SHARED ACCOUNTABILITY AND HIGHER EDUCATION

A Compact Guide for

BROADENING PARTICIPATION IN STEM
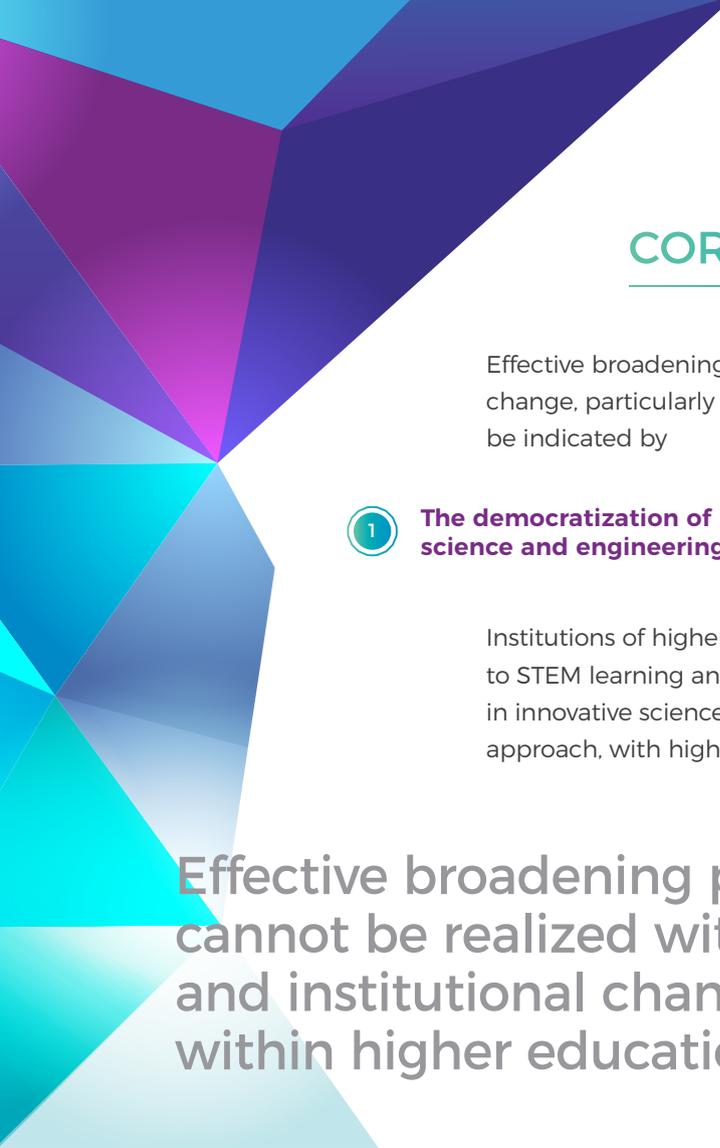
CORE CONCEPTS AND FINDINGS

Effective broadening participation cannot be realized without cultural and institutional change, particularly within higher education institutions. Such change will result in and be indicated by

1 **The democratization of science and engineering**

2 **an inclusive epistemology focused on implementation research**

3 **shared accountability for broadening participation.**

Institutions of higher education are invested in preparing students and faculty dedicated to STEM learning and producing societal benefits that flow from a workforce steeped in innovative science and engineering. This investment also requires a recursive, iterative approach, with higher education taking the lead and NSF helping to set the standard.

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BACKGROUND

Five years ago, the National Science Foundation was urged by CEOSE to implement "a bold new initiative, focused on broadening participation of underrepresented groups in STEM... 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" *(https://www.nsf.gov/od/oia/activities/ceose/reports/Full_2011-2012_CEOSE_Report_to_Congress_Final_03-04-2014.pdf)*.

The Committee on Equal Opportunities in Science and Engineering (CEOSE) is a Congressionally-mandated advisory committee to NSF. CEOSE advises the Foundation on policies and programs to encourage full participation by women, underrepresented minorities, and persons with disabilities within all levels of America's science, technology, engineering and mathematics [STEM] enterprise. Its biennial reports can be found at *https://www.nsf.gov/od/oia/activities/ceose/index.jsp*

Inspired by CEOSE, fifty STEM professionals joined in a field-based workshop and a follow-up meeting supported by NSF on developing an accountability system for broadening participation. This brochure is based on these two 2017 meeting-based reports.* From the workshop, there was agreement that the current approach to broadening participation must be reconfigured to recruit and nurture talent along many pathways, beginning in pre-Kindergarten (pre-K) and continuing into early careers. The follow-up meeting underscored the creation of STEM pathways as vital for STEM equity, and the critical role of higher education. Educational pathways are, of course, delineated long before college. **While higher education's central role in shaping schooling has long been recognized, its increasing commitment to preK-12 schooling is crucial to broadening participation now and in the future.**

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* CEOSE's 2015-2016 Biennial Report to Congress titled, *Accountability for Broadening Participation in STEM*, was informed by the field-based workshop and report. See *Better STEM Outcomes: Developing an Accountability System for Broadening Participation*, March 2017, https://upenn.box.com/v/BetterSTEMOutcomesFinal2. This report was followed by a smaller workshop and brief report, which served as the basis for this brochure. See *Assessing Performance and Developing an Accountability System for Broadening Participation: The Role of Higher Education*, October 2017, https://upenn.box.com/v/STEMAccountability-HigherEd.

THE BUILDING BLOCKS

ACCOUNTABILITY SYSTEM

An accountability system for broadening participation consists of a set of clear goals, assumptions, definitions, metrics, and a strategy for organizational change. Such a system substantially reduces barriers to full participation by all groups, thereby "democratizing" STEM as an educational process with workforce outcomes. Such an accountability system must ensure dedication to pre-Kindergarten through 20+ pathways. For broadening participation, it is crucial to create effective pathways across higher education institutions, starting with community and technical colleges, and including minority-serving institutions, for they serve many first-generation and underrepresented college students. The ten steps that institutions of higher education can take toward developing organizational accountability for broadening participation are listed below.

TEN STEPS TOWARD ORGANIZATIONAL ACCOUNTABILITY FOR BROADENING PARTICIPATION

Conduct a self-study that takes stock of your organization's current broadening participation portfolio and climate.

Construct a timeline (near- and long-term) for achieving broadening participation outcomes articulated by your theory of change consistent with the institutional mission and strategic plan.

Identify data and measures that are required—either extant or to be created—to gauge progress organization-wide (and within operating units) toward your broadening participation outcomes.

Engage stakeholders to define a common agenda and recruit partners to work toward agreed-upon outcomes, disaggregated by demographic, educational, and careers stages as much as possible.

Communicate gains and setbacks with national as well as local stakeholders through a variety of media, sharing information to reach out for new partners and ideas.

Update and revise plans and practices as new knowledge and experience (e.g., program cost, workforce turnover) reshape your organization's thinking about how to experiment, accelerate, and expand broadening participation outcomes.

Incorporate what has been learned from ongoing longitudinal assessments of your organization's broadening participation programs.

Re-examine how the roles of government, institutions of higher education, the private sector, and nonprofits are expediting or inhibiting outcomes that your organization values and report on the contributions of each role-player to broadening participation.

Appraise the performance of your organization in taking steps toward increasing accountability and institutionalizing a democratized science and engineering system.

Be ready to begin again, as accountability for broadening participation is a recursive, iterative, and ongoing process.

DEMOCRATIZING SCIENCE & ENGINEERING

Democratization in the context of broadening participation refers to capturing the insights of a broader talent pool embedded in communities with experiences that bear on STEM discovery and innovation. Too often these students—especially women, underrepresented minorities, and persons with disabilities—are left on the sidelines of educational opportunity and deterred from participating in STEM education and careers. Broadening participation denotes "more," but democratizing means more and better. **Democratized science is inclusive, involving diverse populations in knowledge production, and results in increased advances to knowledge.** An inclusive epistemology needs to be created to produce a better science and a better society. Research universities alone cannot democratize science and engineering. Minority-serving institutions and liberal arts colleges make significant contributions, often in partnership with graduate-degree granting programs elsewhere.

IMPLEMENTATION RESEARCH

Local experts who possess knowledge "on the ground" are essential to implementing an accountability system that helps to achieve community goals. This epistemology expands the definition of expertise and knowing to include other voices not necessarily steeped in professional credentials or academic knowledge, but in lived-experience of the conditions under examination. Such an approach assumes that human beings learn from and through implementation. It also assumes that science is designed to realize large societal goals through developing and implementing programs on the ground with community partners, drawing on all available talent, studying and refining these programs, and engaging in an iterative process that leads to ongoing demand for broadening participation. Such a process yields significant learning, high-level theoretical advances, and improved practice—all while expanding conventional notions of community.

SHARED ACCOUNTABILITY

For accountability to take shape and thrive, stakeholders—in all types of organizations—must become its stewards. Working in concert, they must share accountability for performance. But institutions of higher education, on the front line of STEM research and education, must lead the way. Broadening participation is a cumulative result that unfolds over time. Each result, however, is not the province of the last institution of record. Rather, it reflects on those institutions preceding it. Shared accountability for broadening participation captures the dynamics of performance through what in retrospect appears as a STEM pathway. For organizations to embrace shared accountability, they must provide a collaborative measurement regime that improves both processes and outcomes. Accepting both credit and blame for student successes and practices changes organizational culture in enduring ways. **Through sustained interaction, different organizational actors bring different assets— money, contacts, indigenous knowledge, specialized experience—to formulating approaches to problems of mutual concern and sharing accountability for solutions.**

THE WAY FORWARD

Ongoing conversations on shared accountability are needed. Engaging additional expertise to help solve complex problems can illustrate how diversity fuels innovation and enriches the intellectual environment. If higher education is to continue broadening student participation in STEM, formal organizations in all corners of U.S. society—those that prepare students as well as employ graduates—must collaborate to advance the 21st century workforce through opportunities that build upon exemplary practices. Some higher education-led scorekeeping is essential for measuring progress over baseline and compelling innovations in broadening participation.

Genuine cross-sector partnership requires a paradigm change from zero-sum competition and conflict to cooperation and collaboration focused on real-world community problem solving. Moreover, given the scope and complexity of contemporary problems, significant attention needs to be given to how to effectively expand the community of experts. **Research cannot solely occur within the academy, but needs to be placed within real-world communities.** If efforts are not place based, they will have little if any impact on changing the lives of individuals. Therefore, communities must also be actively involved when the problem is defined and remain involved through the development and implementation of solutions.

Navigating the New Arctic, one of NSF's 10 Big Ideas for Future Investments (https://www.nsf.gov/about/congress/reports/nsf_big_ideas.pdf), illustrates the potential of a place-based approach to shared accountability. Indigenous residents of the Arctic have knowledge to contribute to the STEM enterprise. Communities are threatened by what is happening in the Arctic, which affects the everyday lives not of scientists, but of residents. Defining and addressing these problems through implementation research conducted by a diverse and expanded "community of experts" can create a dramatic difference (https://www.nsf.gov/news/news_summ.jsp?cntn_id=242889). Enlisting members of the public beyond

credentialed experts in community decision making is a prime example of democratizing science.

Leadership can trumpet the values of what institutions of higher education could and should be, especially relative to rewarding the development of human resources. **Higher education leaders can also motivate an examination of the reward system across the university so that broadening participation becomes an indicator of institutional success.** Colleges and universities themselves can be conveners of conversations on how to mobilize all segments of the education community, as well as the public and private sectors, to become more systematically accountable for broadening participation in STEM.

Finally, NSF has a unique historic partnership with universities in all fields of science for promoting discovery, learning, transformation, and innovation. **Among other things, NSF should be encouraged to fund place-based activities that involve multiple partners along the entire preK-20+ pathway.** NSF can also function as the primary catalyst for shared accountability while incentivizing principal investigators and institutions of higher education to move with urgency toward the goal of broadening participation to advance research and education and serve national needs.

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