



**A Research Agenda for the
Science of Broadening Participation:
STEM Employment of Individuals with Disabilities**

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National Academies SciSIP Workshop, January 8, 2018

NSF Grants 1732243* & 1732137†

Context: Importance of Problem

- **Individuals with disabilities** represent a generally **under-studied group** in STEM workforce research.
- Employer focused research on workforce participation of STEM trained individuals with disabilities is thin and focused on larger enterprises and government contractors. **SMEs are not well studied.**

Summary

- **Gaps exist in available knowledge** and information needed to develop a set of effective policies affecting the participation of individuals with disabilities in the STEM workforce.
- **Strategies** are suggested for further exploration and engagement regarding critically needed advancement and research in areas dealing with awareness, outreach, and **professional networks of practice for increasing participation** of individuals with disabilities in STEM occupations.
- **A combined supply and demand focus is needed** to better leverage resources and determine capabilities within different sectors to support and promote responsive, rigorous, and relevant workforce education and training for a viable and inclusive STEM workforce.

The Science of Broadening Participation (SoBP) in STEM

BACKGROUND

Why Broaden Participation?

- **Equity concern:** Policies can produce and reproduce power inequities and inequalities (often in unconscious ways).
- **Efficiency concern:** Homogenous thought can often exclude more efficient and effective methodologies; increased productivity can result from using underutilized human capital.

CEOSE's Recommendation

2011-2012 Biennial Report

“NSF should implement a bold new initiative, focused on broadening participation of underrepresented groups in STEM, similar in concept and scale to NSF’s centers, that emphasizes institutional transformation and system change; collects and makes accessible longitudinal data; defines clear benchmarks for success; supports the translation, replication and expansion of successful broadening participation efforts; and provides significant financial support to individuals who represent the very broadened participation that we seek.”

SoBP Research Agenda

Frameworks

- Curated knowledge from various areas of study related to understanding and assessing underrepresentation in STEM fields.

Education

- Curated knowledge from various areas of study assessing educational attainment, contextualizing educational access, opportunities, and outcomes, and identifying critical causes of underrepresentation in STEM fields.

Measures

- Curated data, metrics and statistics from various areas of study related to assessing underrepresentation in STEM fields.

Workforce

- Curated knowledge from various areas of study for identifying workforce dimensions and dynamics, contextualizing occupational access, opportunities, and outcomes, and investigating recruitment, retention network inadequacies leading to underrepresentation in the STEM workforce.

(Source: Fealing & McNeely, 2016; NSF Awards 1551904 & 1551880)

Project Focus and Frame

- Review and assessment of key issues affecting **employment of STEM trained individuals with disabilities**, especially related to the demand (employer) side.
- Explore **Barriers and opportunities** for increasing employment and occupational engagement in the STEM workforce for individuals with disabilities (and Veterans).

Aspects of Disabilities

Serious difficulties in one or more of the following areas of functioning:

- Sensory
- Physical
- Mental
- Self-care
- Go-outside-home
- Employment

➤ **Some disabilities are not** visible or may be imperceptible to anyone other than the individual with disabilities.

Additional focus: Military Veterans

- An associated group of underrepresented individuals include **military veterans** with STEM training (e.g. practical forms), and have not been significantly considered in research, especially those veterans with service connected disabilities.
- The unemployment rate for Gulf War-era II (Post 9/11) veterans, is higher than that of the civilian population (BLS, 2014)
- Veterans show a propensity for self-employment opportunities, additionally, with 7.3 percent of veteran owned business owners reporting service connected disabilities (Sobota, 2017).
- Understanding characteristics of veteran owned small businesses may provide insight on barriers to employment and ways their STEM education and skills can be useful to developing social networks and communities of practice.

Military Veterans II

- Some literature exists on postsecondary educational preparation as a tool to increase participation, less is known on effective tools for engagement or social/innovation networks as a strategy (Groah, et al. 2017; Jenson et al. 2018).
- Awareness by HR professionals is a problem not only as to capacity of veterans to work; but also veterans lack awareness of non-traditional (e.g. start-ups) options for participation (Stone, 2016).
- Existing programs may be poorly targeted based on mismatch between veterans needs and policy incentives (Gade, 2013); bottom-up policy designed based on observatories can address this.
- **The proposed PIIN offers to potential to bring together STEM trained veterans** with other, entrepreneurial individuals with disabilities increasing knowledge diffusion between groups.

The Task and Challenges

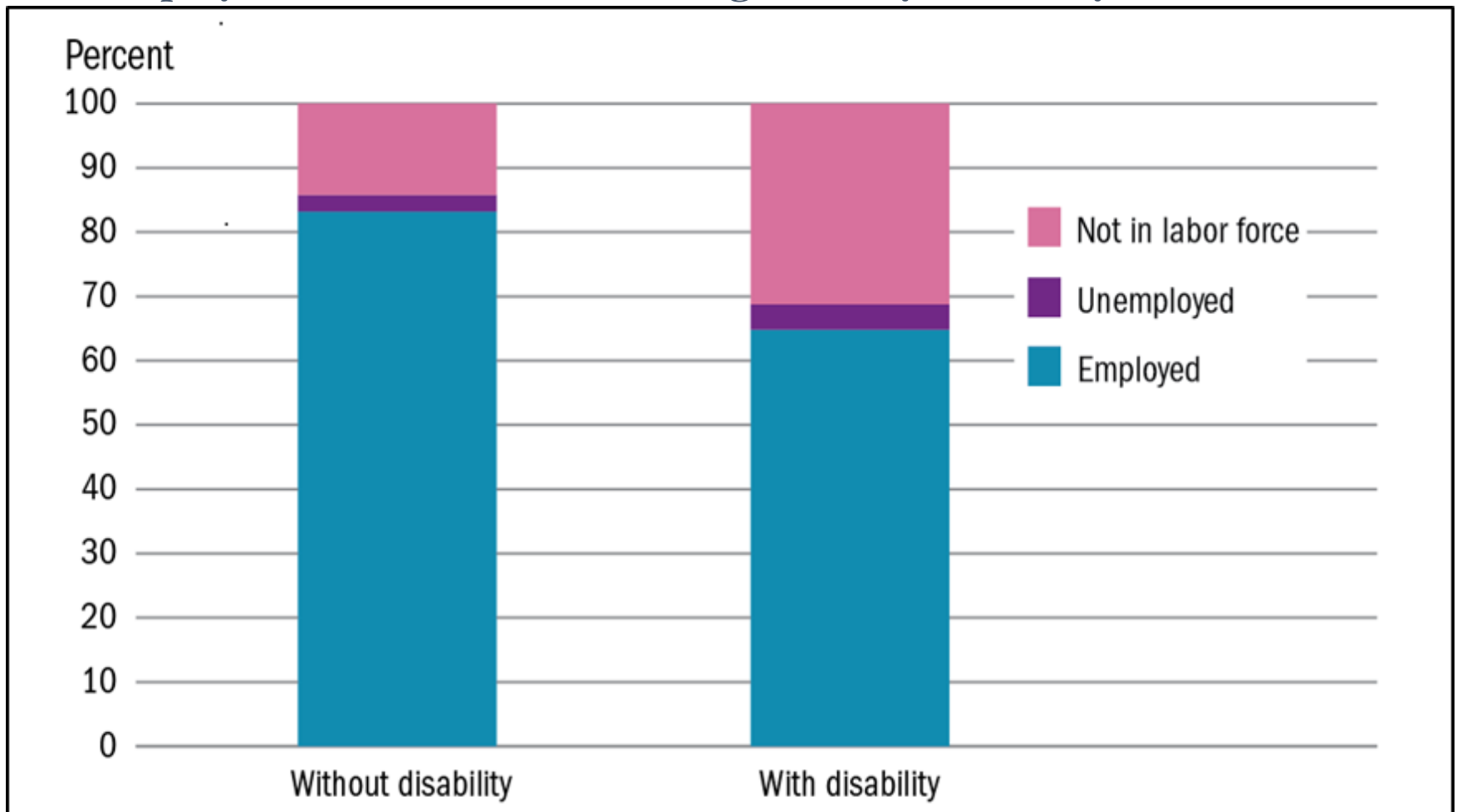
INDICATORS OF THE PROBLEM

Specific Focus on People with Disabilities

- **1 in 5 people** in the U.S. have a disability
- **Unemployment** among individuals with disabilities is **2X** that of the overall population
- **Labor force participation rate is 17.9%** for individuals with disabilities and 65.3% for general population
 - **despite** U.S. Department of Labor's Office of Disability Employment Policy, which states that many employers report **no costs or low costs associated with accommodating the needs of employees with disabilities.**

1 in 9 S&E workers <75 years old has a disability and is more likely to be unemployed than those without a disability

Employment of Scientists and Engineers by Disability Status, 2015



(Source: NSF 2017)

The Task

- We propose
 - ✓ a scientific approach
 - ✓ resting on an assembled body of knowledge
 - ✓ ready for use
 - ✓ to support **effective policy development**
 - ✓ **and implementation**
 - ✓ for broadening participation in STEM education
 - ✓ and the STEM workforce
 - ✓ with a special focus on veterans

Challenges

- **Demand-side obstacles**, even if supply-side approaches are successful
- **Scalability**
 - Regionally
 - Different sectors
 - Different organizational sizes
 - Different social and economic networks
 - Different institutional frameworks and cultures
- **Effective policy and political processes**
- **Effective incentives**

Need Hubs of Innovation

Communities of Practice & Networks

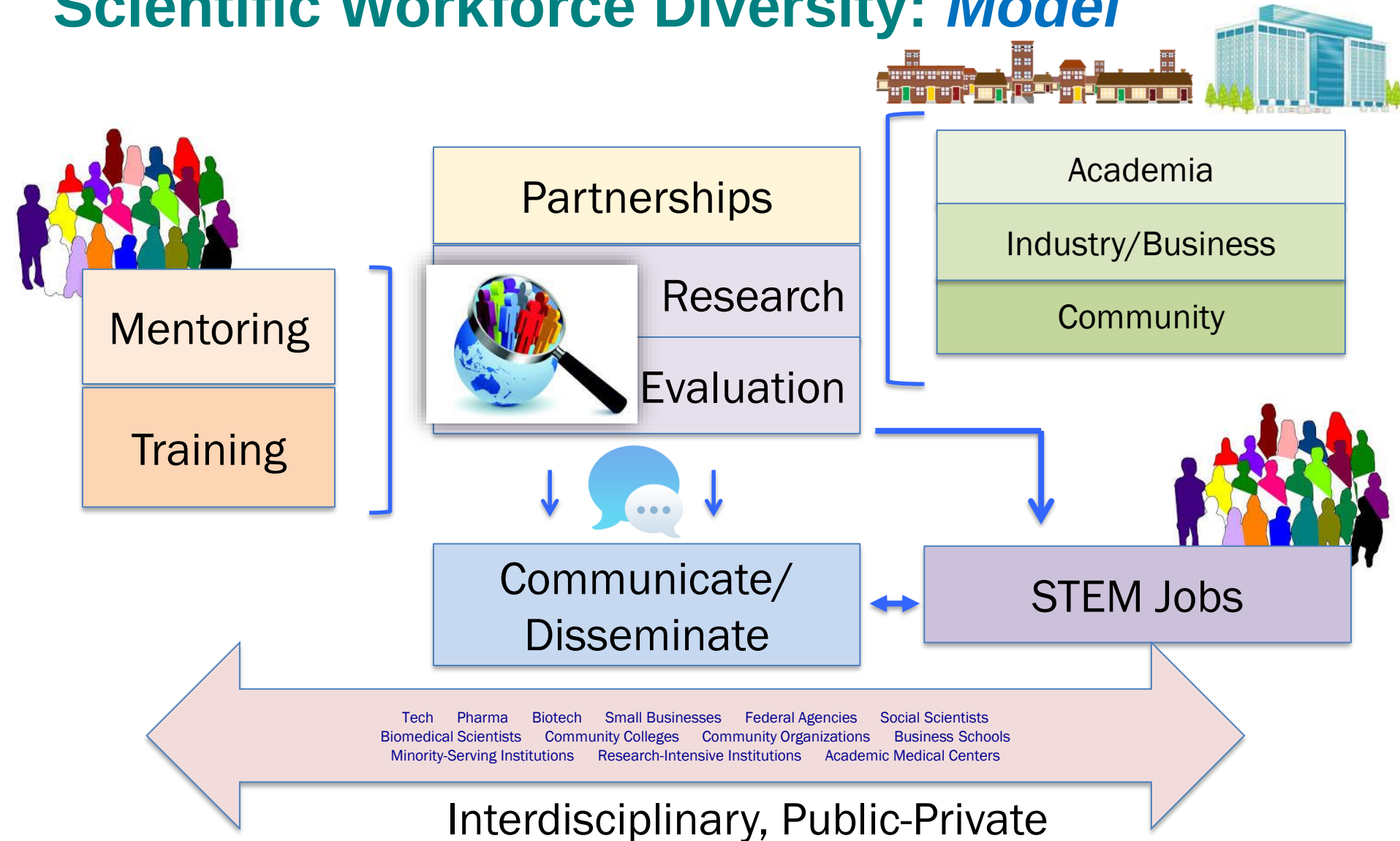
- Academia (educators, students)
- Government (federal, state, local)
- Industry
- Non-profits
- Labor organizations
- Civic organizations

Hubs of Innovation: A Systems Approach to Nationwide STEM Workforce Diversity

- Scarcity of STEM talent in science, health, and tech sectors
- Link-level attrition due to many factors:
 - Lack of awareness
 - Lack of resources
 - Sociocultural factors
 - Structural roadblocks
 - Choice
- Comprehensive, research-centric systems approach to STEM talent recruitment and retention
- Public-private partnership
- Shared decision-making

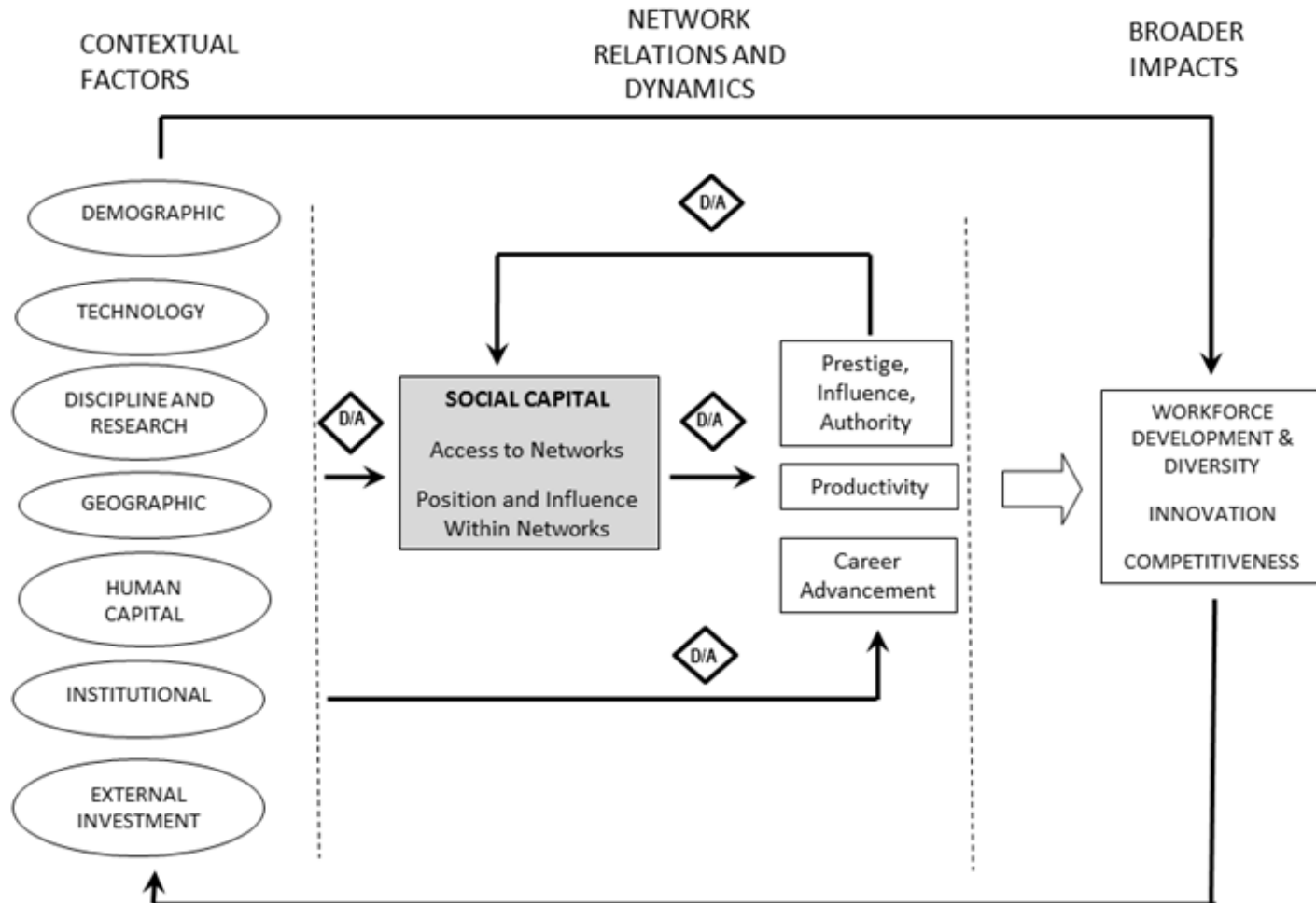
Deliverable: Diverse STEM talent pipeline for range of STEM jobs in science, health, and technology

NIH Hubs of Innovation and Research in Scientific Workforce Diversity: *Model*



Recommendations for Policies and Practice
NETWORKS, OBSERVATORIES, & TOOLKITS

Disability and Ableism (D/A) in Productivity and Workforce Development Processes



(Source: McNeely and Schintler, 2016, modified)

Network of Networks

A Professional Inclusive Innovation Network (PIIN)

➤ Bridges analytical gaps

- Regional nodes of innovation
- Observatories
- “Makerspaces”
- Adaptive design nodes
- Data hubs

Observatories

- **Bring industry and businesses together with STEM professionals with disabilities**, thereby increasing awareness of an under-recognized population, and increasing the awareness of young professionals in STEM fields of the array of possibilities for participation in related areas

Toolkits

- **Catalogue and leverage typical industry inclusive practices and approaches** that have been developed for business and that have deployment in related sectors
 - Tailor them for employers and other end-users
 - Further identify nodes and build PIINs that seek to bring together industry, successful practitioners, and target STEM populations
 - Consist of resources and tools for professional development and contacts, and operates in conjunction with observatory data collection and evaluation and monitoring activities

SoBP Conclusions and Directives

1. **Integrate multidisciplinary knowledge** related to understanding and assessing underrepresentation in STEM fields
2. **Enhance focus on empirical observations** (data, metrics, and statistics) related to assessing underrepresentation in STEM fields
3. **Curate knowledge** focused on educational preparation including assessment of educational attainment, contextualizing educational access, opportunities, and outcomes, and identification of critical causes of underrepresentation in STEM fields

SoBP Conclusions and Directives

4. **Expand research** targeted at identifying workforce dimensions and dynamics, contextualizing occupational access, opportunities, and outcomes, and investigating recruitment, retention, and network inadequacies leading to underrepresentation in the STEM workforce
5. **Conduct additional research** focused on the **economic impacts of inclusion** and non-inclusion in the workforce of STEM trained individuals with disabilities

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Thank You!

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