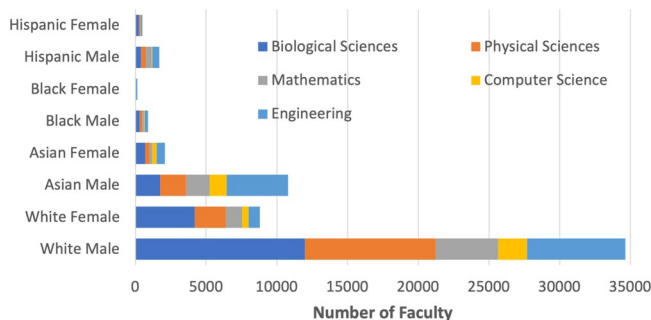


Figure 1. Comparison of US STEM Faculty Holding the Rank of Full Professor by Discipline, Gender, Race, and Ethnicity. Reproduced from ref 1.

limited to race, ethnicity, sexual orientation, disability status, economic background, and geography.^{7–14} In these STEM fields, approximately 4% of associate professors are female faculty of color, and about 1% of full professors are female faculty of color (Figure 1).

Among the most common barriers impeding the success of women STEM faculty are workplace environment, institutional and departmental climate, implicit bias, faculty workload inequities, and the male-designed model of professional and academic achievement.^{15–19} Active interventions are required to systematically address these barriers to professional advancement—particularly for female-identifying faculty; many of whom face additional hurdles because they have a visible or invisible disability, were first-generation college students, or have multiple intersectional identities that compound the challenges within academia.^{1,8,20–23}

One approach to addressing these disparities is through the formation of Peer Mentoring Networks.^{24–34} While such groups are often assembled to increase the scholarly productivity of participants, they can also be a space in which faculty obtain career advice, gather support from colleagues, and learn strategies for overcoming institutional

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barriers. Critical to these peer-mentoring groups is that participants act as both mentees and mentors; thus all parties contribute to and benefit from the relationship.³⁵ Notably, inter-institutional peer-mentoring programs, in contrast to those where all participants are from a single institution, can provide greater confidentiality, an expanded network, and a greater understanding of policies and practices as implemented at different institutions. The resulting community provides an opportunity for guided and informed support in setting goals and making decisions about one's career choices. The positive impacts of these programs can be particularly profound for members of under-represented groups.^{36–38}

■ OUR STORY

In 2012, the authors were selected to participate in a National Science Foundation ADVANCE project titled Advancing the Careers of Women in STEM at Predominantly Undergraduate Institutions (ASAP).³⁹ As part of the project, four- to five-member mentoring networks, or alliances, were created based on career stage and discipline. We were the mid-career chemistry alliance. For the next four years, we met virtually most months and in person annually. During our time together, we discussed our scholarly efforts, teaching methodologies, service activities, and career plans. We reviewed each other's grant proposals, manuscripts, and tenure and promotion documents. We also shared numerous pedagogical and scholarly resources, professional development and funding opportunities, and information about campus practices, policies, and infrastructures.

It was incredibly helpful that we were all faculty at predominantly Undergraduate Institutions (PUIs) and, therefore, had a good understanding about each other's professional obligations, expectations, and challenges. The unique characteristics of PUIs can make already-significant barriers for female-identifying faculty in STEM more pronounced. These institutions are often located in rural areas with minimal racial and ethnic diversity, and female faculty have few women STEM colleagues to turn to for support and guidance, especially those with intersectional under-represented identities. Furthermore, given the small size of these institutions, individual STEM faculty often serve as the sole expert in their subdiscipline (limiting opportunities for flexible or part-time work) and are tasked with a broad and demanding range of responsibilities including above-average teaching, advising, and service loads. This leaves little time and support for scholarship. Finally, the student-centered culture of such institutions places emphasis on collaborative research with undergraduate students, which often impacts the rate and quantity of research progress and publication.

Despite the varying institutional barriers we faced, our alliance provided us the support, mentorship, and networking we needed to grow both professionally and personally. We addressed the challenges that were holding us back, prioritized the many competing demands on our time, and held each other accountable to pursue our goals. We also realized that our voices have power and can affect systemic change. Included below are individual reflections on the nature of our participation in ASAP and the impact it had on us.

Liz – Conquering Associate Professor Inertia. At the time I received the invitation to be a part of the mid-level chemistry ASAP ADVANCE alliance, I was a very active associate professor on our campus. The bulk of my time was focused on teaching and service, with relatively little devoted to

research. I was serving as the Director of Assessment for the university and had chaired a number of important initiatives. My efforts toward my scholarly agenda and my own advancement had basically stalled. After some thoughtful discernment, I applied to be a participant in the ASAP ADVANCE network as a commitment to my research and future promotion. The development opportunities provided at the yearly meetings in conjunction with the supportive peer group were significant factors in my success as a scholar and led to my eventual promotion. I presently serve as Assistant Dean of Academics in the College of Engineering & Science. This is a position I do not believe I would have attained without my involvement in the ASAP ADVANCE network. Others on campus knew I was affiliated with this chemistry peer group and a much larger group of STEM faculty from PUIs. Consequently, I was able to share best practices from the ASAP ADVANCE group and use these on my own campus to contribute to the development and institutionalization of impactful and equitable practices and policies for both students and faculty.

Patty – Overcoming Bullying and Microaggressions.

As an Associate Professor, I faced challenges with a toxic work environment that made it difficult to thrive. At meetings, I was often yelled at, told to “just do my job”, or interrupted and not allowed to continue speaking. I felt discouraged, undervalued, and lost. I sadly watched as other women STEM faculty left our university for different positions, and I contemplated my own career options, which included leaving academia altogether. The peer mentoring from my midcareer chemistry ASAP ADVANCE alliance provided the support I needed to navigate these difficult times, successfully advance my career to full professor, and eventually become department chair. Slowly, through peer networking on my campus, we have been able to create institutional changes that have reduced microaggressions and bullying on our campus, as well as increasing training for diversity and equity.

Personally, this experience has made a world of difference. Previously, my interactions with students were my main motivation. They were the reason to get out of bed every morning and keep doing my job. Today, while I still love teaching and working with my students, I now find that I like going to work more generally. I enjoy seeing and working with my colleagues and finally feel a sense of belonging. It is a joy to now be able to support and mentor the untenured faculty in my department and help make their career journeys happier and more productive.

Chrystal – Beating the Odds. When the ASAP ADVANCE alliances were being formed, I had just changed institutions. As an Associate Professor repeating the tenure process on a short clock at a new institution, I relied on my alliance to provide a sounding board, healthy and supportive accountability, and a friendship I did not know I needed. The workshops offered by the ASAP ADVANCE leaders still resonate with me. I learned negotiation skills, the value of a mentoring network, how to self-advocate, the impact of bias, and the importance of diverse voices in STEM.

As a first-generation college student who chose both my undergraduate institution and my major based on maximizing scholarship funds, I had never heard of graduate school, much less thought I was a good candidate for a Ph.D. Over the last 10 years, I have gained confidence in my abilities and a sense of belonging that I never expected. I am currently the only tenured or tenure-track woman in my department. I was the

first woman in my department to be granted promotion to full professor. The ASAP ADVANCE project gave me the courage to apply and the understanding of why it was important to do so.

Hala – Affecting Institutional Change. Being a part of the ASAP ADVANCE alliance had such a profound impact on me that upon returning from our first meeting, a colleague and I felt compelled to share the benefits we were receiving with faculty at our home institution. We formed a faculty group focused on advancing the careers of under-represented faculty. We met quarterly to share issues impacting our career advancement. We also worked to improve campus culture by identifying and advocating for supportive institutional policies and practices. We initially focused our efforts on addressing gender disparity among our faculty ranks. We found that faculty who had experienced childbirth, adoption, or had significant childcare duties were less likely or took longer to apply for tenure or promotion. Working with our administration, faculty senate, and faculty union, we passed an automatic tenure-clock extension policy, allowed for postponement of personnel reviews and evaluations, and removed timespan limitations on materials eligible for submission for promotion to full professor. We also created a faculty ombuds office to provide faculty encountering work-related challenges with an off-the-record, neutral, and confidential resource that could help them gain perspective and evaluate options. Our faculty network now meets weekly for faculty walks and we continue to identify and pursue faculty-friendly policies.

Sarah – Inspiring Leadership. As I reflect back on my time in the midcareer ASAP ADVANCE alliance, what impacted me most was a sense of urgency to support others in ways that advanced their careers. I noted that, disproportionately, women were waiting longer to apply for promotion to full professor. This propelled me to stand for full professor as quickly as I was able. I also felt moved to both advocate for myself and take on increasing leadership roles within the university, and eventually beyond. Participating in this group gave me the confidence to put my name forward for important roles on campus. I moved from department chair, to associate dean, interim dean, and eventually associate provost before moving on to a new institution to serve as Provost and Dean of the Faculty. In these positions, I was able to advocate more generally for under-represented faculty by introducing changes to the faculty handbook to improve equity, developing peer mentoring networks within the college and in the region, and working to ensure that credit toward promotion was received for institutional grant writing to better serve our students.

■ EXPANDING OUR NETWORK - THE ASCEND PROJECT

The ASAP ADVANCE project took place over the course of five years; during our final in-person meeting, we reminisced about our past few years together and celebrated all that we had accomplished. We made a commitment to “pay it forward” and share with others what we had experienced. Consequently, we continued to hold our virtual monthly meetings and focused on how we could build on and expand our network to benefit others. We eventually decided to pursue an NSF ADVANCE Partnership Grant with the following aims:

- Increase the advancement of mid-career women in STEM fields by creating regional peer-to-peer networks for both faculty and administrators.
- Create agents of change by providing education, training, and professional support that would (1) equip women STEM faculty for promotion and leadership positions and (2) equip administrators to develop inclusive campus policies and cultures.
- Create a lasting change through institutional transformation by identifying, developing, and pursuing goals that would reduce obstacles and increase the retention and advancement of a diverse faculty in STEM.

Our program, Advancing STEM Careers by Empowering Network Development (ASCEND), focuses on mid-career faculty because we recognize that while pre-tenure women were now receiving increased support, this was not the case at the associate level, where women were being asked to do more, especially with regard to service, and yet were not receiving the support required to advance in their careers. We found that our own participation in a close-knit peer network was immeasurably beneficial to our career advancement and believed that by creating the same opportunity for other women in STEM, they too would advance in their careers, eventually leading to an increase in the number of women at the level of full professor and in leadership positions.

We have established 17 Alliances across three geographic regions (Northwest, Midwest, and Southeast) representing 51 colleges and universities. Each region includes 4 to 5 Alliances of STEM faculty and an Administrator Alliance. Each Alliance meets online monthly. We also intended to have annual in-person regional meetings but had to transition to virtual meetings in 2020 and 2021 due to the pandemic.

As part of our evaluation, we administered a baseline survey in 2020 and a follow-up survey in 2021. We noticed that after one year of Alliance activities and interventions, faculty participants prioritized their needs differently. Their primary topic of interest shifted from work–life balance to managing or leading individuals. Participants are now asking for resources that can help them be better leaders and effective change agents. Additionally, they recognize the value of having a robust professional network. To further address the desire for leadership development, we are offering virtual professional development workshops on topics such as “When and How to Say No with Confidence” and “Leading Difficult Conversations”. These are topics that our participants have indicated are important to their professional and personal needs.

While it is still early in the project cycle, we have already witnessed initial indicators of success. Participants reported that peer networks provided a sense of inclusion and empowerment, which fostered resilience in the face of expected and unexpected challenges. During the monthly Alliance meetings, participants often discussed the importance of leveraging networks and how sharing stories leads to needed support and resources to help address obstacles. Both faculty and administrators at PUIs can feel particularly isolated; alliances provide a support network where participants feel connected, can share resources, and freely express themselves.


We joined ASAP ADVANCE to support our own career development and subsequently discovered that it empowered us to serve others. We are now finding that ASCEND participants are also motivated to contribute to the success of other under-represented groups in STEM fields.

CONCLUSION

Our participation in the ASAP ADVANCE project served as a catalyst for change for our own professional advancement and benefited our institutions through our development as leaders. While we all successfully navigated the challenges of becoming full professors, there are still numerous barriers to promotion and professional advancement for women and other underrepresented groups. This is especially important in the context of the pandemic, which has created specific challenges in terms of work–life balance and the implementation of equitable institutional policies and practices. As part of the ASCEND project, we are assembling a collection of institutional policies to better equip faculty and administrators in leading change at their home institutions. We encourage readers of this Viewpoint article to examine their own institutional track record and look for opportunities to remove these barriers. As this effort demonstrates, clear, equitable policies benefit everyone.

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Notes

The authors declare no competing financial interest.

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REFERENCES

- (1) National Center for Science and Engineering Statistics (NCSES). *Women, Minorities, and Persons with Disabilities in Science and Engineering*; Report NSF 21–321; National Science Foundation: Alexandria, VA; April 29, 2021. <https://nces.nsf.gov/wmpd>.
- (2) Ceci, S.; Williams, W. Understanding Current Causes of Women's Underrepresentation in Science. *Proc. Natl. Acad. Sci. United States Am.* **2011**, *108* (8), 3157–62.
- (3) Mathews, K. *Perspectives on Midcareer Faculty and Advice for Supporting Them*; Collaborative on Academic Careers in Higher Education, Cambridge, 2014.
- (4) August, L.; Waltman, J. Culture, Climate, and Contribution: Career Satisfaction Among Female Faculty. *Res. High. Educ.* **2004**, *45* (2), 177–192.
- (5) Callister, R. R. The Impact of Gender and Department Climate on Job Satisfaction and Intentions to Quit for Faculty in Science and Engineering Fields. *J. Technol. Transfer* **2006**, *31* (3), 367–375.
- (6) Seifert, T. A.; Umbach, P. D. The Effects of Faculty Demographic Characteristics and Disciplinary Context on Dimensions of Job Satisfaction. *Res. High. Educ.* **2008**, *49* (4), 357–381.
- (7) Hunt, V.; Morimoto, S.; Zajicek, A. Intersectionality and Dismantling Institutional Privilege: The Case of NSF ADVANCE Program. *Race, Gender & Class* **2012**, *19*, 266–290 (<https://www.jstor.org/stable/43496873>).
- (8) Mack, K.; Taylor, O.; Cantor, N.; McDermott, P. If Not Now, When? The Promise of STEM Intersectionality in the Twenty-First Century. *Peer Rev.* **2014**, *16* (2), 1.
- (9) Sambamurthy, N.; Main, J. B.; Sanchez-Peña, M.; Cox, M. F.; McGee, E. Asian-American Women Engineering Faculty: A Literature Review Using an Intersectional Framework of Race, Class, and Gender. *Proc. - Front. Educ. Conf. FIE* **2016**, *1* DOI: [10.1109/FIE.2016.7757518](https://doi.org/10.1109/FIE.2016.7757518).
- (10) Muhs, G. G. y.; Niemann, Y.; González, C. G.; Harris, A. P. *Presumed Incompetent: The Intersections of Race and Class for Women in Academia*; University Press of Colorado, 2012.
- (11) Marschke, G.; Nunez, A.; Weinberg, B. A.; Yu, H. Last Place? The Intersection of Ethnicity, Gender, and Race in Biomedical Authorship. *AEA Pap. Proc.* **2018**, *108*, 222–227.
- (12) Núñez, A. M.; Rivera, J.; Hallmark, T. Applying an Intersectionality Lens to Expand Equity in the Geosciences. *Journal of Geoscience Education* **2020**, *68*, 97–114.
- (13) Moore, M. R. Women of Color in the Academy: Navigating Multiple Intersections and Multiple Hierarchies. *Soc. Probl.* **2017**, *64* (2), 200–205.
- (14) Charleston, L. J.; Adserias, R. P.; Lang, N. M.; Jackson, J. F. L. Intersectionality and STEM: The Role of Race and Gender in the Academic Pursuits of African American Women in STEM. *J. Progress. Policy Pract.* **2014**, *2* (3), 1.
- (15) Van Miegroet, H.; Glass, C.; Callister, R. R.; Sullivan, K. Unlogging the Pipeline: Advancement to Full Professor in Academic STEM. *Equal. Divers. Incl.* **2019**, *38* (2), 246.
- (16) Mendoza-Denton, R.; Shaw-Taylor, L.; Chen, S.; Chang, E. Ironic Effects of Explicit Gender Prejudice on Women's Test Performance. *J. Exp. Soc. Psychol.* **2009**, *45* (1), 275–278.
- (17) Hill, C.; Corbett, C. *Solving the Equation: The Variables for Women's Success in Engineering and Computing*; AAUW; 2015.
- (18) Webber, K. L.; Rogers, S. M. Gender Differences in Faculty Member Job Satisfaction: Equity Forestalled? *Res. High. Educ.* **2018**, *59* (8), 1105–1132.
- (19) Mamiseishvili, K.; Lee, D. International Faculty Perceptions of Departmental Climate and Workplace Satisfaction. *Innov. High. Educ.* **2018**, *43* (5), 323–338.
- (20) *Gender Differences at Critical Transitions in the Careers of Science, Engineering, and Mathematics Faculty*; The National Academies Press, Washington, DC, 2010. DOI: [10.17226/12062](https://doi.org/10.17226/12062).
- (21) Xu, Y. J. Gender Disparity in STEM Disciplines: A Study of Faculty Attrition and Turnover Intentions. *Res. High. Educ.* **2008**, *49* (7), 607–624.
- (22) Blackwell, L. V.; Snyder, L. A.; Mavriplis, C. Diverse Faculty in STEM Fields: Attitudes, Performance, and Fair Treatment. *J. Divers. High. Educ.* **2009**, *2* (4), 195–205.
- (23) Lisnic, R.; Zajicek, A.; Morimoto, S. Gender and Race Differences in Faculty Assessment of Tenure Clarity: The Influence of

Departmental Relationships and Practices. *Sociol. Race Ethn.* **2019**, *5* (2), 244–260.

(24) Thomas, N.; Bystydzienski, J.; Desai, A. Changing Institutional Culture through Peer Mentoring of Women STEM Faculty. *Innov. High. Educ.* **2015**, *40* (2), 143–157.

(25) Mitchneck, B.; Smith, J. L.; Latimer, M. A Recipe for Change: Creating a More Inclusive Academy. *Science* **2016**, *352* (6282), 148–149.

(26) Gibson, S. Mentoring of Women Faculty: The Role of Organizational Politics and Culture. *Innov. High. Educ.* **2006**, *31*, 63–79.

(27) Chesler, N. C.; Chesler, M. A. Gender-Informed Mentoring Strategies for Women Engineering Scholars: On Establishing a Caring Community. *J. Eng. Educ.* **2002**, *91* (1), 49–55.

(28) Chesler, N. C.; Single, P. B.; Mikic, B. On Belay: Peer Mentoring and Adventure Education for Women Faculty in Engineering. *J. Eng. Educ.* **2003**, *92*, 257–262.

(29) Driscoll, L. G.; Parkes, K. A.; Tilley-Lubbs, G. A.; Brill, J. M.; Pitts Bannister, V. R. Navigating the Lonely Sea: Peer Mentoring and Collaboration among Aspiring Women Scholars. *Mentor. Tutoring Partnersh. Learn.* **2009**, *17* (1), 5–21.

(30) Meschitti, V.; Lawton Smith, H. Does Mentoring Make a Difference for Women Academics? Evidence from the Literature and a Guide for Future Research. *J. Res. Gen. Stud.* **2017**, *7* (1), 166–199.

(31) Nisbet, G.; McAllister, L. A Critical Review of Outcomes of Peer Group Mentoring and Elements Influencing Its Success and Application to Student Placement Supervisors. *Int. J. Pract. Learn. Heal. Soc. Care* **2015**, 61–76.

(32) Zellers, D. F.; Howard, V. M.; Barcic, M. A. Faculty Mentoring Programs: Reenvisioning Rather Than Reinventing the Wheel. *Rev. Educ. Res.* **2008**, *78* (3), 552–588.

(33) Rees, A.; Shaw, K. Peer Mentoring Communities of Practice for Early and Mid-Career Faculty: Broad Benefits from a Research-Oriented Female Peer Mentoring Group. *J. Fac. Dev.* **2014**, *28* (2), 5–17.

(34) Gibson, S. K. Being Mentored: The Experience of Women Faculty. *J. Career Dev.* **2003**, *30* (3), 173–188.

(35) Biehle, L.; Crowl, A.; Park, H. C.; Vos, S.; Franks, A. M. The Power of Peer Mentoring to Support Women Pharmacy Faculty Personally and Professionally. *Am. J. Pharm. Educ.* **2021**, *85* (2), 8471.

(36) Espino, M. M.; Zambrana, R. E. How Do You Advance Here? How Do You Survive? An Exploration of Under-Represented Minority Faculty Perceptions of Mentoring Modalities. *Rev. High. Educ.* **2019**, *42* (2), 457–484.

(37) Zambrana, R. E.; Ray, R.; Espino, M. M.; Castro, C.; Cohen, B. D.; Eliason, J. “Don’t Leave Us Behind”: The Importance of Mentoring for Underrepresented Minority Faculty. *Am. Educ. Res. J.* **2015**, *52* (1), 40–72.

(38) Nunez, A.; Murakami, E.; Gonzales, L. Weaving Authenticity and Legitimacy: Latina Faculty Peer Mentoring. *New Dir. High. Educ.* **2015**, *2015*, 87–96.

(39) McGrath, C.; Francovich, C.; Smieja, J. A.; Cronin, C.; Lacueva, G.; Sabin, R. E.; Song, J. Y.; Voltzow, J.; Zhong, X. Building a Framework to Advance the Careers of Women in STEM at Predominantly Undergraduate Institutions. *Adv. J.* **2019**, *1* (2), 1
DOI: 10.5399/osu/ADVJRNL.1.2.1.