

Report of the NSF Broadening Participation Subcommittee

Gregory N. Washington, Ph.D.

Interim Dean,

NSF Dir. Of Engineering Advisory Committee

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Goals of the Report

- To review the recommendations made by the Engineering Diversity Working Group
- To add additional recommendations in areas that make sense
- To prioritize the full slate of recommendations into three categories: Essential, Important and Helpful

The Problem



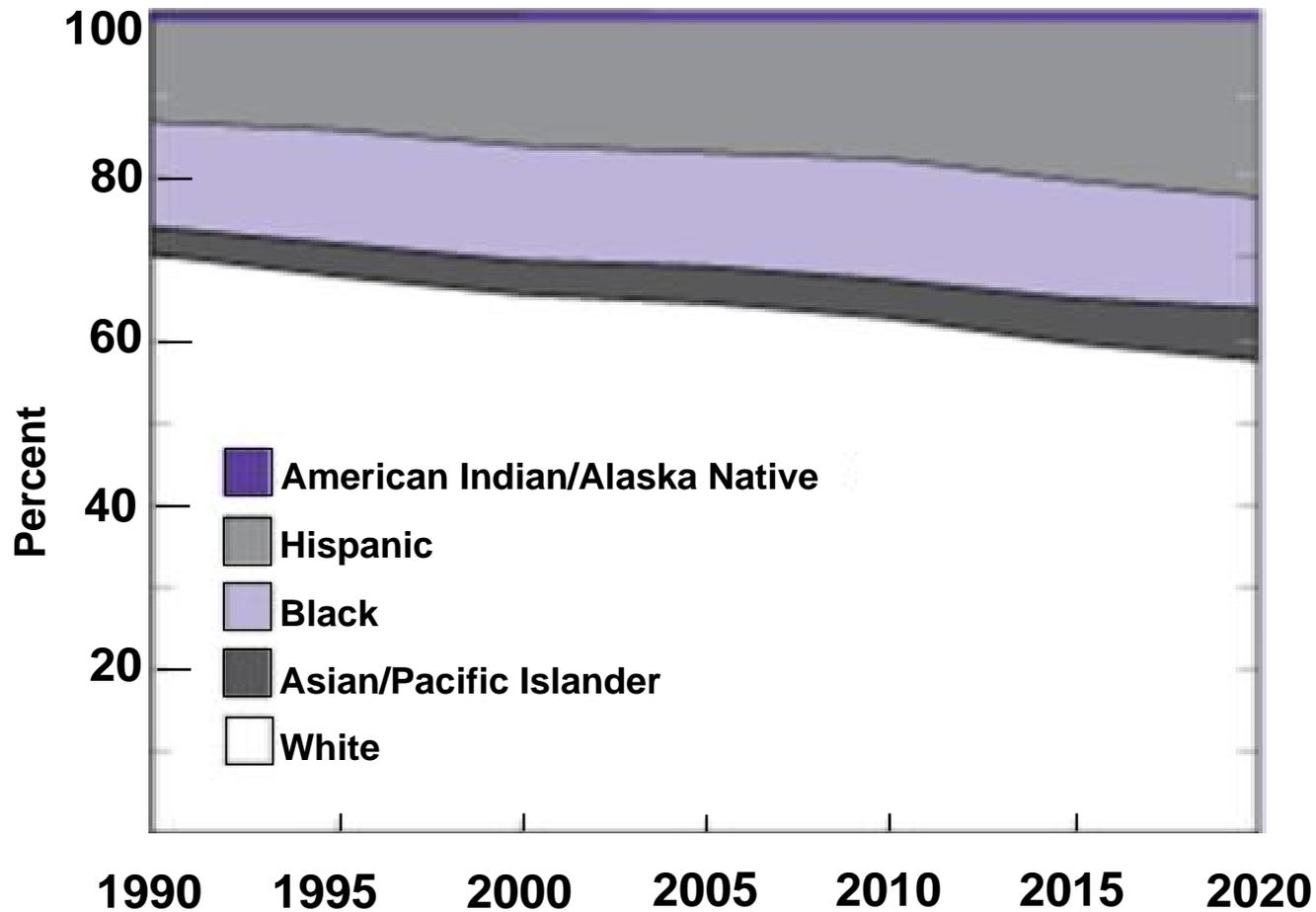
Demographic Issues



| | 1985 | 1995 | 2005 |
|-----------------------------------|---------------|---------------|---------------|
| BS Eng (Degrees) | 70,000 | 64,000 | 66,000 |
| US Enrollment (All fields) | 12.3M | 15.6M | 17.3 M |
| Eng Intention (Freshmen) | 11% | 8.1% | 8% |
| African American | 9.6% | 8.6% | 7.2% |
| Hispanic | 12.6% | 11.2% | 6.4% |
| Asian | 23.9% | 13.3% | 15.0% |

After 2011 the eligible cohort starts to decrease

U.S. College-age Cohort

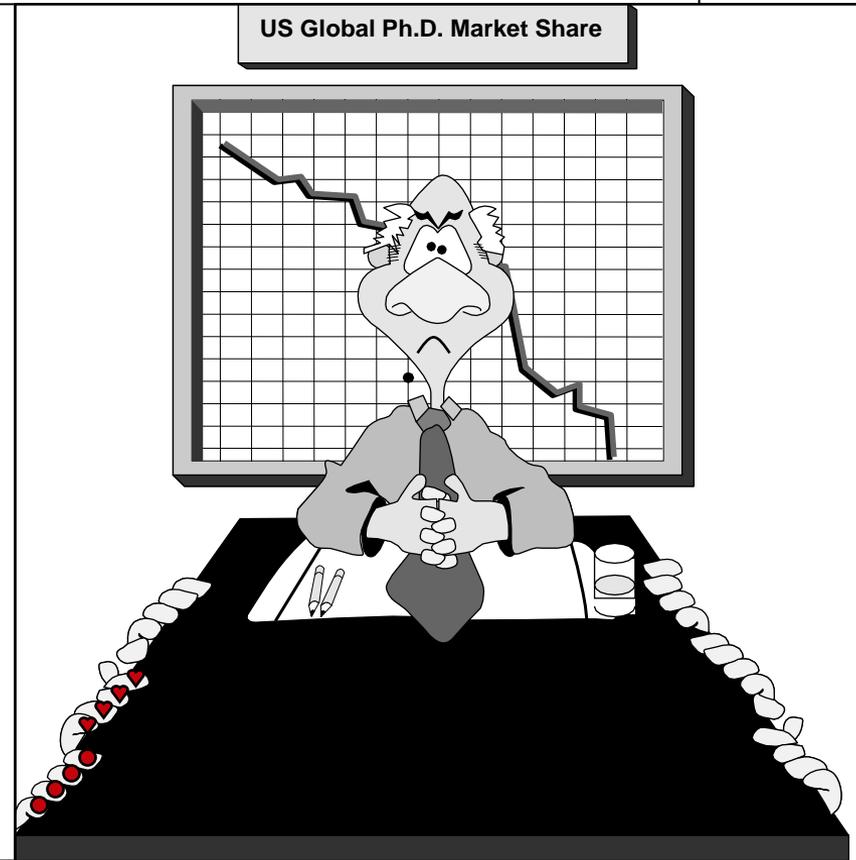


Sources: U.S. Census Bureau, Population Division, 1990 Census; Population Projections Program. Projections of the Resident Population by Age, Sex, Race, and Hispanic Origin: 1999–2100 (2000).

In Summary



- African-Americans and Hispanic-Americans make up about 24% of the population but combined make up less than 8% of the Ph.D. graduates
- Women make up about 51% of the population but produce less than 30% of the Ph.D. degrees
- The U.S. is losing “market share” globally in the production of Science and Engineering (S&E) degrees
- The fastest growing segment of the U.S. population (Hispanic) is an underrepresented segment in S&E
- International students, who have been the life blood of S&E graduate programs, are no longer opting to come to the U.S., at historical rates, due to more attractive options elsewhere



Changes must be put in place now so that we can ensure US dominance in the future

ENG Diversity Goals



- Engineering Diversity Working Group (EDWG)
 - Representatives from all ENG divisions.
 - Developed a plan for broadening participation in ENG.
 - These recommended initiatives and programs focus on all members of the engineering academic community, from K–20 to faculty.
- Engineering Diversity Goals
 - Excellence *through* diversity.
 - To enable the integration and success of a diverse engineering workforce, both inside and outside NSF.
 - ***To make the demographics of engineering disciplines representative of the US census.***

Broadening Participation Recommendations



Recommendations – General



- Recommendation 1: Broaden participation in NSF activities by increasing the diversity of scientists and other STEM experts who provide merit review for NSF proposals, either as *ad hoc* reviewers or as panelists.
- Recommendation 2: Provide training for staff throughout the Foundation on NSF priorities and mechanisms for broadening participation and workforce development, effective outreach efforts, reviewer selection, and avoiding implicit bias in the review process and program management.
- Recommendation 3: Clearly communicate broadening participation and workforce development guidance and best practices within the Foundation and throughout the STEM community. Establish two websites, one for the general public, and one internal to NSF to facilitate broad dissemination and consultation.

Recommendations – General



- Recommendation 4: Enhance the accountability and tracking of NSF-supported broadening participation efforts by requiring PIs to report outcomes of broadening participation activities as part of the reporting process for grant support. Establish Foundation-wide reference codes for all broadening participation funding activities. Incorporate broadening participation efforts as a performance indicator in NSF Program Officer performance plans.
- Recommendation 5: Maintain and regularly update the NSF portfolio of broadening participation programs to facilitate Foundation-wide coordination of efforts to more actively engage all people, from all types of institutions, and all regions of the nation in the science and engineering enterprise.
- Recommendation 6: Conduct external, third-party evaluations of the programs within the NSF broadening participation portfolio to determine effectiveness and impact.

Recommendations – K through Postdoc



- Essential

- K–12:
 - Expand the [Research Experiences for Teachers \(RET\)](#) program significantly and maintain overall success in broadening participation.
 - Develop Best Practices regarding RETs and make this information easily accessible for faculty (e.g. consider creative partnerships between Colleges of Engineering and Education).
 - Programs that build awareness of engineering in communities with high populations of under-represented groups should be especially encouraged and supported.
- Undergraduate:
 - Expand the [Research Experiences for Undergraduates \(REU\)](#) program to **include** a broadening participation theme.
 - Replication of programs that are working well in this space nationally. Meyerhoff (UMBC), LA-STEM (LSU)
 - NSF should partner with universities to promote curriculum reform in engineering at the undergraduate level. Curriculum Reform is **STILL** needed

Recommendations – K through Postdoc



- Essential

- Graduate:
 - Develop a broadening participation graduate award that is portable—similar to the [Graduate Research Fellowship Program](#)—and encompasses all ENG divisions.
 - Support Diaspora programs where students (english proficient) from Hispanic, African and Caribbean speaking countries are given support and used to help build numbers of US underrepresented groups
 - GRS should be coupled with LSAMP to provide minority students a clear pathway to the Ph.D.
- Post-doctoral research:
 - Develop a portable research initiation grant to broaden participation of post-docs in ENG.

Recommendations – Faculty



- Faculty:
 - Expand the BRIGE to provide funding for a faculty mentor.
 - Initiate a career advancement award to broaden participation of senior faculty (> 3 years in academe) and complement the BRIGE program.
 - Promote technical collaboration with international scholars, hold periodic international workshops for U.S. women and underrepresented ENG faculty and grad students to promote international exchanges.
 - Promote collaboration between minority-serving institutions and R1s through expanded research-oriented workshops at minority-serving institutions.

Important and Helpful Recommendations



Recommendations – General



- Innovations for a Competitive America (a set aside of \$10M - \$20M) for high risk, high reward projects aimed at broader impact.
- Faculty in general can't do Outreach! NSF should sponsor training workshops featuring programs and researchers who have successful programs.
- NSF needs to hold universities accountable. Universities need to develop and implement best practices such that resources are distributed based on a merit system, as well as developing effective mentoring for students and faculty.
- BP should be incorporated in the scoring of ENG proposals. One way to codify BP in proposals is to specifically ask what has the PI done previously to BP and has it been successful?
- NSF should treat BP programs with the same intellectual rigor that it treats its core programs. For emerging technical areas, NSF brings in people to announce its interest so the community understands it and can respond to solicitations. NSF should do the same with BP.

Recommendations – K through Postdoc



- K–12:
 - In addition to a research experience, many K-12 teachers are seeking more sophisticated help e.g. exposure to new teaching methods, applets and hands-on learning materials. Provide access to materials, kits, and supplies based on RET programs that work.
- Undergraduate:
 - In the case of partnering with engineering societies, NSF might also consider sponsoring the engineering societies to innovate on successful programs in Physics and Chemistry that help departments optimize their environments so that they are attractive to a diverse group of students.
- Graduate and Post Doc
 - NSF should consider working with universities to support parental leave for graduate students and postdocs.



Recommendations – Faculty

- NSF should encourage the creation of positions that might be termed associate deans for career equity. These positions could serve to
 - Develop Best Practice procedures to assure career advancement, over the entire arc of a career, based on merit and accomplishment.
 - Eliminate situations where women and under-represented minorities are cumulatively left behind in salary, resources, lab space or other aspects of career advancement.
 - Ensure equitable workload, ensure credit for outreach, effective broadening participation!!!
 - Ensure attractive role models for graduate and undergraduate students.
 - Monitor recruiting and retention of faculty - demographics and \$\$\$\$
 - NSF could stimulate the effectiveness of such positions by providing support for comparative research across institutions, and by requiring these data as part of large infrastructure or center grants.
- NSF could consider grants for what might be termed “re-entry” faculty, i.e., those who needed to take some time off for family reasons but wish to relaunch or resume an activity research and teaching career.
- NSF should make parental leave the default option on the birth of a child, eliminating the need to request such a leave



Metrics for Success

- The goals here should be to refresh weak or non-performing programs with those that are strong.
- Towards that end 10% of the budget for the programs should be substituted
- Metrics for success
 - On recommendations 1-6, the key metric is when the recommendation has been implemented and how long did it take to happen.

Metrics – K through Postdoc

- Essential



- K–12:
 - Quantify the growth and expansion of the RET and REU programs.
 - Have Best practices been developed and attached to the website?
 - How many new programs for high concentration underrepresented groups have been developed? How successful are these programs
 - Increase of student interest in engineering
 - Increase in key entry metrics: Number of students taking college prep math and science courses. Increase in HS test scores
- Undergraduate:
 - How many new programs built on key programs have been implemented? Meyerhoff (UMBC), LA-STEM (LSU)
 - Has a new curriculum reform program been implemented?

Metrics – K through Postdoc - Faculty - Essential



- Graduate:
 - Was a broadening participation graduate award that is portable—similar to the [Graduate Research Fellowship Program](#) implemented
 - Number of students supported
 - Number of students who pursue faculty positions after award
 - # of Diasopora programs supported. Increase in domestic graduate students as a results
- Post-doctoral research:
 - Has a portable research initiation grant to broaden participation of post-docs in ENG been developed?
 - Increase in the # of post-docs
 - Increase in the # of post-docs that become faculty

Metrics – Faculty



- Faculty:
 - Has the BRIDGE program been expanded?
 - Increase in rate of faculty obtaining tenure
 - Increase in rate of faculty getting promoted to Professor
 - Increase in the # of technical collaborations with international scholars,
 - The # of periodic international workshops for U.S. women and underrepresented ENG faculty and grad students to promote international exchanges.
 - Conduct at least one research-oriented workshop at minority-serving institutions and R1s
 - Measure the number of increased collaborations after these exchanges