



Reducing the Impact of Bias in the STEM Workforce

STRENGTHENING EXCELLENCE AND INNOVATION

REPORT DIGEST



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PRODUCT OF THE

Interagency Policy Group on Increasing Diversity
in the STEM Workforce by Reducing the Impact of Bias,
Office of Science and Technology Policy (OSTP) and
Office of Personnel Management (OPM)

About the Office of Science and Technology Policy

The Office of Science and Technology Policy (OSTP) was established by the National Science and Technology Policy, Organization, and Priorities Act of 1976. OSTP's responsibilities include advising the President in policy formulation and budget development on questions in which science and technology (S&T) are important elements; articulating the President's S&T policy and programs; and fostering strong partnerships among Federal, state, and local governments, and the scientific communities in industry and academia. The Director of OSTP also serves as Assistant to the President for Science and Technology and manages the National Science and Technology Council (NSTC). More information is available at:

<https://www.whitehouse.gov/ostp>

About the Office of Personnel Management

The Office of Personnel Management (OPM) was established in 1978 as one of three organizations of the former Civil Service Commission. OPM oversees all policy created to support Federal human resources departments—from classification and qualifications systems to hiring authorities and from performance management to pay, leave, and benefits. Along with making those policies, OPM is responsible for ensuring they are properly implemented and continue to be adequately carried out.

About the Interagency Policy Group on Increasing Diversity in the STEM Workforce by Reducing the Impact of Bias

In October 2015, OSTP and OPM established the Interagency Policy Group on Increasing Diversity in the STEM Workforce by Reducing the Impact of Bias and charged the Group to do the following: identify existing and propose new policies aimed at reducing the impact of explicit and implicit biases in the Federal and federally funded STEM workforce; produce a report recommending Government-wide policy options; and submit the report and recommendations for leadership approval.

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Introduction

There is enormous opportunity to enrich the science, engineering, technology, and mathematics (STEM) enterprise and the innovations and solutions it produces by increasing diversity of the human resource on which STEM relies at all levels of participation and leadership. Realizing the potential contributions of people from all backgrounds in STEM is a national imperative, and critical to continued U.S. leadership and competitiveness in innovative fields.

The Obama Administration has taken many steps to increase the diversity of the science, technology, engineering, and mathematics (STEM) enterprise by including groups historically underrepresented in STEM such as women and girls, certain racial and ethnic groups, and people with disabilities. In October 2015 the White House Office of Science and Technology Policy (OSTP) and the Office of Personnel Management (OPM) established an Interagency Policy Group to identify steps the government can take to increase diversity in the STEM workforce by mitigating the impact of implicit, institutional, or explicit bias¹ that may exist in both the Federal Government and in federally funded institutions of higher education. The Interagency Group developed a vision, a goal, objectives, and basic principles to guide its efforts to: inventory current policies and practices; identify best and promising practices; develop recommendations for Government-wide policies and practices; and suggest strategies and next steps.

Implicit bias refers to unintended and unconscious assumptions, often based on stereotypes about gender or ethnicity, which may improperly influence judgments about other people or their work; ***institutional bias*** refers to policies and practices of an institution that may make it more difficult for some members of certain groups to succeed; and ***explicit bias*** refers

1 Use of the terms “bias” or “mitigating or reducing the impact of bias” should be understood to mean “where it exists” throughout this report.

to intentional, consciously articulated beliefs that result in discriminatory attitudes and behaviors toward others.

Diversity refers to representation of people who are members of gender and ethnic groups historically underrepresented in STEM, including women, African Americans, Native Americans, Hispanics, Pacific Islanders, and people with disabilities. The intent, however, is to implement practices that benefit all groups, including groups who are underrepresented and may experience the impact of bias based on their educational attainment, socio-economic status, sexual orientation, gender identity, and geographic location within the United States. Inclusion refers to fostering a work culture in which uniqueness of beliefs, backgrounds, talents and capabilities, and ways of living by all backgrounds and at all levels is valued and leveraged for learning and informing better decision making.

Why STEM Diversity?

Several imperatives drive the urgency to increase diversity of the STEM workforce:

- + **Science and Innovation Imperative:** Diversity within groups enables them to be more creative and generate higher quality or more defensible decisions, particularly in uncertain and novel situations, such as the pursuit of science and innovation.^{2,3}
- + **Workforce Imperative:** The demand for STEM workers is expected to outpace STEM degree production by about 1 million in 2022.⁴ As more

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- 2 Laurel Smith-Doerr, Sharla Alegria, and Timothy Sacco describe “cognitive diversity” as involving “training, ideas, and skills relevant to completing the task” in Laurel Smith-Doerr, Sharla Alegria, and Timothy Sacco, “How Diversity Matters in the U.S. Science and Engineering Workforce: A Critical Review Considering Teams, Fields, and Organizational Contexts.” Under review for publication by Engaging Science, Technology, and Society (2016).
 - 3 Joshi, A., and Roh, H. (2009). Aparna Joshi and Hyuntak Roh, “The Role of Context in Work Team Diversity Research: A Meta-Analytic Review.” *Academy of Management Journal* 52 (2009): 599–627; Scott E. Page, *Diversity and Complexity*, (Princeton, NJ: Princeton University Press, 2010).
 - 4 Executive Office of the President, President’s Council of Advisors on Science and

students are attracted to STEM, it is essential to draw them from all demographic groups to ensure access to the best talent. As the proportion of women and ethnic minorities in the U.S. college population increases—currently approaching 70 percent—it becomes even more important to engage the brainpower of women and underrepresented minorities,⁵ so that agencies and institutions of higher education are drawing from the entire population to hire the best talent.

- + **Economic Imperative:** Research shows that diverse teams outperform homogeneous teams when it comes to financial returns.⁶ While neither Government nor nonprofit institutions of higher education are pursuing profits, the same contributing factors to these success metrics, such as the ability to attract and retain top talent and improved customer or constituent orientation, suggest that many private sector benefits of diversity would accrue to these stakeholders as well.
- + **First Principles Imperative:** The Federal-merit-system principles, which are a foundation for the civil service, provide that agencies should recruit, for their workforce, qualified individuals drawn from all segments of society.
- + **Moral Imperative:** To advance the most fundamental American value of fairness, it is essential to provide equal opportunities to all members of society, including women, racial and ethnic groups, and persons with disabilities, to enter STEM fields. As more members of the diverse groups that make up this Nation realize their potential in the STEM workforce, they also will experience the personal and financial rewards that accompany STEM careers.

Technology, “Report to the President, Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics,” (2012).

5 Ibid.

6 Vivian Hunt, Dennis Layton, and Sara Prince, “Why Diversity Matters,” *Our Insights*, McKinsey & Company, (2015), <http://www.mckinsey.com/business-functions/organization/our-insights/why-diversity-matters>

Best, Promising, and Emerging Practices to Reduce the Impact of Bias in the STEM Workforce

The Interagency Policy Group (IPG) Best Practices Subgroup identified a range of best and promising practices that 14 agencies are using to raise awareness about bias and minimize its impact (see visualization of agency efforts in Figure 1). This section highlights selected successful practices that the Federal science and engineering agencies have used (1) to reduce the impact of bias within their own workforce or (2) to generate basic research, development, and tested interventions on bias in academia.

Key Word Visualization of Agency Efforts from the Collective Summary of Agency Submissions

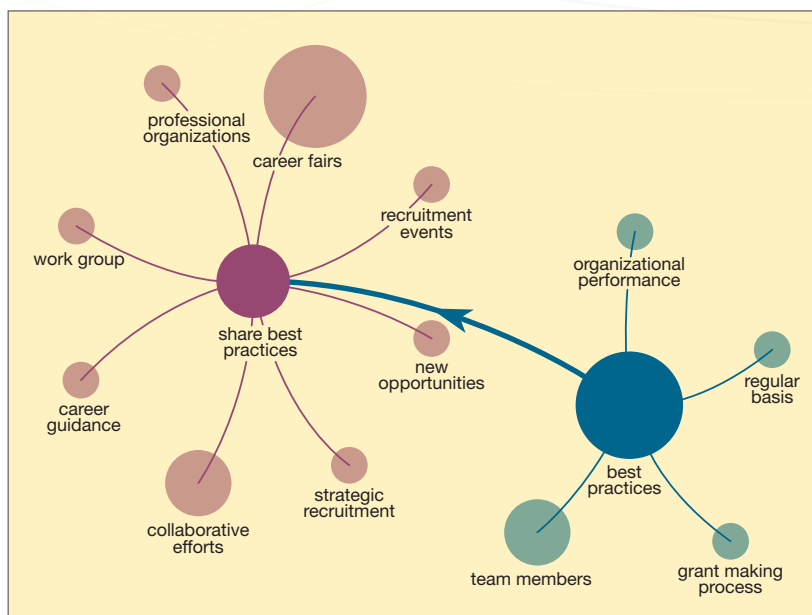
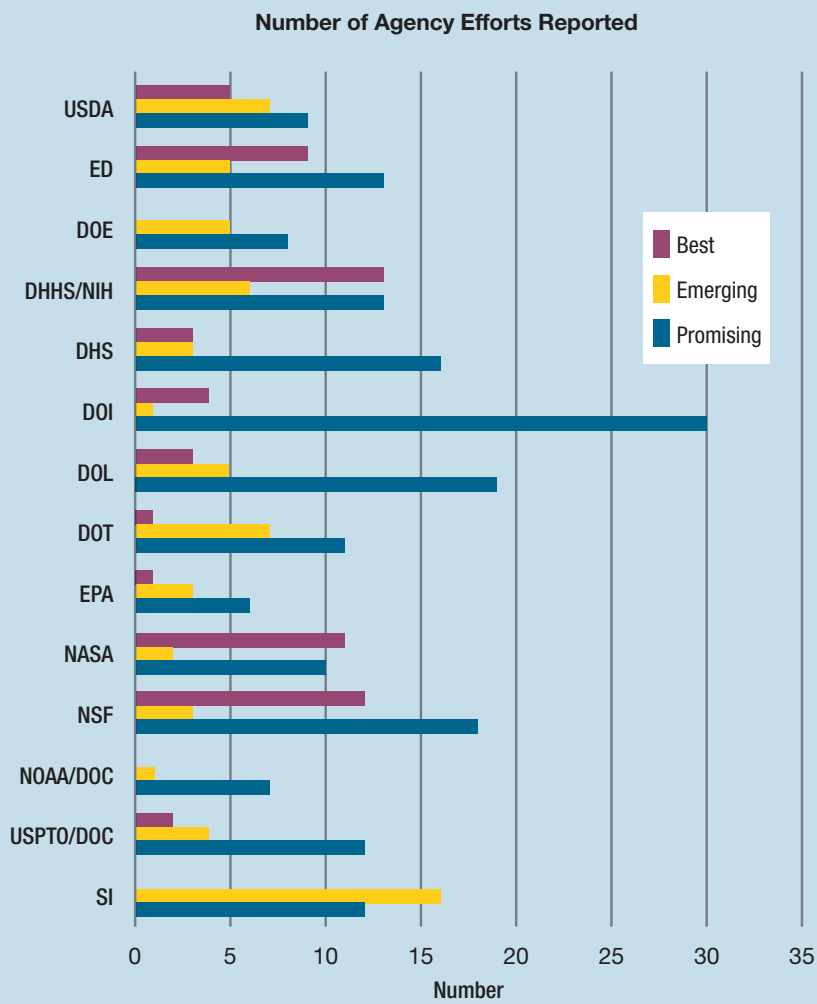


FIGURE 1. Visualization Summary: In general, best practices for mitigating the impact of bias are related to organizational performance and the grant-making process. The participating agencies identified the following best practices for sharing information: participation in career fairs, collaborative efforts, strategic recruitment, work with professional organizations, regular participation in recruitment events, the use of inclusive work teams, career guidance resources, and sharing new opportunities to reduce bias and promote diversity and inclusion. This graphic was created specifically for this report using data collected from the IPG agencies.

Best, Promising, and Emerging Practices to Reduce the Impact of Bias in the Federal STEM Workforce



BEST PRACTICES identified with credible evidence include:

- » Analyses of mandated workforce data sets;
- » Implicit bias training;
- » Conflict resolution; and
- » Promoting work flexibility.

PROMISING PRACTICES are defined as those that are consistent with principles established by research but have not been the subject of evaluation. The following are particularly promising:

- » Diversity change agents;
- » Diversity toolkits;
- » Technical qualifications board; and
- » Proposal review experiments.

EMERGING PRACTICES include:

- » Unconscious bias training for search committees;
- » Special training for the entire workforce;
- » Hiring and promotions safeguard pilots; and
- » New inclusive workforce tools.

Mitigating the Impact of Bias in Action: Top Strategies in the Federal STEM Workforce

+ **Incorporation of Diversity, Inclusion, and Bias Mitigation into**

Strategic Plan: *Federal agencies' strategic plans should convey the value of diversity, inclusion, and equality of opportunity and the importance of mitigating the impact of explicit and implicit bias.*

National Aeronautics and Space Administration (NASA) deploys its own comprehensive Diversity and Inclusion (D&I) Assessment Survey to all employees for a more in-depth measurement of its D&I efforts and to discover potential areas of bias or perceptions of exclusion that might exist in the workplace. NASA first deployed the survey in 2010 and repeated it in 2014. NASA used the initial survey as a baseline assessment, with plans to measure progress by repeating the survey approximately every 3 years. The D&I Survey measures respondents' perceptions about the meaning and culture of diversity and inclusion at NASA. It indicates strengths as well as areas and opportunities for improvement. Survey questions address whether employees believe that managers address bias (where it exists) or whether employees have felt marginalized or excluded, enabling NASA to measure perceptions around the presence of bias and enabling the Agency to shape means of addressing bias, such as voluntary education and awareness opportunities that explore methods of bias mitigation. NASA compared the 2014 survey results with the baseline survey and saw small improvement in employee perceptions on the presence of bias. The progress indicated by the survey results was presented to senior leadership and used to inform the Agency's D&I Strategic Plan and Agency-wide D&I training.

A significant impetus for work by the **U.S. Department of Transportation (DOT)** to reduce the impact of bias within the agency is the Ladder of Opportunity Agenda, a major DOT priority, which advances equal opportunities for all, including both DOT's internal and external stakeholders. In 2015, DOT hosted the first in a series of planned diversity, self-advocacy, and leadership events entitled, "DOT

Planting Seeds: Select Your Destination.” The department-wide Ladders of Opportunity Agenda is an internal program that focuses on the importance of harnessing the talents of each individual, embracing diversity and promoting self-advocacy, and considering how these priorities help ensure that equity considerations are part of all DOT decisions.

- + **Recruitment, Hiring, Promotion, and Engagement:** *Federal agencies can provide managers and supervisors with concrete examples of workplace inclusiveness to emulate and can direct that the reviewers evaluate all candidates against published guidelines.*

The **Environmental Protection Agency (EPA)** has developed Technical Qualifications Boards based on a substantial body of research indicating that when evaluators establish criteria before review, they apply less bias to their evaluation of people or their accomplishments. These panels review and evaluate qualifications and contributions of all candidates for promotion to senior (GS14–15) levels for research positions against published guidelines, in an attempt to ensure consistent, fair, and equitable treatment of candidates for promotion throughout EPA’s research organization.

Unconscious-bias training at the **National Institutes of Health (NIH)** is an institutional practice used with scientific directors and the search committees in charge of hiring their scientific workforce. This effort also will attempt to assess, with data, the effectiveness of implicit bias training on hiring outcomes.

- + **Implicit Bias Training:** *Most Federal agencies include content regarding implicit bias in various required training protocols for supervisors, managers, or search committees.*

Implicit bias is not inherent. It is a reaction to experiences, including words and actions over the lifetime of an individual. In order to mitigate the impact of bias, there needs to be experiential learning opportunities to truly change how one approaches an individual and their ability to accomplish a task. It is through this learning by doing that **Department**

of Energy (DOE) will make the impact of bias wane. DOE will make the following recommendations for providing experiential learning related to implicit bias:

- » **Individual Professional Development Training:** DOE will encourage employees to take a series of courses made available through the online learning center on topics related to bias mitigation and communicating across cultures. DOE will recommend making courses mandatory for managers and team leaders on an annual basis and optional for non-supervisory employees. Employees will receive a certificate in bias mitigation once all courses are completed.
- » **Bias Interrupters:** DOE will develop and promote “bias interrupters” as a resource for managers and employees who complete training related to mitigating the impact of bias. The “bias interrupters” will be tips and practices that employees can use to improve the objectivity and quality of decisions related to hiring, promotions, career development opportunities, and performance appraisals.
- » **DOE Community:** DOE will leverage its workforce to challenge stereotypes in STEM by engaging underrepresented communities in hands-on technology demonstrations. By introducing learners to new technology applications like the Smartphone Microscope, which utilizes a camera and microscope (relatively familiar, non-intimidating technologies), DOE will tap into a learner’s conscious and unconscious experiences with STEM. By leveraging the Smartphone Microscope, developed by one of its National Labs along with its eclectic Federal workforce, DOE can positively impact STEM education efforts in certain targeted communities.

The **United States Department of Agriculture (USDA)** provides Department-wide online and instructor-led training opportunities through its AgLearn system. Examples of these trainings include: “Avoiding Discrimination and Bias; Training and Tips for Leaders/Managers” and related opportunities such as “Veteran Employment Training for Federal Hiring Manager/Human Resource Professionals”

and “A Roadmap to Success: Hiring, Retaining and Including People with Disabilities.”

- + **Diversity Tools and Resources:** *Valuable resources, including published guides with practical applications to improve objectivity, can be made widely accessible for managers and employees.*

NASA’s Promising Practices Guide⁷ is a catalogue that showcases innovative EEO and D&I efforts of the Agency and its field centers. The promising practices are grouped around six themes: leadership commitment, attracting top talent, cultivating excellence, teamwork and innovation, serving the American people, and advancing the STEM pipeline. Examples of promising practices cited in the Guide include: D&I training that focuses on implicit bias, is designed for executive leadership, managers, supervisors, and employees, and includes opportunities for practical application; making the Agency’s Web sites more accessible to individuals with vision disabilities; increasing work-life flexibilities; and partnering effectively with local educational and business communities to engage and inspire young people from all backgrounds. One purpose of the Promising Practices Guide is to enhance cross-pollination among the NASA Centers. The Guide will be regularly updated.

Department of Homeland Security (DHS) has developed a new tool, the “Inclusive Behaviors Job Aid,” to provide managers and supervisors concrete examples of how to be consciously inclusive in the workplace. In 2016, DHS will also develop a bank of interview questions that focus on the candidates’ experience in managing diverse and inclusive workplaces. This effort is founded upon research that indicates that under-represented groups are often excluded from key positions simply because they are not deliberately included, but that by learning about the power

7 “Promising Practices for Equal Opportunity, Diversity, and Inclusion,” National Aeronautics and Space Administration, last modified July 2015, http://odeo.hq.nasa.gov/documents/PromPract_8-20-15_TAGGED.pdf.

of implicit bias and ways to mitigate its impact, organizations can create more inclusive workplaces.⁸

- + **Proposal Review Experiments:** *Research or pilot efforts with the potential for identifying and reducing the impact of any possible bias in grant proposal evaluation can be implemented through a variety of techniques within the Federal agencies to level the playing field in the review process.*

NSF is continuously experimenting with novel review approaches. One new and two recent pilots offer potential to strengthen the review process by: (1) attracting an untapped reviewer pool, (2) removing barriers to scientists serving as reviewers, and (3) reducing evaluation bias, if present. Initially, the focus will be on differences in outcomes by gender. To extend to, for example, the impact on proposals from African Americans, will require the accumulation of data from more panels.

Experiment 1: Virtual Panels. NSF has experimented with having reviewers participate virtually, using teleconferencing, videoconferencing, or virtual worlds. Motivations for using virtual panels have included enhanced opportunities for reviewer training, greater flexibility in how panels are structured, and removing barriers for those who may not be able to travel due to physical limitations, family responsibilities, or other restrictions. In addition to completely virtual panels, many panels now provide the option for panelists to attend remotely, if they cannot attend in person. For example, looking at those reviewers for whom gender information was available in FY 2013, 29 percent of the reviewers who participated in hybrid panels by traveling to NSF were women while a larger percent (34 percent) of those who participated virtually were women.

Experiment 2: Mechanism Design. The Mechanism Design pilot examined a review mechanism in which the investigators who submit proposals also review some of the competing proposals. The usual policy

8 Corporate Executive Board, “Beneath the Surface of Diversity Recruiting: Activating Inclusion Recruiting,” 2011.

on avoiding conflicts of interests was applied. In the pilot, each proposal received seven reviews and the average review ratings were used to determine a consensus ranking of all the proposals. The rating of the PI's own proposal was then supplemented with "bonus points" depending upon the degree to which is or her order of the assigned seven proposals agrees with the consensus ranking. The awarding of bonus points is the step that game theory suggests should provide an incentive to each reviewer to give a fair and thorough rating and ranking of the proposals to which he or she is assigned. This encourages objectivity and promotes openness in the review process by requiring the individual to consider how other objective reviewers would assess each proposal. The NSF program officer then uses the reviewers' comments, ratings, and rankings as the primary input for his or her funding recommendations.

Experiment 3: Reviewer Orientation: Beginning in 2017, many research programs at NSF will provide an orientation, by Webinar, to panel reviewers before they prepare their individual written reviews of proposals. The orientation will include tips on how to structure reviews, a reminder of the review criteria, and techniques for consciously mitigating the potential influence of unconscious, cognitive biases. This pilot will test whether such an orientation enhances the quality of written reviews. It will also examine whether providing information about strategies for mitigating the impact of unconscious biases leads to any changes in the distributions of review ratings received by proposals from investigators who belong to underrepresented minorities.

NIH's Center for Scientific Review (CSR) is playing a key role in understanding the role of implicit bias in unexplained racial disparities in R01 grant awards. With the input from a team of experts in implicit bias, stereotyping, decision-making, and research training, CSR completed two America COMPETES Act Challenge contests that engaged the scientific community in finding new methods to detect possible bias in peer review given the unavailability of valid metrics for evaluating implicit bias in the review process. This subcommittee on Peer Review discouraged over-reliance on the Implicit Associations Test and

cautioned possible resistance associated with mandatory implicit bias training for reviewers. CSR surveyed and conducted focus groups with a diverse sample of new investigators to garner their insights on the fairness of NIH peer review and the challenges they face in seeking NIH funding. The value of anonymization of grant applications in reducing bias will be tested in an upcoming project that examines the effect of altering PI race, gender, and university affiliation on reviewer scores of R01 applications.

Federal-Academic Interface: Research, Development, and Interventions on Bias

The Federal government has had a vast impact on the academic STEM workforce by funding a substantial body of basic and applied research on bias. Basic research has produced a rich understanding of bias, while the applied research has built on this understanding to design evidence-based interventions that have been tested on campuses across the Nation. Several agencies have advanced these efforts.

+ Proactive Use of Diversity, Equity, or Inclusion Grants: *Institutions can pursue programmatic support to develop and employ policies, practices, training materials, and recruitment and retention strategies designed to mitigate any bias in higher education.*

NSF has supported basic research, development, and implementation activities. Through its Science of Broadening Participation portfolio, NSF has invested in research on the theories, methods, and analytic techniques of the social, behavioral, economic, and learning sciences to better understand the barriers that hinder and factors that enhance the participation of women and underrepresented minorities in STEM. Some of the powerful findings that emerge from this type of research include:

- » *Gender bias impacts hiring.* A male job applicant for an academic positions was rated as more competent and would be offered a higher salary than an identical female applicant.⁹
- » *Assertiveness training does not improve women's ability to negotiate.* Sometimes women did not know that they could ask for what they want, and sometimes they did not ask because they had learned that society reacts badly to women asserting their own needs and desires.¹⁰
- » *Letters of recommendation disadvantage women.* Female applicants were described in more communal (social or emotive) terms and male applicants were described in more agentic (active or assertive) terms.¹¹
- » *Stereotype threat impacts performance.* If there are negative stereotypes about a specific group, its members are likely to become anxious about their performance if attention is called to their membership in that group, which may hinder their ability to perform at their maximum level in part due to diversion of blood away from the cognitive centers of the brain following activation of stereotype threat.^{12,13}

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- 9 Corinne A. Moss-Racusin, John F. Dovidio, Victoria L. Brescoll, Mark J. Graham, and Jo Handelsman, "Science Faculty's Subtle Gender Biases Favor Male Students," *Proceedings of the National Academy of Sciences* 109, no. 41 (2012): 16474–16479.
 - 10 Hannah Riley Bowles, Linda Babcock, and Lei Lai, "Social Incentives For Gender Differences in the Propensity to Initiate Negotiations: Sometimes it Does Hurt to Ask," *Organizational Behavior and Human Decision Processes* 103, no. 1 (2007): 84–103.
 - 11 Juan M. Madera, Michelle R. Hebl, and Randi C. Martin, "Gender and Letters of Recommendation for Academia: Agentic and Communal Differences," *Journal of Applied Psychology* 94, no. 6 (2009): 1591.
 - 12 Claude M. Steele and Joshua Aronson, "Stereotype Threat and the Intellectual Test Performance of African Americans," *Journal of Personality and Social Psychology* 69, no. 5 (1995): 797; Jason W Osborne, "Linking Stereotype Threat and Anxiety," *Educational Psychology* 27, no. 1 (2007): 135–154; Anne Maass, Claudio D'Ettorre, and Mara Cadinu, "Checkmate? The Role of Gender Stereotypes in the Ultimate Intellectual Sport," *European Journal of Social Psychology* 38, no. 2 (2008): 231–245.
 - 13 Wendy Berry Mendes and Jeremy Jamieson, "Embodied Stereotype Threat: Exploring

NIH also supports basic research on bias, stereotypes, and interventions to combat the impact of bias. Some examples are research on causal factors and interventions that support careers of women in biomedical and behavioral sciences and engineering¹⁴ and the NIH Directors Pathfinder Award, designed to encourage exceptionally creative individual scientists to develop highly innovative and possibly transforming approaches for promoting diversity within the biomedical research workforce.¹⁵

Findings from these NIH-supported basic research include:

- » ***Gender bias in grant reviews.*** Grant reviewers implicitly hold different standards for male versus female applicants; are more critical of female applicants; and give lower priority, approach, and significance scores to women in renewal applications.¹⁶
- » ***Race bias in grant reviews.*** Black applicants are less likely to receive independent research grants compared to white applicants.¹⁷
- » ***Reducing implicit gender leadership bias in academic medicine with an educational intervention.*** Educational intervention on implicit

Brain and Body Mechanisms Underlying Performance Impairments,” *Stereotype Threat: Theory, Process, and Application* (2011): 51–68.

- 14 Research on Causal Factors and Interventions that Promote and Support the Careers of Women in Biomedical and Behavioral Science and Engineering (R01), Program Announcement, RFA-GM-09-012.
- 15 NIH Recovery Act Grants to Foster Scientific Workforce Diversity, *National Institutes of Health, Turning Discovery into Health*, (2010), <https://www.nih.gov/news-events/news-releases/nih-recovery-act-grants-foster-scientific-workforce-diversity>
- 16 Anna Kaatz, You-Geon Lee, Aaron F. Potvien, Wairimu Magua, ... Molly Carnes, “Analysis of NIH R01 Application Critiques, Impact and Criteria Scores: Does the Sex of the Principal Investigator Make a Difference?” *Academic Medicine: Journal of the Association of American Medical Colleges*, 91, no. 41 (2016): 1080–1088.
- 17 Donna K. Ginther, Walter T. Schaffer, Joshua Schnell, Beth Masimore, Faye Liu, Laurel L. Haak, and Raynard Kington. “Race, ethnicity, and NIH research awards.” *Science* 333, no. 6045 (2011): 1015–1019.

bias reduced faculty members' implicit bias regarding women and leadership (as measured by the Implicit Association Test).¹⁸

- » *Stereotype threat gender differences in academia.* Female faculty report greater susceptibility to stereotype threat in academic sciences and lower confidence in the likelihood of advancement compared to males, despite similar career interest and identification.¹⁹

+ Family-Friendly Policies and Programs: *Mechanisms such as supplemental support for parental leave or dependent care can be used to minimize institutional barriers that can undermine performance due to parental status and family responsibilities.*

Family-friendly policies and practices for **NIH**-grant recipients include child care support as part of conference grants, reentry supplements, and up to eight weeks of paid parental leave for National Research Service Award trainees. **NSF**'s Career-life Balance Initiative provides a coherent set of career-life policies and practices agency-wide to expand dependent care and dual career support to improve the STEM work environment in higher education.

+ Compliance Reviews: *Federal agency compliance reviews can identify and examine any institutional bias in the review of grantees and provide feedback to institutional leadership with findings and recommendations to reduce the impact of bias.*

18 Sabine Girod, Magali Fassiotto, Daisy Grewal, Manwai Candy Ku, Natarajan Sriram, Brian A. Nosek, and Hannah Valantine. "Reducing Implicit Gender Leadership Bias in Academic Medicine With an Educational Intervention." *Academic Medicine: Journal of the Association of American Medical Colleges* (2016).

19 Magali Fassiotto, Elizabeth O. Hamel, Manwai Ku, Shelley Correll, Daisy Grewal, Philip Lavori, VJ Periyakoil, Allan Reiss, Christy Sandborg, Gregory Walton, Marilyn Winkleby, and Hannah Valantine. "Women in Academic Medicine: Measuring Stereotype Threat Among Junior Faculty." *Journal of Women's Health* 25, no. 3 (2016): 292–298.

National Institute of Food and Agriculture (NIFA)/USDA and NASA both conduct civil-rights and equal-employment-opportunity reviews in the institutions they fund. They attempt to ensure that their partners in research, education, and extension are in compliance with the rules and regulations pursuant to Federal civil-rights laws:

- » Title VI of the Civil Rights Act of 1964 (prohibits discrimination on the basis of race, color, national origin, limited English proficiency);
- » Title IX of the Education Amendments Act of 1972 (prohibits discrimination on the basis of gender);
- » The Rehabilitation Act of 1973 (prohibits discrimination on the basis of disability); and
- » Age Discrimination Act of 1975 (prohibits discrimination on the basis of age).

In assessing grantee compliance, NASA reviews methods of administration that can have unintentional adverse impacts, including policies and practices such as admission criteria, student advising, and classroom or research participation. Written reports with findings and recommendations that include identifying and addressing implicit bias are provided to university presidents or heads of museum and science centers. NASA's compliance reports have made recommendations to STEM programs to address the presence of unconscious bias in meaningful ways, such as training tailored to a particular audience. NASA has published a "Title IX and STEM" series that highlights promising grantee practices that assess the presence of bias and steps to address it.²⁰ Holding grantees accountable for reducing the impact of implicit bias is a strategic component for promoting diversity in STEM.

20 "Title IX & STEM: Promising Practices for Science, Technology, Engineering, & Mathematics," National Aeronautics and Space Administration, http://odeo.hq.nasa.gov/documents/71900_HI-RES.8-4-09.pdf; "Title IX & STEM: A Guide for Conducting Title IX Self-Evaluations in Science, Technology, Engineering, and Mathematics Programs," National Aeronautics and Space Administration, http://odeo.hq.nasa.gov/documents/TITLE_IX_STEM_Self-Evaluation_Fillable.pdf.

- + **Access to Resources:** *Online learning tools and other informational resources to address bias can be made widely available to administrators, faculty, staff, and students at federally funded institutions.*

The National Center for Women and Information Technology, funded by NSF and other collaborators, has developed case studies that offer solutions to reduce the impact of bias.²¹ For example, Avoiding Gender Bias in Recruitment/Selection Processes, Reducing Unconscious Bias to Increase Women's Success in IT, and Avoiding Unintended Gender Bias in Letters of Recommendation can be found at <https://www.ncwit.org/resources/how-can-reducing-unconscious-bias-increase>.

21 See <https://www.ncwit.org/resources/how-can-reducing-unconscious-bias-increase-women%E2%80%99s-successit/avoiding-unintended-gender>; <https://www.ncwit.org/resources/how-can-reducing-unconscious-bias-increase-women%E2%80%99s-success-it/avoiding-gender-bias>.

Agency and Department Websites for Summaries on Efforts to Raise Awareness about Bias and Mitigate Its Impact

Department of Agriculture (USDA): <https://www.ascr.usda.gov/about-oascr>

Department of Defense (DOD): <http://www.dodstem.us/blog-posts/2016/dod-agency-final-report-mitigating-bias-in-stem-workforce>

Department of Education (ED): <http://innovation.ed.gov/what-we-do/stem/>

Department of Energy (DOE): <http://www.energy.gov/diversity/bias-mitigation>

Department of Health and Human Services (DHHS): <http://www.hhs.gov/stem-bias-mitigation-report>

Department of Homeland Security (DHS): <https://www.dhs.gov/publication/stem-workforce-diversity>

Department of Interior (DOI): <https://www.doi.gov/notices/stem-eo>

Department of Labor (DOL): <https://blog.dol.gov/2016/07/20/strengthening-our-workforce-through-diversity-and-opportunity/>

Department of Transportation (DOT): <https://www.transportation.gov/civil-rights/about-docr/reducing-impact-bias-stem-workforce>

Environmental Protection Agency (EPA): <https://www.epa.gov/aboutepa/reducing-impact-bias-stem-workforce>

National Aeronautics and Space Administration (NASA): http://odeo.hq.nasa.gov/documents/NASA_Mitigating_Bias_Agency_Progress_Rpt_6-23-16_tagged.pdf

National Science Foundation (NSF): <http://www.nsf.gov/od/broadeningparticipation/bp.jsp>

National Oceanic and Atmospheric Administration (NOAA), a Bureau of the Department of Commerce: <http://www.epp.noaa.gov/>

United States Patent and Trademark Office (USPTO), a Bureau of the Department of Commerce: <http://www.uspto.gov/about-us/organizational-offices/office-equal-employment-opportunity-and-diversity/reducing-impact>

Smithsonian Institution (SI): <http://www.si.edu/oeema/DivInitiatives.htm>

Recommendations and Implementation

The reduction of the impact of bias in STEM disciplines and the workforce is critical if America is to maintain its competitive edge in the global economy of the 21st century and fully utilize the Nation's vast diversity of talent. Strategies for addressing the impact of bias in the STEM workforce, both internally and in federally funded institutions of higher education, must start with a commitment from top leadership to advance equality and cultivate the best talent, independent of demographic affiliations. The practices that reduce the impact of bias must be integrated into each agency's core mission and at all levels of the organization. Predicated on these essential principles, the Interagency Policy Group developed the following policy recommendations to mitigate biases in the Federal STEM workforce and STEM programs in institutions of higher education that receive Federal funding. See the full report for more discussion of each recommendation.²²

In the Federal STEM Workforce

Recommendation 1. Each Federal agency should exercise leadership at all levels, including senior officials, STEM program and administrative managers, human capital officials, and diversity and inclusion officials (or their equivalent), to reduce the impact of bias in their internal operations through:

- + Incorporation of the agency's diversity and inclusion objectives in its strategic plan;

22 Office of Science and Technology Policy – Office of Personnel Management. "Reducing the Impact of Bias in the STEM Workforce: Strengthening Excellence and Innovation," 2016.

- + Visible participation, deep engagement, and demonstrated accountability by agency and department leaders in the dialogue and activities to increase diversity;
- + Implementation of an organizational cycle of recruiting, hiring, and promotion practices that encourages diversity and inclusion, in part by reducing the impact of bias;
- + Engagement and empowerment of employees through policies, practices, and programmatic activities across all groups, including managers;
- + Expanded education and training on implicit- and explicit-bias mitigation; and
- + Establishment of bias-mitigation goals, techniques, and accountability mechanisms.

In Federally Funded Institutions of Higher Education

Recommendation 2. Each Federal agency should incorporate bias-mitigation strategies into its proposal-review process and offer technical assistance to grantee institutions to implement bias-mitigation strategies. Such strategies and activities should include:

- + Emphasizing to the academic community the importance of using bias-mitigation strategies to achieve fairness and quality in the STEM endeavor;
- + Ensuring diversity in membership of grant-review panels to include representation of all, including women, underrepresented racial and ethnic groups, and people with disabilities;
- + Establishing a systematic means of collecting and analyzing data on the entire cycle of the grant-making process to analyze success rates in getting grants across groups;
- + Providing grantees with information about methods to reduce bias and enhance diversity and inclusion in their research groups and institutions; and

- + Collecting best practices from grantee institutions and sharing them among agencies and other grantees, including by supporting communities of practice.

Cross-Cutting Government Leadership— STEM Workforce and Federally Funded Institutions of Higher Education

Recommendation 3. OSTP, OPM, and the Department of Justice (DOJ), as appropriate, should exercise leadership to reduce the impact of bias in the Federal STEM workforce and federally funded institutions of higher education by:

- + Serving as focal points, clearinghouses, and distribution points for bias-reduction strategies and best practices for both Federal agencies and federally funded institutions of higher education;
- + Coordinating civil-rights-compliance efforts;
- + Providing guidance to agencies related to performance and accountability in efforts to mitigate the impact of explicit and implicit bias (where it may exist) by investigation of potential measurement tools;
- + Spurring greater strategic coordination, sharing, and collaboration on, successful programs aimed at reducing the impact of bias and increasing diversity in federally funded institutions of higher education; and
- + Strengthening university-community partnerships to mitigate the impact of bias and to increase access to Federal STEM employment.

Implementation and Next Steps

To implement the recommendations, the Interagency Policy Group proposes the following actions. Targeted timelines for implementation and completion should be provided for each of the proposals.

- + An interagency body, acting as a community of practice and comprising staff drawn from OSTP, OPM, and Federal agencies should coordinate and review the Government-wide implementation and scaling of best and promising practices; develop principles for appropriate local adaptation of practices; identify gaps; develop a tool, including a set of quantitative metrics and strategies, to track increased diversity in the Federal STEM workforce by the reduction of the impact of bias where it may exist; and develop a comprehensive, living inventory of policies and practices by the Federal government and federally funded institutions of higher education that reduce the impact of bias in the STEM workforce.
- + OSTP, OPM, and Federal agencies should implement a public-engagement campaign, strategically targeted to key stakeholders, to highlight the existence, challenges, and impacts of bias and ways to reduce it in the STEM workforce.
- + Federal agencies should develop plans to implement and institutionalize policies and practices for reducing the impact of bias on the education, employment, and advancement of members of groups historically underrepresented or underserved in STEM fields. Such policies and practices should be designed to make careers in STEM more attractive and conducive to the success of all people, including women, members of underrepresented ethnic and racial groups, and people with disabilities. Agency plans should be best-practice driven, include measurable goals, and be published in easy-to-understand forms to be reviewed by OPM on an annual basis.
- + Federal agencies, institutions of higher education, and the proposed interagency-implementation body should develop accountability measures that can be used to assess progress and should review ongoing research to accelerate progress in the emerging fields of bias mitigation, diversity, and inclusion policies and practices; best practices emerging from research should also be brought back into agencies to accelerate implementation of new research-based tools and strategies.

Conclusion

America's role as a global leader in innovation and equity will be fortified by tapping into one of America's foundational strengths—the unparalleled diversity of the American people. Efforts to draw on a diverse community in STEM, however, are undermined, at least in part, by systemic barriers. Prominent among these are both implicit and explicit biases generated by stereotypes and expectations of what a STEM professional should look and act like. The Nation must continue to address the biases that may constrain the STEM workforce; there is a “fierce urgency of now”²³ to do so in order to maintain competitiveness as a Nation.

23 Martin Luther King, Jr., *Why We Can't Wait*, (New York: Harper & Row, 1963); Martin Luther King, Jr., “I Have a Dream,” (Washington, DC, 1963).

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