The Science of Broadening Participation at NSF

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The Urgency of Broadening Participation

THE PROBLEM: Minorities and women are under-represented in the number of STEM graduates and in the STEM workforce
Major Reports Document the Problem

Not just NSF that is interested in this question
Many other organizations/entities also invested
NAS Crossroads report (2010)
Others
NIH: “Committee on Underrepresented Groups and the Expansion of the Science and Engineering Workforce Pipeline” (2011)
Committee on Equal Opportunities in Science and Engineering (CEOSE)
Society of Women Engineers: “Diversity and Inclusion Fuels Innovation in STEM” (2014)
Institute for Broadening Participation: “Building Partnerships to Support Diversity in STEM”
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The “Crossroads” report from the National Academy of Sciences (2010)

U.S. faces urgent need to expand participation in STEM fields. Non U.S. citizens and international students account for large numbers of STEM doctorates and employees. Stricter visa requirements and increasingly competitive opportunities in countries of origin make U.S. reliance on this pool uncertain. URM = just over 9% of STEM employees. U.S. needs to target programs to increase URGs in STEM.
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Major Conclusions across Projects and Reports

Under-representation of historically under-represented groups is a critical problem for US competitiveness.

The diversity of American higher education institutions is a competitive advantage.

There is a pervasive culture of attrition as related to URGs in the STEM disciplines.

Interventions are necessary at every point of the pipeline.

Continuous program evaluation is essential.
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Broadening Participation is Important;

1. How do we do it?
2. What types of programs/interventions work?
3. Why are some interventions not working?

Research on the Science of Broadening Participation attempts to answer these questions.
Broadening Participation is Important;

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1. HOW do we do it?
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Research on the Science of Broadening Participation attempts to answer these questions.
What is the Science of Broadening Participation?

Research focused on understanding the factors that impact participation of underrepresented individuals in STEM education and careers.

Institutional and organizational factors
Cultural, psychological, social, demographic and community factors
Economic and policy-related factors

Provides scientific evidence that STEM educators, employers, and policy makers need to make informed decisions and design effective programs and interventions.
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What does the SBP look like?

Informed by and building onto existing social and behavioral science theories methodologically rigorous incorporating research that employs a variety of empirical approaches and methods.

SBP examines all levels of analysis, including the individual, group and society.

Potentially transformative (i.e., disrupt existing paradigms)
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- Engineering training settings prove hostile for LGB students
Empirical evidence suggests that some interventions can work

Mentorship can be an effective intervention against Stereotype Threat

Evidence suggests that faculty mentors can help decouple the experience of failure with threats to belong in a scientific community

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Diversity training does not lead to greater diversity in senior management (Dover, Major & Kaiser, 2014; Dobbin, et al., 2010).
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SBP at NSF

- SBP is at the intersection of the SBE and education research fields and can inform NSF program design and policies as well as other stakeholders outside the Foundation, including other federal agencies.
SBP in SBE

Five Dear Colleague Letters have been released on Stimulating Research Related to the Science of Broadening Participation

- FY11 & FY12 - SBE only
- FY13, FY14 & FY15 - Joint SBE-EHR DCLs

DCL emphasizes:
- The importance of SBP research
- Examples of SBP research questions
- Identifies SBE & EHR programs for SBP submissions
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SBE “Matching Funds” Competition

- SBE has provided matching funds to support SBP research, up to 50% of the award amount, since FY11.
  - FY11: ~$350,000; 4 projects
  - FY12: ~$900,000; 10 projects, 1 supplement
  - FY13: $1 million; 11 projects, 1 supplement
  - FY14: $1 million; 13 projects
  - FY15: $1.5 million; currently accepting project nominations
  - FY16: $1.5 million requested
Programs that Have Received Matching Funds

- **SES**
  - Decision, Risk & Management Sciences
  - Economics
  - Law & Social Sciences
  - Political Science
  - Science of Science & Innovation Policy
  - Science, Technology & Society
  - Sociology

- **BCS**
  - Cognitive Neuroscience
  - Cultural Anthropology
  - Developmental & Learning Sciences
  - Documenting Endangered Languages
  - Social Psychology

- **SMA**
  - Interdisciplinary Behavioral & Social Sciences (IBSS)
Examples of SBE Awards Receiving Matching Funds

- Chad Forbes (University of Delaware): A Biopsychosocial Model of Women's Departure from STEM Fields (DRMS & Cognitive Neuroscience)
- Henry Sauermann (Georgia Institute of Technology): The Initial Career Transitions of Science & Engineering PhDs (SciSIP)
- Monica Biernat (University of Kansas): Race and Gender Stereotyping in Evaluative Language (Social Psych)
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Emerging Findings from SBE Matching Funds Research

- Does post-test stereotype activation affect beliefs about math performance?

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- Increased accessibility of post-test stereotypes among underrepresented participants → Increased certainty of poor performance

<table>
<thead>
<tr>
<th>Decreased confidence in abilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower expectations for future performance</td>
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<tr>
<td>Less interest in STEM-relevant career pursuits</td>
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What contributes to women’s under-representation at all levels of elective office?

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- Create a SBE Broadening Participation website: resource for PIs, students, and scientific communities
Foundation-Wide Broadening Participation Working Group

Formed in 2014, one representative from each directorate
Working Group produced a response to the CEOSE report, requesting
NSF launch a “bold new initiative” for BP
Developed a Framework for Action for Broadening Participation
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Inclusion across the Nation of Communities of Learners that have been Underrepresented for Diversity in Engineering and Science

New Foundation-wide BP initiative for FY16; SBE contributing $500,000

Goal: fund new research, models, and partnerships that leads to transformative progress in broadening participation

Workshop to promote solutions to BP challenges
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1. Networks for STEM Excellence: centers/institutes/partnerships that build on effective strategies to achieve transformative scale

2. Empowering All Youth for STEM: invite research proposals to engage young people directly in STEM learning opportunities

3. Expansion/Re-Framing of Directorate-Based BP Efforts: coordination across the Foundation for maximum impact
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Questions, Comments, & Discussion
with Dr. Nilanjana Dasgupta