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Harnessing Social Psychological Insights to Grow the Next Generation of American Scientists, Engineers, and Technologists and Address Real-World Challenges Facing the Nation

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ABSTRACT

Two interconnecting challenges contribute to a substantial gap between the supply and demand of talented STEM professionals in the United States workforce. First, is a substantial gap between the rising demographic diversity of the U.S. population and the limited diversity of Americans in STEM education pathways and careers. Second, inadequate attention connecting STEM research and teaching to socially relevant real-world issues makes STEM education and careers less appealing to young people. Many STEM learning environments do not satisfy young people's core psychosocial needs to belong, feel competent, and engage in work that is socially relevant and personally meaningful. In this article, we leverage social psychological research to highlight evidence-based solutions to these challenges. We detail actionable steps that can be taken by schools, universities, government agencies, and STEM employers to attract, motivate, and retain new, diverse STEM talent in the United States. By increasing the presence of successful role models, providing career development opportunities for meaningful professional interactions and relationship building, and connecting STEM content to social good, institutions can support young scientists' motivation to pursue and persist in STEM careers while at the same time address social issues of concern to the American people. Many of these evidence-based actionable steps have stalled or are at risk because of federal actions of the current administration that hurts Americans' well-being, national progress, and U.S. competitiveness on the global stage.

1 | Introduction

Two long-standing challenges have been echoing within the American research and educational community in STEM. The first is the gap between rising demographic diversity in the U.S. population, especially among young people, and yet limited diversity in STEM-skilled graduates and professionals entering the workforce. A growing proportion of all employment in the U.S. today revolves around scientific and technological innovation industries (Carr and Christy 2025; Noonan 2017) and the demand for a skilled workforce in science, technology, engineering, and mathematics (STEM) has outpaced the supply of STEM graduates (National Center for Education Statistics 2024). Many organizations with vital jobs requiring STEM skills have trouble filling these positions, pointing to the urgent need to use science-informed approaches to overcome barriers preventing American youth from pursuing STEM education and careers in larger numbers (Athey 2023; Smith and White 2024). A second challenge is substantially less attention to, and investment in, translational STEM research that tackles social issues of public interest compared to the long tradition of national investments in fundamental STEM research (at least until 2025), resulting in missed opportunities to address real-world problems. Informed by social psychological research, we believe that these two

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challenges are intimately connected and mutually reinforcing. Understanding the connections promises to unlock innovative solutions to shortages in the STEM workforce (Dasgupta 2023).

Psychological research shows that the connection between the above-mentioned long-standing challenges starts with three fundamental psychological motives that drive human behavior across many social contexts, including school, college, and work: the need to belong, the need for mastery or competence, and the need for meaning and purpose (Baumeister and Leary 1995; Dasgupta 2023, 2025; Deci and Ryan 2000; Fiske 2004). Applied to STEM education and career pursuits, many young people are curious about science, engineering, and technology-oriented activities and approach them initially. The question is, do they stick with it? The answer depends on the degree to which informal learning activities, formal education, and later career opportunities in STEM satisfy young people's need for belonging, mastery, and meaning. Most programs and initiatives on broadening participation in STEM focus on outreach, recruitment, and providing financial support without linking these efforts to psychological need fulfillment (e.g., Cannaerts et al. 2025; Jones and Cleaver 2020).

The goal of this article is to leverage social psychological research to shine light on the types of changes in STEM learning environments and teaching approaches connecting STEM to social issues that promise to satisfy young people's motivation to belong, master, and pursue something meaningful, thereby fueling continued curiosity, interest, and persistence along STEM education and career pathways. The social-psychological takeaways summarized in this article will be informative in the designing of effective programs, policies, and practices that attract and retain more youth in STEM educational and career pathways nationwide, while also addressing real-world concerns of interest to the American people.

This article comes at a fraught time—when the goal of expanding STEM education and workforce development is impeded by several executive orders from the Trump presidential administration (see also articles by Oyserman et al. 2025; Ito et al. 2025). The first major impediment comes from the White House Executive Order 14173, titled "Ending Illegal Discrimination and Restoring Merit-Based Opportunity," that revokes a long-standing federal requirement to record, analyze, and report demographic data on job applicants and employees in the American labor market (Exec. Order No. 14173 2025). This executive order has many employers wondering whether they need to rethink their internal data collection efforts on their workforce, including the voluntary collection of applicants' and employees' demographic data, such as race, ethnicity and sex. Without knowing who is applying for STEM jobs across the nation, as well as job applicants' and employees' demographics, the nation will be in the dark about whether the gap between the demand for STEM-skilled workers in the U.S. labor market and the availability of STEM graduates is shrinking, expanding, or unchanged. If the problematic demand-supply gap in the STEM workforce increases or continues unchanged, the reasons will be unknown without reliable data on the demographics of STEM applicant and employee pools, which impedes the nation's ability to solve an important problem and remain competitive in the global economic market.

A second impediment to closing the demand-supply gap in the American STEM workforce comes from presidential Executive Order 14151 ("Ending Radical and Wasteful Government DEI Programs and Preferencing") that seeks to end diversity, equity, and inclusion (DEI) programs and offices across the federal government (Exec. Order No. 14151 2025). Subsequently, the Office of Personnel Management (OPM) instructed federal agencies to terminate many DEI programs, policies, and practices, and indeed, most DEI initiatives, personnel, and offices across the federal government have been eliminated. Going further, the Department of Justice (DOJ) Civil Rights Division and Office of Legal Policy are using its powers to push the private sector to shut down DEI programs by investigating and penalizing private companies for corporate DEI programs, policies, and activities (Murray and Bohannon 2025). But Executive Order 14173 does not define what constitutes DEI programs and policies, the boundary conditions, or what makes it "illegal." Its issuance from the apex of the federal government has increased the risk profile and uncertainty around many programs nationwide that could be vaguely construed as DEI-oriented in the private and public sectors. This executive order effectively puts a freeze on many STEM education and workforce development efforts, challenging American society's ability to meet national needs and maintain the United States' STEM innovation competitiveness on the global stage (see Ito et al. 2025). Within this national context, our goal in this article is to offer to the public and policymakers science-backed evidence from social psychological research as useful nonpartisan data to inform policies, practices, and programs that attract and retain more youth in STEM educational and career pathways nationwide, while also addressing real-world concerns of interest to the American people.

2 | Student Success in STEM Using the Framework of the Stereotype Inoculation Model

What factors allow young people to deflect negative stereotypes, satisfy their core social motives, and embrace STEM pathways in ways that benefit their career goals and contribute to national progress? To address this question, our research group developed a theoretical framework called the stereotype inoculation model (Dasgupta 2011; Stout et al. 2011). A shorthand way to describe this model is through a biomedical metaphor. Just as biomedical vaccines protect and inoculate one's physical body against noxious bacteria and viruses, so too do three features of learning environments inoculate one's mind against noxious stereotypes and experiences of social inequality.

These metaphorical "viruses" can be described as follows: First, STEM environments threaten the need to belong by activating stereotypes about who ideal scientists and engineers are. To the extent that idealized scientists and engineers come from a narrow demographic band, it makes young people who don't see themselves in that idealized group wonder that perhaps they are not good enough or welcome in STEM, increasing risks of isolation, loss of motivation, and attrition from STEM (Aday et al. 2025; Bowman et al. 2023; Cheryan et al. 2015). Second, STEM careers and learning environments have a unique culture requiring knowledge of implicit norms and unwritten "rules of

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the game" (e.g., which classes to take, when to drop a course, the importance of hands-on research experience, how to secure internships, what skills and work experiences are most important to land a permanent job in STEM) that are learned through word of mouth from parents, mentors, advisors, and peers in the inner circle (Dasgupta 2025; Lareau 2017). Finally, teaching practices that convey abstract STEM content tend to be disconnected from topics relevant to students' everyday lives, leaving students disinterested in pursuing STEM careers (Boucher et al. 2017; Garibay 2015). If young people are not inoculated through (1) own-group role models that combat negative stereotypes, (2) opportunities to build relationships with scientists, engineers, and technologists to humanize these professionals as regular people, and (3) STEM discoveries that are relevant to their own lives, the communities they care about, and socially relevant issues, challenges in attracting, retaining, and advancing young people through STEM education and career pathways will persist (Brannon et al. 2017; Chasen et al. 2024; Dasgupta 2011, 2025; Garibay 2015).

3 | Representation: Own-Group Role Models Spark Interest in STEM and Weaken Negative Stereotypes

What does a scientist look like? For many students with identities that are underrepresented in STEM educational spaces and careers, the most frequent answer to this question typically generates images that don't match their own background. Students' understanding of what a scientist is "supposed" to look like is reinforced from an early age by messages from peers, parents, teachers, mainstream media (e.g., television shows and movies), and textbooks (Chimba and Kitzinger 2010; Miller et al. 2018). Psychologists have spent decades exploring how young people visualize typical scientists using the "draw a scientist" test. They found that young people's most common representations rely on stereotypes and tropes. Scientists are typically drawn as middle-aged or older White men who appear disheveled, working alone in a lab on something abstract, surrounded by beakers and test tubes (Chambers 1983; S. L. Ferguson and Lezotte 2020; Finson 2002; Joy et al. 2024; Kellow and Jones 2008; Miller et al. 2018; Starr 2018; Wood et al. 2020).

While children under 6 years of age tend to draw men and women equally, children entering kindergarten tend to draw male scientists more often than female scientists, a trend that lasts well into high school (S. L. Ferguson and Lezotte 2020; Joy et al. 2024; Miller et al. 2018; Morgan 1982; Murphy and Beggs 2002). These stereotypical depictions parallel representation gaps in real life where, for example, many students from racial and ethnic minority groups, girls and women, working-class students, and people with disabilities never meet another member of their own identity group in STEM spaces until they are well into their careers (Cooke 2023; L. Ferguson and Seery 2021). In the absence of exposure to scientists from varied backgrounds, stereotypes get imprinted in the mind, caricaturing scientists as people who work in isolation and who represent a narrow demographic band that excludes many groups (Black and Hispanic people, women, etc.).

3.1 | Expand What a Scientist Looks Like: The Role of Varied Visual Representations and Meaningful Relationships

Research shows that increasing the presence of scientists from underrepresented social groups is an impactful "social vaccine" that has lasting impact on many young people's career pursuits (Dasgupta 2011; Dasgupta and Stout 2012; Herrmann et al. 2016; Hansen-Brown et al. 2023; Laiduc et al. 2021; Wu et al. 2022). Increasing the visibility of varied types of scientists who don't fit a narrow stereotypic pigeonhole is inspiring to young people who can find someone they relate to and imagine their future self in those successful professionals. Students benefit from seeing role models both from afar, as is the case with hearing about successful scientists through stories or mainstream media (Asgari et al. 2010; Buckley et al. 2022; Corsbie-Massay and Wheatly 2022; Du et al. 2023; Gladstone and Cimpian 2021; Mark 2020; Shin et al. 2016; Steinke 2017; see White et al. 2021), and up close through meaningful interpersonal interactions with similar others in STEM professions who act as mentors or guest speakers (Dennehy and Dasgupta 2017; González-Pérez et al. 2020; Locke et al. 2025; Stout et al. 2011).

Programs that increase exposure to diverse mentors and professionals in STEM are beneficial both for short-term goal completion and long-term STEM participation (Dennehy and Dasgupta 2017; Wu et al. 2022). Such programs are cost-effective and have lasting impacts on students from all social backgrounds; such is the case with inviting guest speakers from diverse backgrounds to give inspirational talks to young students (e.g., González-Pérez et al. 2020; Hansen-Brown et al. 2023; Locke et al. 2025; Laiduc et al. 2021). Multiple experiments have found that when undergraduate students from historically underrepresented gender, racial, and ethnic backgrounds read about scientists from diverse social groups who achieved their success through hard work and persistence, they report greater motivation, interest, and persistence in STEM; they see more alignment between their social identity and a STEM identity, and as a result are more likely to see themselves as budding scientists (Buckley et al. 2022; Du et al. 2023; Gladstone and Cimpian 2021; Shin et al. 2016; De Welde and Laursen 2011; Lockwood and Kunda 1997; Stout et al. 2011). Relatedly, adolescent girls and racial minorities who watch fictional representations of scientists in popular media were more likely to express interest in pursuing STEM paths (Corsbie-Massay and Wheatly 2022; Mark 2020; Steinke 2017; see White et al. 2021).

Role model interventions like these are not only helpful in the short-term but also benefit students' long-term STEM retention. Dennehy and Dasgupta (2017) conducted a multi-year field experiment to investigate the benefits of a year-long mentoring program among female engineering students during their first year of college. Students met with either a male or female mentor on an average of four times throughout their first year, while students in the control condition were not assigned a mentor. Women with female peer mentors expressed steadfast feelings of belonging, motivation, and self-efficacy in engineering whereas others who were assigned male or no peer mentors significantly declined in their sense of belonging, motivation,

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and self-efficacy. By the end of the first year, 100% of female students paired with female peer mentors were still in engineering majors; that number was significantly lower in the other two conditions. A follow-up study (Wu et al. 2022) showed that these benefits lasted 4 years after the peer mentoring ended, revealing both positive psychological outcomes (i.e., belonging, mental health, aspirations to pursue graduate degrees in STEM) and behavioral outcomes (success in engineering internships, higher graduation rates with STEM degrees). Together, these findings provide critical evidence for the ways investment in programs that ensures all students have access to own-group role models can ensure larger numbers of diverse groups of students are successful STEM graduates.

Effective role models and mentors do not need to have the same social background as underrepresented youth to make them feel welcome in STEM. Professionals from majority groups can cultivate an environment of identity safety by engaging in organizational messaging and environmental cues signaling that underrepresented social groups are valued and belong (Davies et al. 2005; Derricks et al. 2023; Pietri et al. 2024). Relatedly, university professors who mentor students from different backgrounds are more effective when they explicitly talk about systemic contributions to inequality (Johnson et al. 2019; Matsick et al. 2020). These studies demonstrate that even in the absence of mentors with underrepresented identities, explicit reference to a person's awareness of structural barriers and a desire to overcome them is particularly helpful at ensuring all students feel welcome and validated in environments that have traditionally been homogeneous and not represented people with varied identities.

4 | Relationships: Environments That Expand Social Connections and Professional Networks Boost Belonging and Confidence

When students transition from one life stage to another, such as with the transition from high school into college, they are often vulnerable to feelings of self-doubt and uncertainty, particularly in environments where they are a numeric minority (Dasgupta 2011, 2025; Dennehy and Dasgupta 2017; Hope et al. 2015; Wu et al. 2022, 2024). Such is the experience of women who only hold 36% of bachelor's degrees in STEM, and Black and Hispanic students who hold 8% and 14% of STEM bachelor's degrees respectively (Lent et al. 2005; National Center for Education Statistics 2024). This is when close physical proximity with similar others can be an effective social vaccine for improving students' STEM belonging, interest, and long-term success.

The physical design of the local environment affects who knows whom, relationship formation, and access to information networks—this is how valuable knowledge is often informally shared in STEM education programs and workplaces (Dasgupta 2025; Runiewicz-Wardyn 2020). Organic relationship-building often begins with physical proximity, resulting in frequent casual social interactions that provide critical information about how to navigate institutions, rules and regulations, courses, and careers (Ludwig et al. 2024; Soldner et al. 2012; Strayhorn 2008, 2017). Knowledge-sharing opens the doors to new opportunities, which is especially important for students from under-resourced backgrounds who may not have access to such social networks through friend or family connections. In contrast, when people are physically segregated from others who have valuable information, they are likely to find it harder to build relationships with them and learn critical information that is informally communicated but not formally written anywhere, resulting in missed opportunities and further feelings of exclusion from STEM careers (Dasgupta 2025; DiPrete and Ehrlich 2008; Lareau 2017; Maltby et al. 2016; Massey and Denton 2018; Mayer and Jencks 1989; Peach 1996; Pedulla and Pager 2019; Soldner et al. 2012; Wu et al. 2022).

A good example of an intervention that leverages physical proximity to encourage relationship formation and community are living-learning communities in higher education. Here, underrepresented undergraduates live together in campus residence halls to spark organic friendships; they are grouped in introductory courses as a cohort and sometimes have access to extra resources to bolster STEM participation through field trips and skill-building workshops (Soldner et al. 2012; Wu et al. 2024).

Other research shows that meaningful and repeated cross-group interactions reduce prejudice and improve attitudes toward outgroups (see Turner et al. 2007 and Tropp et al. 2022 for review). In educational settings, programs that ensure race- and gender-diverse classrooms pave the way for informative group discussions that allow students to reference their own unique experiences to solve new challenges. Students who have many opportunities to talk with outgroup members become more open to new experiences, question social hierarchies, and are more likely to embrace, rather than reject, social and cultural differences (Hodson et al. 2018). Such interactions make students more confident, help them develop greater awareness of global issues, and become more empathetic and collaborative in finding innovative solutions for real-world problems (Hodson et al. 2018; see Tropp et al. 2022 for review). These benefits persist into adulthood in work settings, where psychological evidence found that gender-diverse scientific teams produced more innovative and high-impact solutions to important scientific problems (Yang et al. 2022).

Physical proximity that encourages social mixing and relationship-building across group lines is equally important as creating space for underrepresented students to spend some time with peers who share their identity to allow discussions of shared lived experiences and to receive validation that one is not alone (Leaper 2015). Studies with women and racial minority groups find that having a critical mass of ingroup peers within STEM environments promote identity solidarity and self-efficacy (see Cannaerts et al. 2025 for review; Dasgupta et al. 2015; Schmader 2023; Nix et al. 2016). Students with invisible or concealed identities, such as first-generation students, sexual minority students, and students with disabilities, benefit from ingroup peer groups as a space where they can openly converse about their experiences without self-censorship or worries of discrimination (Jennings et al. 2020; Rademaker et al. 2020).

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Physical proximity with similar others creates community and reduces concerns about tokenism—worries about being viewed through the lens of negative stereotypes in spaces that one's group is underrepresented (Aday and Schmader 2019; Dasgupta 2011, 2025; Kim et al. 2018; Spencer-Rodgers et al. 2016). Numerous programs and initiatives increase students' access to spaces that allow students with similar identities and career paths to collaborate with each other, provide signals of belonging through numerical representation, along with crucial social and psychological support (Baumeister and Leary 1995; see Cannaerts et al. 2025 for review). Having opportunities to connect with similar others is particularly important during periods of transition, like the transition from high school to college when young people enter a new unfamiliar environment.

5 | Meaning and Purpose: STEM Programs for the Good of Society

The need to pursue purpose-driven activities that contribute to societal good is a third core psychosocial motive that improves young people's thriving and persistence in STEM education and career pathways (Baumeister and Leary 1995; Deci and Ryan 2000; Fiske 2004). Topics that allow young people to contribute to positive social change, be altruistic, and make a difference in their community are of interest to young people from all identity backgrounds (Boucher et al. 2017; Carrera et al. 2018; Thoman et al. 2015). Unfortunately, STEM courses, especially at introductory levels, are traditionally taught in terms of abstract concepts disconnected from real-world issues and communal values (Boucher et al. 2017; Garibay 2015). Such forms of teaching convey the message that STEM education and careers are not the right fit for people whose interests lean toward making meaningful social change.

In an attempt to infuse social good into STEM education, some programs have sought to incorporate social issues and fieldwork into STEM teaching. Studies with middle- and high-school youth and undergraduates from a variety of social identity backgrounds show that young people who understand that science provides a way to be altruistic and to collaborate with peers are more interested in science and more motivated to persist in STEM over time (Adetunji 2025; Garibay 2015; Thoman et al. 2015; Carrera et al. 2018; Weisgram and Diekman 2017; Goldweber et al. 2022; Jackson et al. 2016; Makuch and Aczel 2020).

STEM education that connects the content being taught with students' experiences in their communities is another useful approach to spark diverse young people's interest in science. Person-centered methods such as photovoice—where students photograph important scenes in their lives that provide a unique take on STEM—allows elementary and middle school students to share their unique perspectives with classmates to inform their awareness of, and solutions for, persisting challenges in their communities (Chio and Fandt 2007; Ellis et al. 2024; Dwyer and Azevedo 2016).

Studies show that translational STEM research and education connected to social issues attracts diverse professional scientists. For instance, an analysis of research grant proposals submitted to the National Institutes of Health (NIH) revealed that African American scientists were significantly more likely to focus on macro-level research questions related to community health and well-being (e.g., behavioral contributions to disease prevention), which were less likely to be funded compared to micro-level mechanistic research questions (e.g., disease analysis; Hoppe et al. 2019). Similarly, in Burrage et al. (2025) examination of the National Science Foundation's Innovation Corps (NSF I-Corps) program, female students and faculty researchers were more likely to express interest in STEM entrepreneurship training programs when they were framed as using STEM research to address social issues instead of purely commercial issues. Women scientists and engineers were also more likely to submit federal grant proposals to the NSF I-Corps program with the motivation of using their STEM skills to design commercial inventions to address social problems. These findings suggest that increasing incentives and support for STEM research connected to socially relevant topics is likely to be an effective tool to recruit, engage, and retain underrepresented students and early career scientists and engineers.

6 | Key Points and Recommendations

With the above-mentioned research as a foundation, we recommend a series of interventions to enhance STEM representation, strengthen relationships among novices and experts, and make STEM education and careers personally meaningful to all, especially the next generation. The responsibility for effective changes rests with institutional leaders, educators, policymakers, and funders.

6.1 | Recommendation 1: Develop Targeted Programming to Increase Young People's Interest and Awareness of the Connections Between STEM and Social Issues

To spark interest and curiosity in youth and encourage their motivation to pursue STEM careers, organizations must build connections between STEM and social issues. This recommendation can be put into action by many organizations—K-12 schools, universities, professional societies, government agencies, and industry leaders. Leaders of educational institutions and professional societies with industry collaborators should support and invest resources into STEM course and curriculum redesign to connect STEM teaching to social issues. Such changes are likely to be especially impactful in high school courses and introductory college courses where loss of interest and attrition from STEM pathways is most prominent (Hatfield et al. 2022). While Executive Order 14190 argues that topics such as environmental justice, social identity, bias and privilege "promotes discrimination and undermines national unity," social psychological research shows quite the opposite. Education that illuminates how science, engineering, and technological discoveries can be applied to tackle social problems and inequalities related to health, environment and sustainability, AI fairness, and learning, attracts and keeps more young people in STEM pathways from high school to higher education to careers

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because of the social relevance of these topics in daily life (see Ito et al. 2025).

One example of how science for social good can advance national interests comes from the Navajo Nation in Arizona, where a vast network of local entrepreneurs and scientists from the Navajo Technical Institute engage in regional development projects that tackle pressing issues within their community (Feldman and Kayaani-George 2025). With support from federal granting agencies and partnerships with local families, farmers, and store owners, these programs have expanded the Navajo Nation's manufacturing capacity, leading to rapid economic growth, technological advancement, and community well-being. This model demonstrates the impact that government agencies, private foundations, and corporations have when supporting local, school and university programs that connect STEM to social good through internships, cooperative employment programs, and recruitment events. In the last decade, the federal government has invested over $4.3 billion in the STEM workforce through improving STEM education from pre-kindergarten to college graduation, improving job training, university programs, and funding advanced STEM research (Carmichael 2017). If such programs use a STEM-for-social-good approach they are likely to attract students from diverse backgrounds and also address social challenges that improve people's lives and communities.

6.2 | Recommendation 2: Engage in Professional Development Programs to Increase Young People's Exposure to STEM Careers Early On

Intentionally organized social and professional events that allow young students and early career scientists from different backgrounds to learn about STEM careers is another way to improve recruitment of new talent. For example, students of all backgrounds and across contexts (e.g., K-12, undergraduate students, online learners) who are exposed to hands-on research experiences through coursework, internships, and extracurricular activities report lasting skill development and STEM career pursuits (Boyington and Moody 2019; Cannaerts et al. 2025; Wu et al. 2022). These programs combat traditional STEM practices that prioritizes students who already display stand-out STEM research skills and instead embeds research into classes to make hands-on research experiences accessible to all (Buchanan and Fisher 2022; Mohammadi et al. 2020). These opportunities also provide students access to advanced professionals, allowing them to expand their professional social network and serve as the first steps for students to build connections with senior professionals who could provide a head start for job opportunities in the future.

Building robust relationships between educational institutions and workplaces have the potential to expand career pathways and reduce identity-based barriers to success. Unfortunately, many STEM programs that provide students access to hands-on research and internship experiences have been defunded after recent executive orders (Zernike 2025). Though executive order 14190 states that parents trust American schools' duty "to provide their children with a rigorous education," some present-day federal actions under the Trump administration have terminated funding to programs that improve youths' access to early research experiences, decreasing STEM skill development among American youth from all social demographic groups. The termination of STEM research grants have also stalled much-needed research that addresses pressing issues of national interest and have stymied students' and young professionals' career progress (Ito et al. 2025; Zernike 2025; Klein 2025). For instance, many grant programs that provided advanced STEM research opportunities for scholars from under-resourced backgrounds (e.g., from rural communities or single-parent households) were terminated, even though the topics of most of these awarded grants were not related to the topics outlined in the Executive Orders discussed here (Zernike 2025). Of additional concern are credible news reports showing that many graduating STEM students and young scientists and engineers are considering leaving the U.S. to pursue STEM careers in Canada, Europe, Latin America, and Asia (Askenfeld and Ahart 2025; Duster 2025).

6.3 | Recommendation 3: Redesign Physical Spaces in Educational and Work Environments to Increase Proximity Among Students and Workers From Underrepresented Groups

Underrepresented students and employees tend to feel isolated in STEM environments, especially when they are beginners or are in transitional periods of their careers (e.g., entering college or starting a new position; Hope et al. 2015). Physical proximity to supportive ingroup members, particularly senior and successful individuals, increase feelings of comfort and belonging, as well as provide unique opportunities for informal knowledge-sharing that can help combat feelings of inadequacy (Dasgupta 2025; Runiewicz-Wardyn 2020). Through strategic hiring and admission practices that account for the benefits of a diverse body of students and employees, institutions can ensure that there is a critical mass of similar others that can meaningfully encourage relationship building and knowledge sharing. This process is more organic when individuals are in close proximity to others, providing ample opportunities to expand social connections and professional networks (Dasgupta 2025). Informal sharing of valuable information, such as organizational practices and the hidden curriculum in higher education, prevents underrepresented individuals from falling behind and opens doors to new opportunities.

For instance, many unspoken institutional norms, etiquette, and rules for success are shared through informal, unplanned social interactions (Ludwig et al. 2024; Soldner et al. 2012; Strayhorn 2008, 2017). In contrast, if people are physically segregated, it is harder to build relationships and share critical information, and some people miss out on important career-building opportunities. Living-learning communities are one such intervention that helps underrepresented students in the first year of college navigate these challenges. Another intervention is resource groups for early career employees dedicated to supporting individuals with underrepresented social identities where old and new members mingle, and the more seasoned members share valuable information about the

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unspoken rules of the game, how to navigate a new complex organization, and provide critical social support that is foundational for long-term success (Beaver 2023; Green 2018).

Unfortunately, recent executive orders have targeted programs in K-12 schools, universities, and workplaces that bring together people who are underrepresented in STEM into affinity group-based programs (Klein 2025). This, together with the 2023 Supreme Court decision that severely limits the scope of affirmative action in college admissions, makes it challenging for colleges, universities, and employers to implement evidence-based programs that help cohorts of individuals with shared identities who are underrepresented in STEM navigate STEM education and workplaces together; programs that are designed to strengthen their sense of belonging in STEM, build relationships and expand networks, and learn the unspoken cultural norms, practices, and opportunities in STEM.

6.4 | Recommendation 4: Increase Access to Mentors and Role Models in K-12 Schools, College, and Early Career

Our final recommendation emphasizes the role of mentors for retaining students' and early career professionals' interest in persisting in STEM careers. Mentors are particularly effective when: (a) they are relatable to their mentees because of shared life experiences or identities; (b) mentoring relationships begin at critical transition periods in the mentees' academic and career journey (e.g., in the first year of high school, first year of college, or upon entry into one's first job); and (c) mentors are slightly ahead in their educational or career journey relative to their mentees and can draw upon their more recent life experiences to provide nuanced support tailored to their mentees' needs.

Support for programs that bring role models into the K-12 classroom are particularly helpful for historically underrepresented students. Official programming such as targeted school-based extracurriculars and the DO-IT Scholars program—an intensive program that provides STEM mentoring to high school students with disabilities—are key opportunities to improve students' exposure to STEM leaders with similar identities and experiences (Cagle et al. 2018; Locke et al. 2025). Matching undergraduate students with high schoolers, for example, is another innovative way to maintain youth's interest in STEM careers (Akinla et al. 2018; Tenenbaum et al. 2014). Mentorship programs can be offered by a range of organizations, such as schools, colleges and universities, STEM businesses, professional societies, and volunteer nonprofit organizations.

7 | Conclusion

Social psychological research shows that educational environments can better serve STEM students if they satisfy core motivational needs to belong, feel competent, and pursue a meaningful life. Supported by a growing body of research in social psychology and adjacent fields, three situational factors have major impacts on the ability of STEM environments to meet the needs of increasingly diverse American students: (a) The availability of people in high status roles that young people can relate to, (b) opportunity to form relationships with peers and professors across group lines, and (c) learning STEM content that makes a difference in the real world. Using this research as a foundation, we offer four actionable recommendations for how organizations can attract and retain larger cohorts of STEM students and professionals to meet the needs of the modern STEM workforce. Putting these recommendations into action will expand innovations in products and services that promote the health and well-being of the American people, strengthen the infrastructure in our towns and cities, and enhance our understanding of, and ability to handle, complex challenges in the changing nature of work, the role of AI and technology in human society, health, adaptation to climate change, and national security.

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Conflicts of Interest

The authors declare no conflicts of interest.

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Biographies

Tiani R. Perkins research focuses on the interaction between individual traits and contextual factors that contribute to undergraduate student success. She has authored and co-authored papers in leading journals including the *Journal of Black Psychology*, *Cultural Diversity & Ethnic Minority Psychology*, and the *Journal of Research on Adolescence*. Her research has been supported by public and private research foundations including the National Science Foundation, the American Psychological Association, the Spencer Foundation, and the William T. Grant Foundation. Her current research examines the ways colleges and universities can improve student outcomes through an asset-based participatory approach that accounts for both student and faculty needs. Dr. Perkins received her B.S. in Psychology from Howard University and her PhD in Personality and Social Psychology from the University of Michigan.

Nilanjana Dasgupta research is on unconscious or implicit bias with emphasis on the plasticity of implicit bias—the ways in which changes in social contexts correspondingly change implicit attitudes, beliefs, and behavior. In collaboration with graduate students and postdocs, her current research identifies the types of academic and professional contexts that protect individuals' sense of self and aspirations against negative stereotypes. Her research has been funded by the National Science Foundation, National Institutes of Health, and the American Psychological Foundation. The work has been recognized through the Distinguished Academic Outreach Award in Research from UMass Amherst (2014) and the Chancellor's Award for Outstanding Accomplishments in Research and Creative Activity (2016), the Hidden Bias Research Prize awarded by the Level Playing Field Institute, a private foundation based in Silicon Valley (2012), and through distinguished faculty lectures at the National Science Foundation (2016) and at UMass Amherst (2016). A good bit of her time is spent translating scientific research to inform social problems such as educational disparities in science, engineering, and mathematics, and the underrepresentation of women and ethnic minorities in professional leadership roles. She has presented this work to K-12 teachers and administrators, university leaders and faculty, business leaders, policymakers on Capitol Hill, and at a White House roundtable organized by the Office of Science and Technology Policy and Office of Public Engagement. Dr. Dasgupta is the founding director of a new Institute of Diversity Sciences at UMass Amherst. She received her Bachelor's degree in psychology and neuroscience from Smith College and her PhD in social psychology from Yale University.

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