

Book Review**Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads**

National Academy of Sciences, National Academy of Engineering, & Institute of Medicine. (2011). *Expanding underrepresented minority participation: America's science and technology talent at the crossroads*. Washington, DC: National Academies Press. doi:10.17226/12984 ISBN: 978-0-309-15968-5, \$40 (Paperback), 286 pages.

Over the last few years, the national push to have a properly trained science, technology, engineering, and mathematics (STEM) workforce has been at the forefront of the nation's top priority list. In a recent report to the President, *Engage to Excel: Producing One-Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics*, President Barak Obama's Council of Advisors on Science and Technology (2012) offered five recommendations to address this priority. Recommendation 3 was to "launch a national experiment in postsecondary mathematics education to address the mathematics-preparation gap" (p. 27); Recommendation 4 was to "encourage partnerships among stakeholders to diversify pathways to STEM careers" (p. 30). These initiatives mirror *Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads*, which aimed to address the need to strengthen the U.S. STEM workforce with diversity and the inclusion of underrepresentation minorities at the forefront of its mission.

Overview and Motivation

As a successor to *Rising Above the Gathering Storm* (National Academy of Sciences, National Academy of Engineering, & Institute of Medicine, 2007), a report that generated national attention to America's competitiveness, the importance of research and innovation, and creating a strong STEM workforce, *Expanding Underrepresented Minority Participation* extended its reach to include underrepresented minorities as a means to create an inclusive and diverse science and engineering (S&E) workforce. This idea was initiated by four U.S. senators who requested a study of underrepresented minorities, "citing the need to develop a strong and diverse S&E workforce" (p. 2). The National Academies formed a committee of experienced persons with diverse

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educational, institutional, legislative, and program evaluation backgrounds. Beyond involving leaders in science, technology, engineering, and mathematics (STEM), *Expanding Underrepresented Minority Participation* advocates for a direct program development plan to address underrepresentation. It suggests that “a successful national effort to increase the participation and success of underrepresented minorities in STEM will be urgent, sustained, comprehensive, intensive, coordinated, and informed” (p. 11). The report describes the impact and necessity of including underrepresented minorities in the economy’s research and innovation capabilities. Three reasons for this approach are offered, including: (a) the uncertainty of “our sources for the future of the S&E workforce,” (b) the shifting “demographics of our domestic population,” and (c) the strength of diversity in S&E (pp. 2–3). The committee advises that international students are a cause of uncertainty in S&E because, in previous years, international students “have accounted for almost all growth in STEM doctorate awards and, in some engineering fields, have for some time comprised the majority of new doctorate awards” (p. 22). This is a cause for concern for the S&E workforce because uncertainty remains about whether they will remain in the United States or return to their country after graduation. The committee also provides data that supports the shift in demographics of the S&E workforce. “In 2006[,] underrepresented minority groups represented 28.5 percent of our national population but just 9.1 percent of college-educated Americans in science and engineering occupations” (p. 36). This would imply that “the proportion of underrepresented minorities in S&E would need to *triple* to match their share of the U.S. population” (p. 36). Emphasis is also placed on the multidimensional effects of diversity, which aides in the goals for research innovation, involves a culmination of ideas from a variety of sources, and is deemed essential for developing S&E workforce.

Developing Scientists and Engineers

Members of congress asked for recommendations that would assist in the growth in degrees obtained by underrepresented minorities in S&E. The committee describes the path to developing a strong S&E workforce by examining avenues that currently exists. The case is made for instituting a strategic pipeline to S&E because “no single career pathway or pipeline exists in STEM education” (p. 4). In Chapters 3–6, they clearly identify issues that underrepresented minorities face throughout their educational careers. Detailed programmatic measures are suggested in hopes of reversing this trend to include educational stakeholders focusing on “preparation, access and motivation, financial aid, academic support, and social integration” (p. 5). Preparation examines training received at the K–12 level. The committee notes that the current system, with the various laws and initiatives enacted throughout the years, has not properly addressed underrepresented minorities’ needs for academic preparation. Data shows the increase of minority populations within

the K–12 system throughout the years; therefore, the proposed pipeline “must be a major focal point of intervention to cultivate the diverse talent pool is needed to sustain the nation’s future in STEM” (p. 56). In addition, a connection is shown “between teacher quality and student achievement” as an indicator of preparation (p. 54). A strong emphasis is also placed on transitioning from high school to college, retention, and sustaining interest in STEM when considering access and motivation of underrepresented minorities. Data suggest “underrepresented minorities who do begin at four-year institutions and aspire to major in STEM, as we have seen, have a lower four- and five-year completion rate than whites and Asian Americans” (p. 93). The committee offers institutional changes that can be made at the departmental level to address motivation and interest, such as hands-on activities in programs outside of the classroom, STEM outreach initiatives, and increasing STEM career and college awareness. They also point out the need for transformative measures in organizations who allocate resources to assist students seeking to persist in STEM fields. A call for action is issued to federal programs, such as the Louis Stokes for Minority Participation and NIH training programs, to be transformed in order to increase participation. In addition, the report ascertains that creating an inclusive climate for learning and support through student success programs, retention models, social support, and advising can be an avenue of support for underrepresented minority students.

The committee targets higher education institutional administrators at all levels, stakeholders, and funding partners to pledge to create a climate of inclusion at their prospective institutions. There has been emphasis placed on predominately white institutions, minority-serving institutions, and community colleges to implement best practices by identifying successes at institutions that fall within their designated Carnegie classification. They make it clear that this approach to creating scientists and engineers involves national and local stakeholders’ assistance to ensure that all students receive a quality education. This includes highlighting “the need to provide substantial support to high-need schools, including professional development for teachers and school leaders” (p. 89) with innovative practices that incorporate STEM in the classroom.

Moving Forward to Inclusion in S&E

After establishing a clear rationale for the need to expand underrepresented minority participation in the S&E workforce, the committee recommends six action plans to move beyond the crossroads (see Figure 1). The recommendations were driven by a set of principles to enact immediate plans of actions, including: (a) recognizing the urgency of the problem, (2) sustainability, (3) educational pathways from all levels that will secure pathways for all students, (4) increased intensive efforts to assist students with inadequate preparation for STEM, (5) allocation of funding, and (6) STEM program evaluation (pp. 143–148). These priorities extend to institutional roles and

leadership, program design, program development, and characteristics of successful STEM program models. The committee further suggests offering research experiences, mentoring, and think tanks amongst stakeholders to share practices. For instance, important factors (retention) that contribute to African American success at Historically Black Colleges and Universities (HBCUs) are described; although S&E minority numbers are smaller in comparison to predominantly White institutions, the fact that they “graduate a larger percentage speaks to the efficacy of these institutions in retaining these students” (p. 156). The importance of retention practices is emphasized throughout this report. Although recommendations were provided, given the immediate action needed to advance report findings, the committee provides further justifications for increasing diversity and inclusion by identifying two priority initiatives. Priority 1 addresses all programmatic and financial support needed to increase retention and completion of undergraduate degrees in STEM, and Priority 2 warrants transitional support from secondary to graduate school initiatives as well as support for teacher preparation programs (pp. 186–188).

Table 1

Committee recommendations from *Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads* (pp. 11–12).

<u>Preparation</u>		<u>Postsecondary Success</u>	
Recommendation 1: Preschool-Grade 3 Education	Prepare America's children for school through preschool and early education programs that develop reading readiness, provide early mathematics skills, and introduce concepts of creativity and discovery.	Recommendation 4: Access and Motivation	Improve access to all postsecondary education and technical training and increase underrepresented minority student awareness of and motivation for STEM education and careers through improved information, counseling, and outreach.

<p>Recommendation 2: K-12 Mathematics and Science</p>	<p>Increase America’s talent pool by vastly improving K-12 mathematics and science education for underrepresented minorities.</p>	<p>Recommendation 5: Affordability</p>	<p>Develop America’s advanced STEM workforce by providing adequate financial support to underrepresented minority students in undergraduate and graduate STEM education.</p>
<p>Recommendation 3: K-12 Teacher Preparation and Retention</p>	<p>Improve K-12 mathematics and science education for underrepresented minorities overall by improving the preparedness of those who teach them those subjects. Postsecondary Success</p>	<p>Recommendation 6: Academic and Social Support</p>	<p>Take coordinated action to transform the nation’s higher education institutions to increase inclusion of and college completion and success in STEM education for underrepresented minorities.</p>

Final Analysis

Expanding Underrepresented Minority Participation calls for the higher education community to help increase degree production in underrepresented minorities in the S&E workforce. Its efforts include providing sustainable measures such as retention, academic, and non-academic support that serve as a roadmap to the inclusion of underrepresented minorities in S&E throughout all levels of education. As the nation strives to increase the number of additional STEM degrees, transformational changes must include initiatives that support underrepresented minorities, as reflected through demographic data provided in

this report. *Expanding Underrepresented Minority Participation* engages national leaders, policy makers, local administrators, and educational communities in a conversation that will assist in keeping America competitive globally. This report offers a sustainable option to inclusion and diversity of underrepresented minorities in S&E and a direct pathway of completion success. However, it is important to recognize that as congress changes, a new paradigm will arise based on the agenda of local and federal constituents. As the 2016 presidential election approaches, one must wonder if America will find itself at the crossroads again.

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