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Addressing Diversity, Equity, Inclusion, and Anti-Racism in 21st Century STEMM Organizations: Proceedings of a Workshop in Brief (2021)

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12 pages | 8.5 x 11 | PDF

ISBN 978-0-309-09273-9 | DOI 10.17226/26294

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SUGGESTED CITATION

National Academies of Sciences, Engineering, and Medicine 2021. *Addressing Diversity, Equity, Inclusion, and Anti-Racism in 21st Century STEMM Organizations: Proceedings of a Workshop in Brief*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26294>.

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Proceedings of a Workshop

August 2021

IN BRIEF

Addressing Diversity, Equity, Inclusion, and Anti-Racism in 21st Century STEMM Organizations Proceedings of a Workshop—in Brief

The National Academies of Sciences, Engineering, and Medicine’s Committee on Addressing Diversity, Equity, Inclusion, and Anti-Racism in 21st Century STEMM Organizations convened a national summit in July 2021 that highlighted how racism operates at different levels in science, technology, engineering, mathematics, and medicine (STEMM) settings; reviewed policies and practices for confronting systemic racism; and explored ways to advance diversity, equity, and inclusion (DEI) in STEMM settings.

The 2-day, public webcast summit explored the empirical and experiential evidence related to the ways in which systemic racism and other barriers impede STEMM careers for historically marginalized racial/ethnic groups, and explored ways to address these barriers, including strategies undertaken by stakeholder communities.¹ In this summit, speakers discussed how diversity, equity, inclusion, and anti-racism impact STEMM organizations. The workshop presentations focused on issues related to the history of racism in the United States, the lasting legacy of biased policies in the nation, and the research on practices to address systemic and structural racism in STEMM organizations.

CALLS FOR URGENT ACTION

Marcia McNutt, President of the National Academies of Sciences, Engineering, and Medicine noted that this summit is a first step in response to a July 2020 letter to the National Academies from Congresswoman Eddie Bernice Johnson (D-TX), the chairwoman of the Committee on Science, Space, and Technology. The letter asked the National Academies to take action on research and policy related to diversity, equity, inclusion, and the racial biases in the nation’s systems that disadvantage people from marginalized backgrounds in pursuit of science, engineering, and medical studies and careers.

Remarks from the National Academies leadership reflected a commitment to removing the barriers to participation in STEMM rooted in deep systemic and structural inequities. McNutt opened the summit by recognizing and highlighting that in order to ensure that the United States develops the diverse talent that will be needed to create a workforce for the future, the nation must avoid inequities in education, housing, and economic status, as well as police brutality, unjust criminalization, and domestic terrorism, since these factors inhibit progress. She cited a report from the National Science Board, the governance body of the National Science Foundation, calling for the expansion of the U.S. human capital in regard to research and workforce in order to be prepared for national demands in 2030.

¹Presentation, videos, and other materials from the workshop can be found at [https://www.nationalacademies.org/event/06-29-2021/addressing-diversity-equity-inclusion-and-anti-racism-in-21st-century-stemm-organizations-a-summit](https://www.nationalacademies.org/event/06-29-2021-addressing-diversity-equity-inclusion-and-anti-racism-in-21st-century-stemm-organizations-a-summit).

John Anderson, President of the National Academy of Engineering, noted that the United States must actively promote opportunities for young people to enter, thrive, and progress in their employment at STEMM organizations. The challenges begin early, said Victor Dzau (President of the National Academy of Medicine), from selection bias in education to lack of role models and representation at more advanced career stages. Black, Indigenous, and people of color (BIPOC) face more hostile work environments, which requires organizations to take active steps to ensure that individuals have support, he said.

THE VALUE AND IMPORTANCE OF DIVERSITY, EQUITY, INCLUSION, AND ANTI-RACISM

A key issue, raised by Latonia Harris (Johnson & Johnson), was the lack of established definitions for diversity, equity, inclusion, and racism. While multiple definitions of DEI were used during the workshop, Harris provided a summary of the following terms discussed over the course of the 2-day summit:

- Diversity: the numerical representation of groups of individuals based on their primary and secondary characteristics and identities.
- Equity: the treatment of individuals in terms of access, opportunity, and advancement.
- Inclusion: the ability to meaningfully participate and contribute, both for the benefit of the individual and the organization.
- Racism: the devaluation and the denial of rights, dignity, and value of individuals due to their race or geographical origin.

Harris noted that misconceptions exist related to DEI. She is particularly bothered when quality and diversity are considered to be mutually exclusive, meaning that one must be reduced for the other to be improved. Speakers throughout the summit confronted this myth by arguing that science thrives with the best minds, the most diverse perspectives, and a breadth of experiences to produce the most innovative ideas.

Modupe Akinola (Columbia University) noted that cultural differences enhance work processes. Organizations that not only have a variety of perspectives, but also know how to integrate and optimize them, will see results in their outputs. The very act of science requires continuous interrogation of what is known, said Joan Reede (Harvard University), and the ability to break new ground and develop novel approaches rests with introducing new ways of seeing the world. This requires that the people in a decision-making positions have diverse backgrounds and that the organization proactively and intentionally brings those individuals to the table.

Eliseo Pérez-Stable (National Institutes of Health) discussed the role of fairness and presented a moral case for DEI, as nearly 40 percent of the population is non-white, and special attention deserves to be paid to those who have been excluded from power in the past and present. The lack of representation of BIPOC leadership, mentors, and individuals in advanced professions in all areas of STEMM means fewer role models and support structures, which leads to future challenges in terms of career advancement, grant funding, journal publications, and other professional opportunities, he said.

These issues affect the health of our nation as well, noted Cato Laurencin (University of Connecticut). Current medical training systems support fewer Black medical professionals, explained Laurencin, and this can contribute to health disparities since BIPOCs have been found to have lower treatment levels and lack trust in the medical community. According to Pérez-Stable, research shows that racial concordant clinic visits, in which the race or ethnicity of the medical professional matches that of the patient, have better health outcomes for patients.

SYSTEMS GROUNDED IN HISTORY AND EMBEDDED BY LEGACY

Even though the United States has a history of casting itself as a country of opportunity, the history of genocide, segregation, and biased policies that have disenfranchised groups of people based on race suggest otherwise said Cheryl Crazy Bull (American Indian College Fund). Over the course of the 2-day summit, several speakers described the United States as a nation divided in terms of prosperity, and this

was attributed to inequities in access to housing, education, employment, wealth, health care, and other critical needs. Past policies have created deep structural biases that continue to impact the ability of individuals to receive quality education and pursue careers in science, engineering, and medicine, she said.

A HISTORICAL PERSPECTIVE ON STRUCTURAL RACISM

While the United States often marks the arrival of colonizers in New England as the early years of the nation, Crazy Bull stated that the history goes back much further for Native American and Indigenous people. She continued by stating that European colonization included genocide of the Native American and Indigenous people who occupied the land. This violence obliterated their culture, governing systems, spiritual practices, and ways of knowing, including the erasure of scientific, mathematic, and medical wisdom. She concluded her remarks with a reminder of the recent discoveries of mass gravesites in the United States and Canada of Native and Indigenous children at boarding schools, which highlights the history of control, violence, and silence as part of recent North American history.

Since the Civil War, the experience of Black people in the United States has been one of reduced access to opportunities and quality of services, said Jennifer Richeson (Yale University). Housing segregation and racist home ownership policies served as the foundation to keep Black communities disenfranchised and unable to build generational wealth in the same manner and magnitude as their White contemporaries, she said. Richeson stated the impact in present-day terms, “Although changes to the law now make explicit forms of discrimination illegal, compared to the 1960s, neighborhoods and schools have remained largely racially segregated, as has the workforce.” Richeson presented a study in which respondents estimated that the average Black family in 1963 had 50 percent of the wealth of an average White family and in 2016 they had 90 percent; however, the average Black family in 2016 actually had about 10 percent of the wealth of the average White family.²

In a presentation on Black experiences with racism, Claude Steele (Stanford University) noted that some of the transformational higher education landmarks in the United States, such as the Morrill Land Grant College Act and the GI Bill, may have bolstered White college degree attainment, but did not rectify racial inequity. Indeed, Keith Wailoo (Princeton University) noted that some of the events in history often correlated with equality, such as the end of segregated schooling, also came with downsides, like the elimination of a generation of Black educators who would have taught in segregated schools but were not allowed to teach White students in desegregated schools. Gilda Barabino (Olin College) highlighted the complex nature of history and its legacy today by saying, “Failure to fully understand the systemic and structural nature of racism and bias and failure to recognize and mitigate concomitant barriers will prolong the underrepresentation and lack of progression of racial and ethnic minorities.”

In spite of these barriers, there were BIPOC individuals who completed higher education and participated in the scientific enterprise; however, these individuals were not allowed to take leading roles and have not been recognized for their contributions with the same awards as White researchers, said Ebony McGee (Vanderbilt University). In some cases, innovations were stolen and presented as innovations under the names of the leading, White male researchers, she said. McGee raised the example of Charles Drew, a leader and innovator in the creation of blood storage and banks, who was not allowed to serve as a blood donor as his blood was not considered useable due to his race. She also pointed out that in the history of the Nobel Prize there are no Black laureates, which also limits the presence of Black role models for young scientists.

UNDERSTANDING BIAS, STEREOTYPES, AND THE RESEARCH ON RACISM

Diversity science, described by Vicky Plaut (University of Wisconsin), claims that intergroup relations do not happen in a vacuum, and they occur in relationship to histories embedded in law, policies, and practice. In a sociocultural framework, psychologists tend to focus on components such as emotion, cognition, motivation, identity, and associated behaviors while sociologists may consider the broader cultural and structural context. A key concept in diversity science is bias, which Sapna Cheryan (University of Washington) defined as implicit or explicit treatment of one group based on their membership, such as race or gender. Bias, noted Susan Fiske (Princeton University), can have associations beyond

²Kraus, M.W., Onyeador, I.N., Daumeye, N.M., Rucker, J.M., and Richeson, J.A.. (2019). The misperception of racial economic inequity. *Perspectives on Psychological Science*, 14(6), 899-921. <https://journals.sagepub.com/doi/epub/10.1177/1745691619863049>.

simply “good” and “bad”, as it can create connections to competence, capability, trustworthiness, and other qualities.

The associations that come from bias can be made quickly, so much so that even knowledge or understanding of the biases cannot prevent the association from happening. Mahzarin Banaji (Harvard University) described research conducted with implicit bias and association in which two faces were shown to participants, one with stereotypically White features and one with stereotypically Black features.³ Participants were asked to assess if one skin color was darker than the other, even though both faces were the same hue. Over the course of the study, participants registered the face with the Black features as darker than the face with the White features. Banaji identified this as phenomena as top-down processing, where certain features (White or Black) are connected so deeply with a group of skin tones that the participants imagined a difference that was not there.

These first-order biases can also produce a second layer of connections with other characteristics. For example, referencing the study above, it would take the first-order relationship (skin hue and facial features) and add another layer of association (skin hue, facial features, plus personal disposition). Cheryan noted that the development of the second order of connections can result in a specific group’s behavior being valued, rewarded, or seen as standard more so than other groups. For race, various types of White behavior are often seen as the default, said Cheryan. This can be seen in the myth of meritocracy, in that people who are successful in STEMM have earned their place through hard work and intelligence alone, without acknowledging that there are disparities in resources and opportunities across groups, she said. This assumption creates a bias against women and people of color.

There are challenges created by privileging White defaults, said Cheryan. The stereotypes, notes Reede, contribute to tokenism, isolation, and exclusion for those who do not fit the perceived standard. Those individuals are less likely to receive validation and more likely to be exposed to microaggressions and bias. For example, Nicole Joseph (Vanderbilt University) demonstrated this by describing the experience of Black girls in high school. First, Black girls are less likely to receive high-quality education than their White counterparts. In the classroom, Black girls are more likely to be subjected to negative stereotypes by teachers, such as being considered too loud, and they do not receive the same support from teachers and counselors in terms of pursuing math and science. The negative experiences, Joseph said, can result in Black girls, including those who have an interest and passion for math and science, not pursuing STEMM studies.

THE MYTH OF A POST-RACIAL AMERICA

Using the Harvard Implicit Association Test,⁴ Banaji cited research shows that 75 percent of White Americans show an implicit preference for White people over Black people. This disrupts the myth of a post-racial United States, a narrative that imagines that the country has progressed beyond the impact of genocide, enslavement, and the systemic disenfranchisement of Black, Indigenous, and other people of color, she said. Crazy Bull also said that this can create a kind of cognitive dissonance for individuals who do not want to believe that the country they live in contains a history of brutality, with the land and resources stolen for profit from Indigenous people who were subjected to violence by European colonizers and the U.S. government.

In addition to an implicit preference for other White people, said Ivy Onyeador (Northwestern University), on average, White Americans are also more likely to overestimate economic equality between Black and White people. Notably, high-income Americans are more likely to provide a lower estimate in the wealth gap between Black and White people than individuals from lower-income backgrounds. A desire to imagine a history without inequity can shift people’s perceptions, resulting in a myth that more progress has been made toward racial equity than has actually occurred, she said.

Plaut noted the challenges with a colorblind approach, in which an individual tries to treat others equally without consideration to their race or ethnicity. When used by teachers, she said, it has been associated

³Levin, D.T., and Mahzarin R. Banaji, M.R., (2006). Distortions in the perceived lightness of faces: The role of race categories. *Journal of Experimental Psychology; 135(5)*, 501-512. https://sites.fas.harvard.edu/~mrbworks/articles/2006_JEPG.pdf.

⁴The Harvard Implicit Association Test is designed to “measures the strength of associations between concepts (e.g., black people, gay people) and evaluations (e.g., good, bad) or stereotypes (e.g., athletic, clumsy). The main idea is that making a response is easier when closely related items share the same response key.”

in research with greater explicit and implicit bias, lower empathy, higher apathy for racist remarks, lower interest and support of inclusive teaching practices, lower expectations of students of color, and a lower willingness to teach and adapt to a diverse student body. In another study, she continued, White students received an essay to read before engaging in a conversation with a Black or Asian counterpart. White students primed with an essay that had a colorblind or race-neutral focus (as opposed to a multicultural focus that featured and celebrated the differences between races) were associated with higher levels of prejudice in their conversations with Black or Asian partners. Additionally, she said, the Black and Asian conversation partners were correlated with higher levels of cognitive depletion, which is a drain on an individual's mental resources.

Steele referred to colorblindness as a way to ignore the identity of another person based on their race and gender in an attempt to provide treatment that appears the “same” and “fair.” Even people with good intentions can harbor colorblindness, he said, which results in the belief of a post-racial America. The presence of colorblindness reinforces the need to build organizations, policies, and structures with an understanding of the impact of systemic and structural racism on BIPOC. Otherwise, as Kecia Thomas (University of Alabama at Birmingham) noted, self-proclaimed diversity allies with well-meaning, yet detrimental behaviors can derail efforts to create and sustain diverse and inclusive STEMM environments.

LEGACY AND CONTINUATION OF BIASED POLICIES IN HIGHER EDUCATION

The U.S. education system has a foundation made of what Sam Lucas (University of California, Berkeley) called “the bricks of racial order.” In the K-12 system, schools that have a higher percentage of students from historically oppressed backgrounds are twice as likely to not offer higher-level math and science courses, AP or IB courses, or dual enrollment programs according to the 2019 National Academies' report *Monitoring Educational Equity*. Students may have vastly different opportunities and experiences in the K-12 system, meaning differential preparation to succeed in higher education.

Higher education and academia have historical roots in exclusionary behavior, which can be seen today in admissions policies and in the culture of academia itself. Barabino called out the dangers of academic elitism, which devalues women and people from historically underrepresented groups. Faculty and administrators serve in gatekeeping roles, which can be impacted by racial bias and, in turn, cause individuals from historically underrepresented backgrounds to be excluded, she continued. Buju Dasgupta (University of Massachusetts, Amherst) stated that people who show interest and talent in STEMM may not stay if the learning environment does not provide social support or provide a path to meaning and purpose. There has also been legislation, as Harris said, across the country to limit the use of race in admissions. At the University of Michigan, the percentage of Black students was 9 or 10 percent in the 1990s, and it has been reduced to one-half that since a ruling by the state of Michigan⁵ was made in the early 2000s.

Admissions Practices in Graduate Education

While diversity officers may work to broaden the applicant pools for graduate education, that work is decoupled from the people who make the final admissions decisions. Julie Posselt's (University of Southern California) research in graduate STEM education has found that the admissions process can serve as an example of institutionalized racism. While the faculty and administrators may believe in a neutral or colorblind process, the biases inherent in a system that prizes meritocracy results in negative outcomes for women and applicants of color. One of Posselt's studies showed that faculty hold a strong preference for certain admissions criteria that signal merit, which are connected to the faculty members' own identities as researchers and preconceived notions of prestigious programs.⁶ When it comes time to make difficult decisions for admissions for borderline students, faculty selected students who they believed were more likely to finish a degree based on racialized signals such as test scores and undergraduate university (preference for elite and Ivy-league schools) as well as hometowns, hobbies, habits, and even hair styles. These biases show up in the diversity of doctoral recipients. Pérez-Stable cited the National Center for Science and Engineering Statistics figures showing that only 14 percent of Ph.D. earners were Black, Native American, or Indigenous, or Latinx.

⁵Gratz v. Bollinger oyez.org/cases/2002/02-516.

⁶Equity in Science: Representation, Culture, and the Dynamics of Change in Graduate Education. Stanford, CA: Stanford University Press.

The Campus Environment

Camille Charles (University of Pennsylvania) said that students from underrepresented groups often carry distinct burdens about their personal expectations and performance as a result of structural issues. For example, she said, they are more likely to be first-generation students, which may impart greater pressure to succeed. For example, the impacts of segregation follow students from their upbringing into college, which often means that Black students are more likely to experience more stressors than their White counterparts and have a greater likelihood of confronting hostility on campus. Yet, Charles also noted that not all students have the same college experience and emphasized the importance of treating each student as an individual rather than treating the Black student experience as monolithic.

One of the benefits of historically Black colleges and universities (HBCUs) is the way that faculty come prepared to address the diversity of students' precollegiate experiences, noted Reynold Verret (Xavier University of Louisiana). In addition, the HBCU setting has a majority of Black students that allows students to avoid the isolation they might feel at other campuses, such as in graduate programs at other institutions that have only one or two people from historically underrepresented groups. Even if there are several hundred or more BIPOC at the college itself, the separation from others can change the student experience dramatically, said Verret.

At all levels of higher education, longstanding stereotypes in fields where professors believe that students must be brilliant and talented to succeed are more likely to push out students of color before finishing their degrees, said David Yeager (University of Texas at Austin). He noted that each instance of unwelcoming behavior and pressure from stereotypes accumulates over time, starting with something like a lower grade on a major exam and continuing with other instances of being challenged under stress. This kind of discrimination, also common for first-generation students, can end up being manifested as academic underperformance.

LEGACY AND CONTINUATION OF BIASED POLICIES IN STEMM ORGANIZATIONS

Similar to higher education, STEMM workplaces face challenges with biases and gatekeeping. There have been claims, said Pérez-Stable, that there are not enough graduates or qualified individuals to fill the pipeline of STEMM careers in organizations; however, even though the numbers of graduates from historically marginalized populations is not at parity, it is also greater than zero. It is not a lack of talent, said Pérez-Stable, that means organizations have difficulty finding qualified applicants, but it is the failure of organizations in their onboarding processes, promotion systems, and workplace environment that causes vacancies in the STEMM enterprise.

Recruitment, Hiring, and Advancement

Much like admissions to graduate school, gatekeeping can occur from the start of the recruitment and hiring process, said Harris. Job postings and materials can send signals about how inclusive an environment is. Examples of this include postings that rely on biased signals, she said, such as educational institutions or hiring committees that compare resumes to an ideal based on White masculine stereotypes. Banaji referenced an experiment run by Devah Pager comparing resume credentials and the likelihood of receiving a callback from an employer in New York City.⁷ According to the study, Banaji said, a Black man and a White man with the same credentials will receive approximately the same number of callbacks if the White resume has one difference: a line about a criminal background. The study suggests that the racial bias in hiring is so strong that Black men's resumes were only viewed as competitive as their White counterparts if the White applicant's history included a criminal history, she said.

Once hired, Harris described the necessity for private organizations to ensure equity in terms of opportunity and advancement. Employees from historically underrepresented backgrounds in private companies do not necessarily receive the same levels of support as White male employees. Scientists and engineers from historically underrepresented backgrounds thrive at a higher level when respected and provided with equitable access to promotion. They tend to persist STEMM fields more broadly rather than leave for work in other disciplines, she said.

⁷ Quillian, L., Pager, D., Hexel, O., Arnfinn H., and Midtbøen, A.H. (2017). Meta-analysis of field experiments shows no change in racial discrimination in hiring over time. *Proceedings of the National Academy of Sciences*, 114(41), 10870-10875; first published September 12, 2017; <https://doi.org/10.1073/pnas.1706255114>.

The Workplace Environment

Ideally, an inclusive workplace would include engaging proactively with others, approaching colleagues with understanding and curiosity, and having a willingness to tackle problems as a group, said Donald James (ret. NASA) of his experience in the government. These behaviors can create a sense of welcome and inclusion, allowing individuals to form a community and be comfortable with each other. As Harris stated, the feeling of belonging allows individuals to perform at their best and dedicate their passion to solving problems and driving innovation.

Plaut described a study that rated engagement between White employees and employees from historically underrepresented group by measuring colorblind attitudes, support for racial diversity policies, and support for diverse staff and leadership.⁸ The more that White employees believed in colorblindness, the less engaged their underrepresented minority colleagues were. In contrast, the more support White colleagues had for diversity policies and staff, the more engaged their colleagues from underrepresented minorities felt.

EVIDENCE-BASED PRACTICES TO ADDRESS RACISM IN HIGHER EDUCATION AND STEMM ORGANIZATIONS

In addition to describing the research and issues that affect diversity, equity, inclusion, and anti-racism in STEMM higher education and organizations, the summit also featured presentations on evidence-based practices to reduce the impact of bias.

ADDRESSING ISSUES IN HIGHER EDUCATION

Changing Graduate Admissions Policies and Practices

Admission policies have the power to determine who is welcomed in and who remains on the outside of higher education. Posselt described her research involving an admissions redesign process in a physics department. The process began with the faculty acknowledging their limitations and skills related to diversity and equity and their willingness to hold themselves accountable to making a more inclusive program. Part of the work included thinking about each respective discipline itself and the values prized by each discipline in a different way, including interdisciplinary approaches that are not as frequently prized. Engaging in a conversation around the discipline's standards of meritocracy allowed the department to confront misperceptions with both different narratives about what constitutes value and with data on how their department fared in terms of diversity in admissions.

Providing Systems of Support

Marielena DeSanctis (Community College of Denver) encouraged participants to examine more of the work occurring at community colleges, which serve students from ages 16 to 70 and beyond who are engaging as first-time college students to adult learners looking to upskill or earn additional credentials. The community college setting, with a focus on the word community, provides the kind of affinity groups, mentoring, and support networks students find beneficial to succeed and participate in STEMM careers. Onyeador mentioned affinity groups at the University of Michigan for Asian, Black, Latinx, and LGBT (lesbian, gay, bisexual, and transexual) students, although she noted that some programs and departments do not have a critical mass of students, faculty, and postdocs from historically underrepresented groups.

The National Academies' 2011 report, *Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads*, recommended a number of other support systems for increasing student equity, such as increased access for academic and social support, institutional roles, teacher preparation, affordability, and program development, said Greg Symmes (National Academies of Sciences, Engineering, and Medicine). Mentoring is a crucial part of a student's support system, notably in doctoral education where the relationship is a cornerstone for the development of research productivity and scholar identity formation, said Symmes. In terms of training, Yeager stated that research on compliance-based training, as opposed to a focus on skills or values, does not necessarily produce the kind of diversity skillset desired. Instead, he described a mentoring fellowship that focused on reflec-

⁸ Plaut, V.C., Thomas, K.M., Hurd, K., and Romano, C.A. (2018). Do color blindness and multiculturalism remedy or foster diversity and racism? *Current Directions in Psychological Science* 27(3), 200-206. <https://doi.org/10.1177/0963721418766068>.

tion and the ability to share best practices across a campus. The fellowship also helps alleviate the strain on faculty of color who bear a disproportionate burden of mentoring students of color.

Twyla Baker of Nueta Hidatsa Sahnish College, one of the U.S.'s tribal colleges and universities (TCU) dedicated to serving Native American and Indigenous students, described the scaffolding of support available through the Project Success program. It included a range of holistic resources covering finances, emergency aid, grad-ready software, registration and enrollment, specific academic support (Carnegie Math Pathways), and incentives to attend the programs. The program also addressed administrative burdens, such as making sure students had guidance in completing paperwork and that they understand the details of their decisions.

Many approaches have targeted the issues at an individual level, such as grit and resilience, two popular traits commented on by McGee. Both of these terms focus on an individual's ability to persevere or recover from difficult events and trauma; however, they do not change the larger system and instead place the onus on primarily Black and Brown individuals to thrive through differentially difficult conditions. Hostile environments, from weed-out classes to racial microaggressions to a feeling of isolation of being the "first or few" can push students out of their STEMM studies, she stated. Mentoring, an important education and workplace feature for support, can provide a student with positive structures; however, it cannot, as McGee said "eradicate centuries of White supremacy in STEMM." She goes on to note that a true mentoring relationship can provide mutual benefit for the parties involved.

ADDRESSING ISSUES IN STEMM ORGANIZATIONS

Changing Recruitment and Hiring Practices

Companies that post job openings and expect large numbers of diverse candidates may not get the results that they hope for, said Harris. Recruiting that aims to increase the diversity of potential candidates may require intentional outreach to specific groups through partnerships with professional societies, HBCUs, and other higher-education organizations, she continued. Building partnerships can help an organization develop a reputation for DEI, Harris said, which in turn can be advantageous when recruiting applicants. At the interview stage, clear checklists that outline specific criteria and clear instructions to the evaluators on how to judge performance in interviews is a first step in shifting hiring practices, said Akinola. The questions in the interview should be specific as well.

Another approach relates to how hires are made, said Plaut. The Berkeley Life Sciences Initiative used a cluster hire approach to enhance DEI with program support for new hires, ongoing developmental resources, and mentoring. She said they found that explicitly shaping the position around gender, race, or ethnicity worked to increase the number of women and applicants from historically underrepresented groups. They also emphasized public scholarship and translational research in their discussions, she said. Another component was a departmental discussion of how diversity priorities related to other departmental priorities. Finally, the Initiative also found that having women and faculty from historically underrepresented groups improved diversity in hiring; however, Plaut cautioned that the department would want to avoid overburdening the same faculty with requests.

Fostering an Inclusive Workplace Environment

While anti-bias trainings and policies may not provide the long-term changes in behavior that organizations hope to see, Onyeador recommended developing comprehensive diversity and inclusion strategies that include training as an element. From there, conducting research about the specific challenges to DEI within the organizational context is an essential step that can identify what kinds of interventions are necessary and what goals should be developed. For example, Onyeador said, if there are no Black faculty in the department, the main issue is not training, rather the first priority should be hiring Black faculty members. The trainings to an all White faculty, given the challenges of implicit bias, might be better used as a time for education around disparities and current diversity issues within the organization.

Frank Dobbin (Harvard University) outlined four kinds of interventions that are effective at promoting diversity, all at the systemic level, that move something informal to something formal and sponsored by the organization: (1) recruitment; (2) mentoring; (3) training; and (4) work-life perks, benefits, and flexibility. These systems all work better if they specifically engage groups that have been historically

excluded, such as making sure that any formal recruitment includes HBCUs and TCUs in addition to Ivy League schools. He noted that creating and sustaining organizational equity is a dynamic process that requires constant review to make sure that the informal elements, which largely benefit White men, are made formal so that all individuals can reap the benefits of the program.

Improving the Efficacy of Diversity Trainings and Policies

Corporate organizations spend approximately \$8 billion annually on diversity training, often focusing on unconscious or implicit bias. However, according to Onyeador, “diversity trainings in general have limited if any utility for increasing the representation of people of color at the managerial level and can result in defensiveness and feelings of exclusion among Whites or other dominant group members.” Dobbin listed three primary approaches that companies, and universities have taken to address diversity, inclusion, and anti-racism within their organizations:

1. Anti-bias training
2. Personnel policies that mitigate bias
3. Grievance processes that include feedback on biased actions and behavior

While these strategies have been popular, research shows that none have significant, positive effects on the workplace environments, and in fact, all of them can be correlated with negative impacts. Individuals may leave trainings feeling upset or accused of bias instead of a drive to make the organization more inclusive. Often, trainings and policy changes do not occur in tandem with greater managerial diversity, which would be a signal that the workplace is becoming more inclusive. Additionally, implicit bias is resistant to change. Onyeador cited a comparative examination of several implicit bias trainings, which found that only 8 of 17 significantly reduced implicit bias, and of those 8, the change faded within 24 hours. Additionally, the change in implicit bias was not associated with a change in explicit bias or discriminatory behavior in the long term.

Onyeador offered a different set of tactics for organizations to use in their diversity training:

1. Use trainings as an opportunity to educate people on how bias manifests and explain the existing approaches for DEI.
2. Prepare for defensive responses and reactions from colleagues and audience members at anti-bias trainings.
3. Build structures that support institutional responsibility for DEI efforts.

Personnel rules may also be put into place to limit the impact of bias; however, interviews with managers suggest that they do not want interference in forming their teams and will circumvent the rules, Dobbin said. Other efforts to mitigate bias may come in the form of job tests for managers or performance rating systems; however, according to Dobbin “job tests have adverse effects on all seven historically disadvantaged groups.” What happens is less of an impact of the job tests themselves, the greater issue is that managers look to work around the processes and rules because they want to be in control of their team. The managers tend to make the people they are less familiar with or less comfortable with take the tests, which means it becomes an exclusion mechanism, he said.

Finally, civil rights grievance procedures and harassment grievance procedures mostly show adverse effects on White women and people of color in corporate management, Dobbin said. This is due to the fact that people who file grievances often face retaliation. The most common outcome of filing a grievance is leaving a job. Even though the grievance process may feel like an important way for people to address problems and hold the organization accountable, he said, they should not be viewed as an effective strategy for promoting workplace diversity.

The research reviewed by Akinola found that in contrast to adding more systems, companies had better results on DEI when they eased control tactics. The companies involved in the study found that what worked was engagement, contact, social accountability, and making sure that diversity programs included these elements. However, while increased contact between groups has been touted as a method

to increase exposure to new ways of thinking, Banaji said that the contact between individuals has to take place when they have equal standing in the situation, and this is not always how people tend to meet across races in real life.

DEVELOPING LEADERSHIP FOR SUSTAINABLE CHANGE

Several presenters identified leadership as one of the key aspects for DEI in STEMM organizations. Akinola noted that leaders in an organization have the capacity to change expectations and culture, “How can we make sure we are cognizant of our biases? How can we be more curious about different ideas, different people?” Responsibilities for leaders included aligning priorities around DEI from the top and allocating resources to make sure the necessary changes are made. These elements set the stage for forging relationships within an organization, welcoming differences, and allowing individuals to embrace their diverse backgrounds.

Another way leaders can accelerate change is through the use of incentives and resources, such as salaries, research funds, sabbatical leaves, awards, or teaching relief, said Shirley Tilghman (Princeton University). She noted the importance of University leadership using public recognition to reward those who contribute to making a campus more equitable and inclusive as a critical step in honoring the work in the community and making the mission on par with that of the most recognized teachers, scholars, and staff. The top leaders of a college or university also have the ability to appoint chairs and deans who support the mission of an inclusive campus to make sure that the efforts have support in each department and program, she said. The Princeton Target of Opportunity Program gave new full-time-equivalent positions to departments who nominated candidates who would expand the diversity of the faculty. While the hire would eventually need to be covered by the department, the leadership at the university level opened the door to possibility, Tilghman said.

RESEARCH AND OTHER EFFORTS ON THE GROUND

Research, data, and evidence-based practices are key components in addressing DEI and the negative costs inequity poses to society. Tilghman raised the National Academies' ongoing studies, reports, and workshops as documents that explore the nature and extent of the problems related to racial/ethnic underrepresentation in science, engineering, and medicine. Leadership from the National Academies extends to the membership component, said Darryll Pines (University of Maryland, College Park), who described the work of the National Academy of Engineering Committee on Racial Justice and Equity. The committee contributed 42 percent of the nominations from historically underrepresented minorities for the 2022 class of the National Academy of Engineering.

The federal government also serves as a leader in providing a path forward to advancing equity in science. In terms of data, Ellen Ochoa (National Science Board), mentioned the data available on education and workforce through the National Center for Science and Engineering Statistics as a resource for those exploring representation and trends across disciplines. The National Science Foundation also established a Racial Equity Task Force to review internal processes and external programs to address the inequity in STEMM. Marie Bernard (National Institutes of Health) discussed the NIH UNITE initiative that uses five interacting work streams to address a range of intramural and extramural issues including stakeholder experiences, research on health disparities, transparency, and accountability. A multiphased, tiered, and integrated NIH common fund of \$60 million over 3 years was also discussed that would focus on transformative health disparities research, she said.

CONCLUDING THOUGHTS

We must let opportunity meet talent, said Pines said about employers and educators in U.S. society. The Summit has been a call to ensure that people from all backgrounds have equitable support and resources to pursue their educational and professional goals. The history of the United States reminds us that racism has deep roots in the colonization, expansion, and development that took place over centuries of this country, and, consequently, is embedded in all elements of society, including STEMM organizations, he said.

In order to address these longstanding and systemic barriers, the work to increase DEI will also help the country realize our values, address complex issues, and ensure viability, said Keith Yamamoto (University of California, San Francisco). He noted that equity provides support to overcome these barriers, not with equal distribution, but provided in accordance with the goal of removing the barriers for all.

Diversity science recognizes both the individual-level psychological tendencies that occur in individuals and the broader sociocultural frameworks that explain the complex implications for behavior. For example, described Yamamoto, “color blindness can exacerbate biases whereas race conscious approaches can create an illusion of fairness and lead to pigeonholing.” He summarized research showing that implicit bias can continue to appear even in those who are aware of it, and that framing discrimination in terms of implicit bias can reduce people’s willingness to hold others accountable. It is possible for individuals to resist DEI despite good intentions, well-meaning behaviors, and even in the application of what have been popularized as effective practices.

There is an emphasis to focus on what works, said Yamamoto. As the research shows, isolated anti-bias trainings, policies, and grievances procedures do not work to combat discrimination on their own. A holistic approach including recruitment, mentoring, interaction through educational training, and mechanisms for social accountability are part of the solution, he said. As Dobbin mentioned, solutions often require taking informal practices, such as recruitment, mentoring, training, and work-life policies, and institutionalizing them as formal practices and policies and thereby making them accessible to all employees. For education, reviewing and updating the recruiting and admissions process can help reduce bias from the beginning; however, educational environments that also welcome all student identities, which will in turn help the students feel a sense of belonging.

A systems approach is required to address gatekeeping, opportunity hoarding, and elitism that reduces opportunities, from early education through career development and beyond, said Barabino, “to fully understand and provide what is needed to ensure that the culture and environment within our institutions, workplaces, and organizations is diverse, inclusive, supportive, and devoid of bias.”

PLANNING COMMITTEE ON ADDRESSING DIVERSITY, EQUITY, INCLUSION, AND ANTI-RACISM IN STEMM ORGANIZATIONS

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REVIEWERS: To ensure that it meets institutional standards for quality and objectivity, this Proceedings of a Workshop—in Brief was reviewed by Darryl Monteau, Native Initiatives, Society for Advancement of Chicanos & Hispanics and Native Americans in Science. We also thank staff member Jennifer Cohen for reading and providing helpful comments. Kirsten Sampson Snyder, National Academies of Sciences, Engineering, and Medicine, served as review coordinator.

SPONSORS: The workshop was supported by the National Institutes of Health.

Suggested citation: National Academies of Sciences, Engineering, and Medicine. (2021). *Addressing Diversity, Equity, Inclusion, and Anti-Racism in 21st Century STEMM Organizations: Proceedings of a Workshop—in-Brief*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26294>.

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