BOARD # 395: NSF AGEP Catalyst Alliance: Engaging Leaders to Improve Diversity among STEM Faculty

Dr. Lizandra C Godwin, University of New Mexico

Dr. Lizandra C. Godwin is a faculty member in the Electrical and Computer Engineering Department at the University of New Mexico. Dr. Godwin earned her M.S. and Ph.D. degrees in Materials Science and Engineering from the University of Florida, and her B.S. in Mechanical Engineering from Florida A&M University. Her research focuses on materials (ink) development for advanced manufacturing processes, microelectronic devices, and broadening participation in engineering graduate programs through her engineering education research. Prior to academia, Dr. Godwin worked for many Fortune 100 companies, including Intel Corporation.

Dr. John K. Wagner, University of New Mexico

Dr. John K. Wagner is a Postdoctoral Fellow for the Alliances for Graduate Education and the Professoriate (AGEP) joint project between the University of New Mexico, Arizona State University, and the University of Oregon. His research interests focus on improving equity in higher education, and the impacts of technology on public opinion and political psychology. Specifically, Dr. Wagner's research explores how to improve equity and inclusion by measuring latent support for exclusionary practices, and designing interventions targeted at improving gaps in graduate student success and support, and faculty hiring, tenure, and promotion. Additionally, his research attempts to understand the impacts of online platforms and their algorithms on political contention in the United States.

Benjamin Jose Aleman, University of Oregon
Elizabeth A Wentz, Arizona State University

Dr. Elizabeth A. Wentz is the Vice Provost and Dean of the Graduate College and Professor in the School of Geographical Sciences and Urban Planning at Arizona State University. She earned her PhD in Geography from the Pennsylvania State University and MA and BS from the Ohio State University. Her research focuses on geospatial technologies in urban adaptation to climate change.

Dr. Donna M Riley, University of New Mexico

Donna Riley is Jim and Ellen King Dean of Engineering and Computing, and Professor in the Gerald May Department of Civil, Environmental, and Construction Engineering at the University of New Mexico.

NSF AGEP Catalyst Alliance: Engaging Leaders to Improve Diversity among STEM Faculty

Introduction

The underrepresentation of historically excluded groups in STEM faculty positions in the United States remains a critical challenge in academia. Despite progress in diversifying the student body, systemic barriers impede the recruitment, retention, and advancement of African American, Hispanic American, Native American Indian, Alaskan Native, Native Hawaiian, and Native Pacific Islander faculty. These inequities limit opportunities for individuals and hinder the innovation and inclusivity of STEM fields.

Such barriers are deeply rooted in structural inequities, including "epistemic exclusion"—the marginalization of scholarship and scholars that challenge disciplinary norms or focus on equity and inclusion [1], [2]. Hiring and evaluation processes often emphasize narrow productivity metrics, such as publication counts, grant funding, and citation indices, which privilege dominant groups and discourage bold, innovative research [3], [4]. These practices reinforce institutional biases and reduce opportunities for all scholars to thrive in academia [5].

The National Science Foundation Alliances for Graduate Education and the Professoriate (NSF AGEP) program addresses these challenges by supporting collaborations that focus on systemic change in academic institutions. Our AGEP Catalyst Alliance (ACA) was a collaboration between three public R1 universities in the western United States. We employed data-driven methods to identify institutional barriers and develop actionable strategies for increasing diversity and inclusion among STEM faculty. Grounded in managerial engagement theory [6] and the small-wins approach to organizational change [7], this initiative mobilizes leaders, fosters inclusive climates, which led to equity plans to transform STEM academia. This paper highlights the major activities, findings, and implications for engineering education and beyond.

Major Activities

The project employed a multi-faceted, data-driven approach to address systemic barriers to representaion in STEM academia. The project integrated institutional self-assessments, leadership engagement, and experimental research and then distilled those activities into a long-term plan to foster organizational change.

Institutional Self-Assessments

The project began with a comprehensive assessment of graduate student data at all partner institutions. The partner institutions included the University of New Mexico, Arizona State University, and the University of Oregon. These assessments highlighted disparities in graduate admissions, retention, and funding, with underrepresented students facing more significant barriers to academic success. By disaggregating data, the assessments provided a baseline for identifying inequities and for tracking progress. Furthermore, the data allowed the team to

identify local barriers at each institution while also understanding what barriers and inequities were common among the institutions.

Leader Engagement Committees

To address systemic barriers at the leadership level, the project piloted leader engagement committees composed of senior administrators, department chairs, and other faculty leaders. These committees reviewed institutional data, identified challenges, and proposed tailored solutions. Guided by Dobbin and Kalev's managerial engagement framework, the committees fostered buy-in by involving leaders in designing and implementing initiatives.

Factorial Experiment

The project also conducted a partial factorial experiment to examine biases in tenure and promotion (T&P) evaluations. Using hypothetical candidate profiles, the experiment tested the effects of institutional affiliation, research field, methodology, and common, but problematic, productivity metrics on perceptions of research excellence. Our goal in implementing this approach was to ensure that we could provide evidence of the problem and a lack of proper merit review with a methodology more familiar to many STEM- especially engineering faculty and leaders. The experiments were developed organically through active engagement with STEM faculty and leaders, exemplifying how collaborative conversations can drive innovative solutions.

Equity Plan Development

The team drafted a five-year equity plan based on the findings from the self-assessments and leader engagement activities. This plan incorporates evidence-based strategies, including mentorship programs and accountability mechanisms, to promote hiring, retention, and advancement of STEM faculty. The plan emphasizes small wins—incremental, visible changes that build momentum for more significant systemic transformations [7]—and engaging critical leaders in helping design interventions to ensure their commitment and to generate accountability [6], [8], [9]. We have yet to see the impact of this plan, as it has not yet been shared with institutional and faculty leaders, though their input closely shaped its design.

Results and Discussion

Challenges in Accessing and Utilizing Institutional Data- Graduate Program Outcomes

While anticipated, the findings from the institutional self-assessments raised critical questions about the barriers to overcoming academia's reliance on a narrow set of success metrics for students. The literature highlights how institutional dependence on such metrics marginalizes diverse perspectives and stifles innovation in STEM [3]. However, our work revealed that even obtaining these metrics in a detailed and comparable format to gain nuanced insights into graduate student success presents significant challenges.

Institutions often limited data sharing or provided inconsistently calculated metrics, complicating cross-institutional analysis. When data were provided, they were often calculated differently across partner institutions, making meaningful comparisons difficult. Each institution also faced

unique barriers within its data systems. One institution displayed frequent inconsistencies that undermined the accuracy of its records, while another only offered the broadest summary statistics, which limited nuanced investigations into graduate student retention and success at the program level.

These challenges underscore a significant issue: inaccuracy can easily infiltrate decision making processes when institutions struggle to access reliable and accurate data. The difficulty of working with inconsistent or incomplete information hinders the ability to make informed, fair decisions. Addressing these systemic data issues is critical, and we hope our work inspires institutions of higher education and others to prioritize improvements in data accessibility and integrity as a step toward more impartial outcomes in STEM education.

Leadership as Agents of Change

Leader engagement committees emerged as a critical mechanism for fostering institutional transformation within the ACA project. By involving senior leaders in the project initiatives, these committees fostered accountability and empowered leaders to act as allies. This approach exemplifies the importance of engaging organizational leaders as partners in change rather than treating them as obstacles [10]. The project saw many faculty and leaders become increasingly engaged and enthusiastic about designing interventions. One participating leader stated in an engagement survey,

> It's nice to meet people who are focused on these issues and moving forward to make advancements. I also appreciate meeting other people from across the country who share similar values and struggles, and seem motivated to do better by faculty and students.

This growing momentum underscores the potential of leader engagement committees to inspire action and commitment.

However, not all reactions were uniformly positive. Some faculty remained hesitant to acknowledge specific inequities thus requiring additional data or confirmation. Others expressed dissatisfaction with transitioning directly to designing solutions, emphasizing the need for more extensive investigation into the nuances of inequity. This was not a denial of inequity itself but rather a reflection of an intense focus on comprehensively mapping its complexities before acting. While these committees successfully drove slight but notable progress, they also revealed persistent resistance to institutional change, highlighting the need for continued efforts to address hesitations and build consensus around actionable solutions.

Insights from the Factorial Experiment

The factorial experiment revealed significant preferences in tenure and promotion evaluations, emphasizing the need for systemic interventions. Research excellence, scored on a 1–5 scale, reflects how a surveyed tenure reviewer perceives the portfolio's research quality, with higher scores indicating greater excellence.

For the factorial experiment, we used independent variables that were dichotomous, as described in the list below.

- Viewpoint: Peer comparison in rating the portfolio (reviewers perception of research excellence vs. their colleagues).
- Ph.D.: Prestige of the candidate's degree-granting institution (high vs. moderate).
- Field: Mainstream vs. out-of-the-box field in a discipline.
- Journal: High-impact vs. lower-impact publication venues.
- Publications: High (30) vs low number (5) of publications since appointment.
- h-index: High (25) vs. low (5) research impact.
- Funding: NSF CAREER grant vs. intramural funding.

The findings demonstrated that NSF CAREER funding versus intramural funding scored more favorably for research excellence. A higher h-index increased research excellence scores, while publishing 30 articles since tenure-track appointment, compared to only five, raised perception of research excellence. Similarly, publishing in prestigious journals significantly boosted peer evaluations. In contrast, Ph.D. institution prestige did not significantly affect perception of research excellence.

The study also revealed substantial variability in how research excellence—a central tenure and promotion metric—is defined and weighted across institutions and disciplines. Some disciplines disproportionately prioritized Ph.D. institution prestige or mainstream research topics, often marginalizing innovative or equity-focused scholarship. These findings underscore the influence of institutional and discipline norms on tenure evaluations.

This work highlights the need for greater transparency and consistency in the tenure and promotion practices. Sharing these findings with faculty and leadership can promote a more equitable understanding of evaluation criteria. Building on faculty interest, we plan to extend this methodology to other academic milestones, such as graduate exams, funding decisions, and faculty hiring, fostering a more transparent and equitable academic culture.

Conclusion

The project demonstrated the transformative potential of combining managerial engagement and data-driven methods to design targeted interventions to address systemic inequities in STEM academia. The project has laid a robust foundation for fostering institutional change through institutional self-assessments, leader engagement committees, factorial experiments, and in developing a five-year equity plan. The project highlight actionable strategies for overcoming data inconsistencies, varied definitions of research excellence, and resistance to change. Expanding this methodology to other critical stages of the academic pathway offers a promising path forward for pushing toward equitable and inclusive environments that benefit all academic community members.

Acknowledgments

This research was supported by the National Science Foundation Alliances for Graduate Education and the Professoriate (AGEP) under Grant No. 2149204. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

References

[1] I. H. Settles, L. R. Warner, N. T. Buchanan, and M. K. Jones, "Understanding psychology's resistance to intersectionality theory using a framework of epistemic exclusion and invisibility," *J. Soc. Issues*, vol. 76, no. 4, pp. 796–813, Dec. 2020, doi: 10.1111/josi.12403.

[2] K. Dotson, "Conceptualizing Epistemic Oppression," *Soc. Epistemol.*, vol. 28, no. 2, pp. 115–138, Apr. 2014, doi: 10.1080/02691728.2013.782585.

[3] P. E. Smaldino and R. McElreath, "The Natural Selection of Bad Science," *R. Soc. Open Sci.*, vol. 3, no. 9, p. 160384, Sep. 2016, doi: 10.1098/rsos.160384.

[4] J. J. Heckman and S. Moktan, "Publishing and Promotion in Economics: The Tyranny of the Top Five," *J. Econ. Lit.*, vol. 58, no. 2, pp. 419–470, Jun. 2020, doi: 10.1257/jel.20191574.

[5] S. W. Davies *et al.*, "Promoting Inclusive Metrics of Success and Impact to Dismantle a Discriminatory Reward System in Science," *PLOS Biol.*, vol. 19, no. 6, p. e3001282, Jun. 2021, doi: 10.1371/journal.pbio.3001282.

[6] F. Dobbin, D. Schrage, and A. Kalev, "Rage Against the Iron Cage: The Varied Effects of Bureaucratic Personnel Reforms on Diversity," *Am. Sociol. Rev.*, vol. 80, no. 5, pp. 1014–1044, Oct. 2015, doi: 10.1177/0003122415596416.

[7] S. J. Correll, "SWS 2016 Feminist Lecture: Reducing Gender Biases In Modern Workplaces: A Small Wins Approach to Organizational Change," *Gend. Soc.*, vol. 31, no. 6, pp. 725–750, 2017.

[8] F. Dobbin and A. Kalev, "Why Diversity Programs Fail," *Harv. Bus. Rev.*, vol. 94, no. 7, p. 14, 2016.

[9] F. Dobbin, *Inventing Equal Opportunity*. Princeton, N.J.; Oxford: Princeton University Press, 2009.

[10] F. Dobbin and A. Kalev, "The Promise and Peril of Sexual Harassment Programs," *Proc. Natl. Acad. Sci.*, vol. 116, no. 25, pp. 12255–12260, Jun. 2019, doi: 10.1073/pnas.1818477116.