

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

President's Council of Advisors on
Science and Technology

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Origins of the Report

- Citing the need to develop a strong and diverse S&E workforce, Senators Kennedy, Clinton, Mikulski, and Murray requested a follow-up to *Rising Above the Gathering Storm*
- Focused on *increasing the participation of underrepresented minorities in STEM*, a request later included as a mandated report in the America COMPETES Act.

Charge to the Committee

- Examine the **role of diversity** in the science, technology, engineering, and mathematics workforce and its value in keeping America innovative and competitive.
- Analyze the **rate of change** and the challenges the nation currently faces in developing a strong and diverse workforce.
- Identify **best practices** and the **characteristics** of these practices that make them effective and sustainable.
- Write a **consensus report** that provides a prioritized list of actionable recommendations across stakeholder groups.

Committee Membership

- **Freeman Hrabowski**, Chair, University of Maryland, Baltimore County
- **James Ammons**, Florida A&M University
- **Sandra Begay-Campbell**, Sandia National Laboratories
- **Beatriz Chu Clewell**, The Urban Institute
- **Nancy Grasmick**, Maryland State Department of Education
- **Carlos Gutierrez**, California State University-Los Angeles
- **Evelyn Hammonds**, Harvard College
- **Wesley Harris** (NAE), Massachusetts Institute of Technology
- **Sylvia Hurtado**, Higher Education Research Institute, University of California Los Angeles
- **James S. Jackson** (IOM), Institute for Social Research, University of Michigan
- **Shirley McBay**, Quality for Minority Education Network
- **Diana Natalicio**, University of Texas El Paso
- **John Nemeth**, Oak Ridge Associated Universities
- **Eduardo Padron**, Miami Dade College
- **Willie Pearson**, Georgia Institute of Technology
- **Sidney Ribeau**, Howard University
- **John Slaughter** (NAE), NACME
- **Richard Tapia** (NAE), Rice University
- **Lydia Villa-Komaroff**, Cytonome, Inc.
- **Linda Sue Warner**, Haskell Indian Nations University

Why Broad Participation Matters

- 1. Our sources for the S&E workforce are uncertain.**
- 2. The demographics of our domestic population are shifting dramatically.**
- 3. Diversity is an asset and an opportunity.**

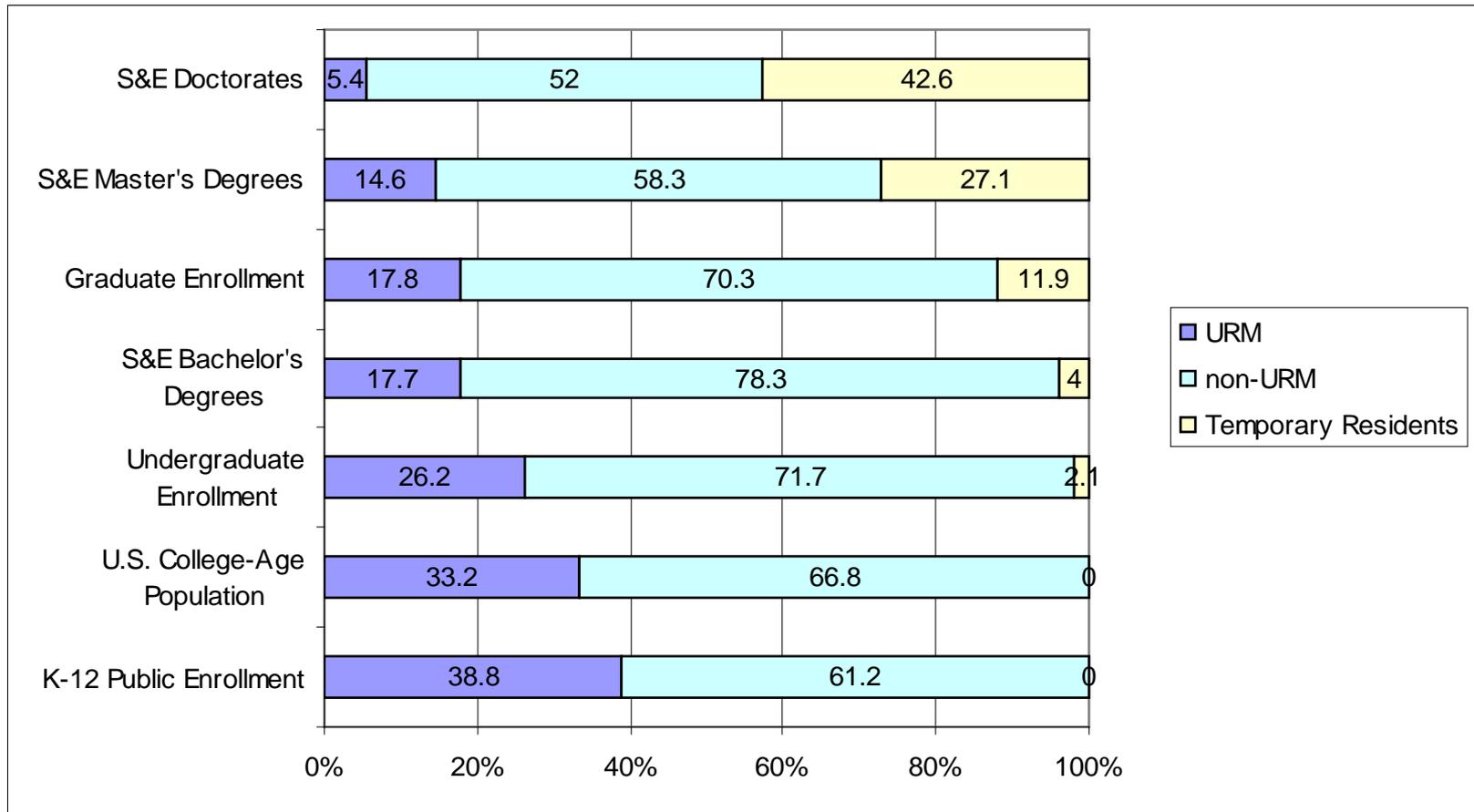
We Start from a Challenging Position

- Underrepresented minority groups comprised 28.5 percent of our national population in 2006, yet just 9.1 percent of college-educated Americans in science and engineering occupations (academic and nonacademic)
- *Suggests the proportion of underrepresented minorities in S&E would need to triple to match their share of the overall U.S. population.*

And Challenging Results

- Underrepresentation of this magnitude in the S&E workforce stems from the underproduction of minorities in S&E at every level of postsecondary education
 - 38.8 percent of K-12 public enrollment
 - 33.2 percent of the U.S. college age population
 - 26.2 percent of undergraduate enrollment
 - 17.7 percent of those earning S&E bachelor's degrees
 - 17.7 percent of overall graduate enrollment
 - 14.6 percent of S&E master's
 - 5.4 percent of S&E doctorates.

Enrollment and Degrees, by Educational Level and Race/Ethnicity/Citizenship, 2007



Postsecondary Attainment

- There is a strong connection between increasing educational attainment in the United States and the global leadership of our economy.
- Calls—from *the College Board, the Lumina and Gates Foundations, and the Administration*—to increase the postsecondary completion rate from 39 to 55 or 60 percent.
- The challenge is greatest for underrepresented minorities:
 - In 2006 only 26 percent of African Americans, 18 percent of American Indians, and 16 percent of Hispanics in the 25-29-year old cohort had attained at least an associate degree.

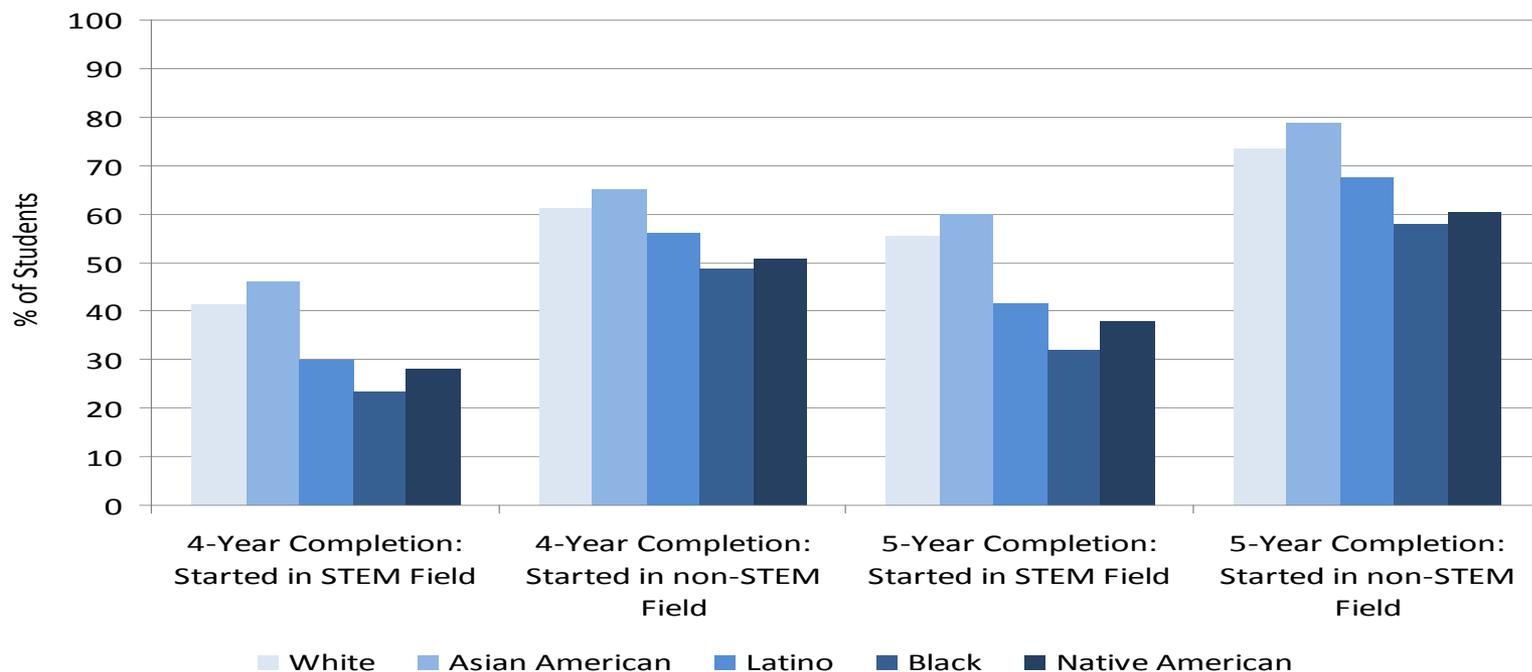
News is Worse for STEM

- In 2000, the U.S. ranked 20th in the percent of 24-year olds who had earned a first degree in **NS&E**.
- *Gathering Storm* recommended increasing the U.S. percentage from 6% to at least 10%.
- Underrepresented minorities would need to triple, quadruple, or even quintuple their proportions in order to achieve this 10 percent goal.
- 24-year olds with a first university degree in NS&E
 - 2.7 percent of African Americans
 - 3.3 percent of Native Americans /Alaska Natives
 - 2.2 percent of Hispanics and Latinos

Why?

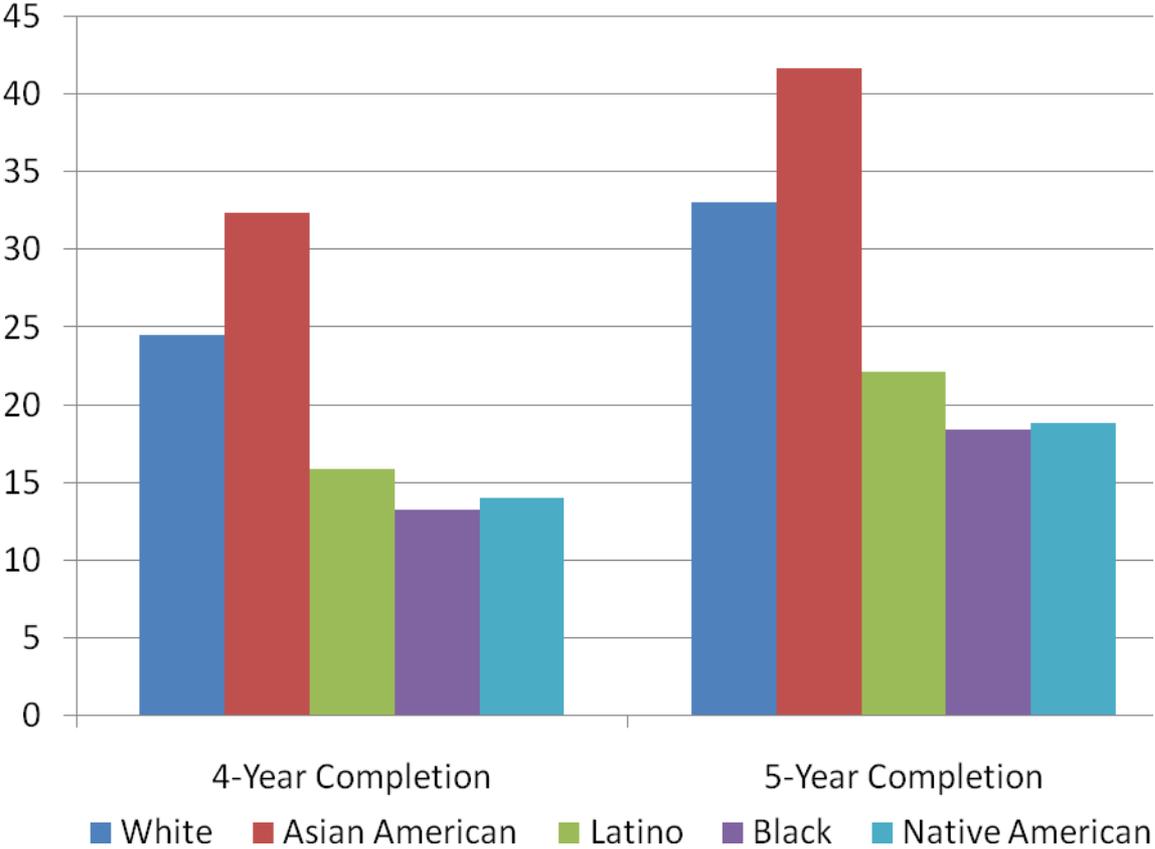
- Underrepresented minorities **aspire** to major in STEM in college at the same rates as their white and Asian American peers, and have done so since the late 1980s.
- Yet, they have lower four- and five-year undergraduate STEM **completion rates** relative to those of whites and Asian Americans.
- *That a similar picture was previously seen in data in the mid-1990s, signals that while we have been aware of these problems for some time, we as a nation have made little collective progress in addressing them.*

Four- and Five-Year Completion Rates of 2004 Freshmen, by Initial Major Aspiration and Race/Ethnicity



SOURCE: University of California Los Angeles Higher Education Research Institute

Percentage of 2004 STEM Aspirants Who Completed STEM Degrees in Four and Five Years, by Race/Ethnicity



SOURCE: University of California Los Angeles Higher Education Research Institute

Fixing the Problem

- Preparation, access, motivation, financial assistance, academic support, and social integration provide URM students the means for obtaining the ingredients for success in STEM
 - the acquisition of knowledge, skills, and habits of mind
 - opportunities to put these into practice
 - a developing sense of competence and progress
 - motivation for and a sense of belonging to the field
 - information about stages, requirements, and opportunities
- ***These ingredients require attention at every stage along the STEM educational continuum.***

Access and Motivation

- Improve college awareness activities for prospective college students.
- Focus on college admissions policies that support matriculation of qualified underrepresented minorities.
- Raise awareness of STEM careers through K-12 activities, improved counseling for science and mathematics, and activities that promote STEM.
- Promote STEM outreach that specifically targets underrepresented minorities.

Affordability

- College affordability is an issue for all students, especially as tuition rises above the inflation rate.
- Financial support that meets student need is strongly correlated with student attendance and persistence, in general and in STEM.
- It is most effective in reducing attrition among low-income and minority students in STEM when provided in conjunction with academic support and campus integration programs.

Academic Support and Social Integration

- The institutional transformation needed to provide these must be based on:
 - Strong leadership from trustees and regents, the president, provost, deans, and department chairs
 - A campus-wide commitment to inclusiveness
 - A deliberate process of self-appraisal focused on campus climate
 - Development of a plan to implement constructive change
 - Thoughtful program development
 - Ongoing evaluation of implementation efforts

Moving Beyond the Crossroads

- Our proposal for “moving beyond the crossroads” includes a discussion of:
 - Guiding Principles to Frame National Policy
 - Institutional Roles
 - The Importance of Leadership
 - Program Development and Characteristics

Policy Principles

1. The problem is urgent and will continue to be for the foreseeable future.
2. A successful national effort to address underrepresented minority participation and success in STEM will be sustained.

Policy Principles

3. The potential for losing students along all segments of the pathway from pre-school through graduate school necessitates a comprehensive approach that focuses on all segments of the pathway, all stakeholders, and the potential of all programs, targeted or non-targeted.
4. Students who have not had the same level of exposure to STEM and to postsecondary education require more intensive efforts at each level to provide adequate preparation, financial support, mentoring, social integration, and professional development.

Policy Principles

4. A coordinated approach to existing federal STEM programs can leverage resources while supporting programs targeting institutions (esp. MSIs) with demonstrated success in preparing and advancing URM_s in STEM.
5. Evaluation of STEM programs and increased research on the many dimensions of underrepresented minorities' experience in STEM help insure that programs are well informed, well designed, and successful.

Institutional Roles

- **Predominantly-White Institutions:** The best way to increase the **retention** of underrepresented minorities in STEM is to replicate programs of the successful PWIs at a **very large number** of similar institutions, especially large state flagships.
- **Minority-Serving Institutions:** MSIs have a legacy of recruiting, retaining, and graduating a disproportionate number of minorities, especially at the undergraduate level. With additional support, MSIs can expand their effectiveness in recruiting, retaining, and graduating an increased number of minorities, especially at the baccalaureate level.
- **Community Colleges:** To facilitate and increase the successful transfer of underrepresented minorities in STEM to four-year institutions, an increased emphasis on and support for articulation agreements, summer bridge programs, mentoring, academic and career counseling, peer support, and undergraduate research at two-year institutions is recommended.

Leadership

Leadership is key to the successful transformation of institutions and development of sustainable programs.

- **Sectoral Leadership:** Leadership in articulating minority success as an institutional goal is essential for all stakeholders.
- **Institutional Leadership:** The academic leadership—regents, trustees, presidents, provosts, deans, and department chairs—should articulate minority participation as a key commitment to set a tone that raises awareness and effort.
- **Programmatic Leadership:** A champion at the program level is typically critical to the success.

Recommendations and Implementation Actions

Preparation

- **1. Pre-School through Grade 3 Education:** *Develop reading readiness, provide early mathematics skills, and introduce concepts of creativity and discovery.*

Implementation Actions (excerpts):

- Federal: Fully fund Head Start and pre-k programs.
- States: Align early childhood programs with public school curriculum and quality standards
- Local School Districts: Align pre-school curricula with learning expectations through third grade.

Recommendations and Implementation Actions

- **2. K to 12 Mathematics and Science:** *Vastly improve K-12 mathematics and science education for URM.*

Implementation Actions (excerpts):

- **Federal:** Require equitable state and district budgeting practices; improve early intervention programs such as TRIO and Upward Bound Math-Science program
- **States:** Adopt evidence-based curriculum standards across subject areas to ensure college readiness.
- **Local School Districts:** Develop and provide quality math and science curricula.
- **Non-Profits:** Pioneer innovative program approaches.

Recommendations and Implementation Actions

- **3. K-12 Teacher Preparation and Retention:**
Improve the preparedness of K-12 mathematics and science teachers.

Implementation Actions (excerpts):

- **Federal:** Provide incentives for the recruitment, retention, and professional development of math and science teachers who teach minority teachers.
- **States:** Coordinate STEM teacher training programs that recruit, prepare, and place qualified teachers in high need schools proportionately to all other schools.
- **Institutions:** Increase the pool of well-qualified K-12 math and science teachers who are prepared to teach diverse students.

Recommendations and Implementation Actions

Postsecondary Success

- 4. Access and Motivation: *Improve access to postsecondary education and technical training and increase URM student awareness of and motivation for STEM education and careers.*

Implementation Actions (excerpts):

- Federal: Ensure that outreach programs linking institutions and K-12 emphasize improving math and science awareness for underrepresented minority students.
- Employers: Provide STEM career awareness and role models.
- Institutions: Engage in outreach and recruitment activities to help cultivate students who may aspire to enroll in these institutions.

Recommendations and Implementation Actions

- 5. Affordability: *Provide adequate financial support to URM undergraduate and graduate students.*

Implementation Actions (excerpts):

- Federal: Provide need-based as well as other financial support; increase funding for undergraduate and graduate STEM programs targeting URM students.
- States: Fully support higher education generally.
- Non-Profits: Support programs that employ innovative approaches or target specific niches in STEM education for URMs.
- Institutions: Provide need-based as well as merit-based financial assistance to URM students.

Recommendations and Implementation Actions

- 6. Academic and Social Support: *Transform the nation's higher education institutions to increase inclusiveness and college completion and success in STEM for URM students.*

Implementation Actions (excerpts):

- Federal: Increase funding for infrastructure, research, curriculum development, and professional development at MSIs; create an ADVANCE type program for URM students.
- Institutions: Articulate an institutional commitment to inclusiveness; diversify the faculty; replicate practices of institutions with demonstrated success in producing URM students in STEM.
- Professional Associations: Communicate the importance of broadening participation to members, the public, and policy makers.
- Industry and Federal Labs: Provide structured incentives and programs to ensure sustained impact; expand partnerships with institutions that enroll large numbers of URM students in STEM.

Priority 1

Undergraduate Retention and Completion

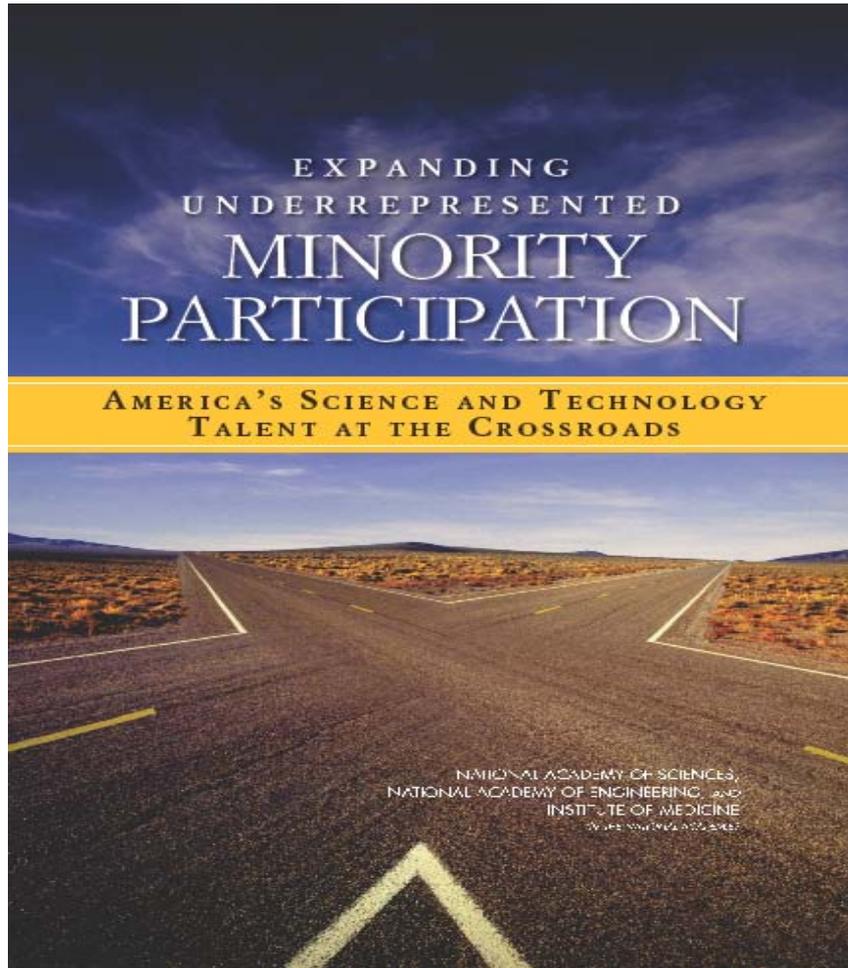
- We propose, as a near-term focus for increasing the participation and success of underrepresented minorities in STEM, programs that increase undergraduate completion through strong academic, social, and financial support.
- Financial support for underrepresented minorities that allows them to focus on and succeed in STEM will increase completion and better prepare them for the path ahead.
- This financial assistance should be provided through higher education institutions along with programs that simultaneously integrate academic, social, and professional development.

Priority 2

Teacher Preparation, College Preparatory Programs, and Transitions to Graduate Study

- We propose an emphasis on teacher preparation and secondary school programs that support preparation for college STEM education.
- We encourage programs that facilitate the transition from undergraduate to graduate education and provide support in graduate programs.

Final Thoughts



- The report is relevant and timely.
- The report expands the previous knowledge concerning STEM education and workforce development.
- This is a transformative moment for the nation to seize so that we do not fail future generations.

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