

CREATE OPPORTUNITIES EVERYWHERE

Description and Rationale

Create Opportunities Everywhere (COE) is a comprehensive approach for inspiring, attracting, supporting, and advancing groups underrepresented in STEM. This whole-of-NSF strategy incorporates all directorates and offices and surpasses prior investments by ensuring equity in program delivery and investing beyond NSF's broadening participation (BP) portfolio, while building on the concept of the "Missing Millions." This approach focuses on expanding diversity, equity, inclusion, and access in STEM by including underrepresented and underserved individual, institutional, and geographic characteristics. The National Science Board (NSB) conceptualized the Missing Missions as the difference between the demographics of the research community and the demographics of the nation and charged NSF with increasing opportunities that may lead to mitigating disparities that often contribute to talent gaps.¹ However, to do so, addressing both resource and representation gaps is critical. Resource gaps refer to gaps in financial resources, access to information and expertise, and the resources needed in increasing representation, such as cultivating, supporting, and advancing people from groups underrepresented in STEM as well as investigators and institutions in geographically diverse locations. Using this comprehensive approach to create opportunities everywhere, NSF will integrate diversity, equity, inclusion, and access into all program efforts to strengthen U.S. STEM education, research, and workforce pathways and infrastructures by drawing on the full extent of the Nation's talent and resources.

NSF is committed to identifying and addressing barriers to innovation, partnerships, experiences (formal and informal), and opportunities in STEM, both within the agency and in how it delivers programs to the thousands of institutions and organizations it supports. Historically, NSF invests significantly each year in its BP programs and projects across the country. An abundance of unrealized STEM potential is found in many communities, jurisdictions, and territories across the Nation. As a result, there is significant need to build upon the agency's BP portfolio of STEM education, workforce, innovation, and research programs, alliances, and models by incorporating the Missing Millions concept into the STEM enterprise. NSB, in its *Vision 2030* report, estimated that, in order for the S&E workforce to be representative of the U.S. population in FY 2030, the number of women in STEM must nearly double, Black or African Americans in STEM must more than double, and Hispanic or Latinos in STEM must triple the number who are in the 2020 U.S. S&E workforce.² These estimates are based on projections from the U.S. Census and Bureau of Labor Statistics, together with data from the National Center for Science and Engineering Statistics (NCSES).

NSF aims to fund projects that inspire, nurture, and advance diverse, domestic STEM talent from all communities, jurisdictions, and territories across the country. Eliminating disparities in cultivating STEM talent must involve a wide set of stakeholders, from *individuals* traditionally identified as underrepresented or underserved, to *institutions of higher education and informal science education institutions* that serve groups underrepresented in STEM, to those *communities (e.g., urban and rural), lands and jurisdictions* across the country that currently lack resources and opportunities for robust education, workforce development, and regional innovation. To be effective in creating opportunities everywhere, NSF must identify and embed guiding principles for COE across NSF's portfolio of

¹ www.nsf.gov/nsb/publications/2020/nsb202015.pdf

² www.nsf.gov/nsb/publications/2020/nsb202015.pdf

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programs.

NSF has identified four guiding principles for creating and implementing opportunities everywhere. The principles guiding NSF's COE strategy are: (1) address research equity, (2) build capacity, (3) foster collaborations and partnerships, and (4) support the next generation of researchers. A focus on *Research Equity* ensures accessible and inclusive spaces for all STEM educators and researchers. To that end, investing in research to understand the science of broadening participation provides additional evidence-based approaches to support long-term efforts in this area. *Capacity Building* is more complex, but it is essential in reaching the Missing Millions of STEM. NSF investments in capacity building begin with support for PreK-12 students and teachers at high-need schools in rural, urban, and suburban communities and continue at the undergraduate and graduate levels to enhance the quality of STEM education and build research infrastructure at Minority Serving Institutions (MSIs) and emerging research institutions (ERIs). These investments commonly aim to improve STEM representation and success rates (i.e., graduation rates) among underserved students and increase diversity in STEM doctoral programs among domestic populations, which will contribute immensely to diversifying the U.S. STEM education and workforce enterprise. Capacity building also includes strategic investments in organizational infrastructures that support the application for and stewarding of funding in support of STEM research and training.

Initiating strategic partnerships, networks, and alliances as part of the COE strategy can lead to the development of national and international collaborations to scale research-based BP and equity efforts while fostering systemic change that addresses the intersection of multiple social identities, such as gender, race, ethnicity, and disability. The final guiding principle focuses on the Next Generation Researchers and STEM professionals, comprising current investments that are designed to support greater inclusion and equity in STEM academic professions. The facilitation of training, mentoring, and professional development opportunities are essential in building knowledge, expertise, and confidence as individuals move through multiple types of STEM career trajectories.

NSF's guiding principles for COE directly support the CHIPS and Science Act (P.L. 117-167) and enable NSF to build a strong domestic and diverse STEM workforce through a variety of partnerships and investments. Examples include: (1) expand the geographic and institutional diversity of research institutions and the students and researchers they serve through NSF's capacity building and broadening participation programs; and (2) promote research equity through supporting research on STEM participation, understanding bias and discrimination, as well as building the tools, surveys, and infrastructure necessary for understanding the impacts of Federally-funded research on society, the economy, and the workforce, including domestic job creation. Other examples include, but are not limited to: creating opportunities and incentives for centers to employ exemplary BP practices in STEM and ensuring implementation of such practices; supporting institutions to implement and study innovative approaches for building research capacity that engage and retain students from a range of institutions and diverse backgrounds in STEM; and working with emerging research institutions to build research capacity, support field and laboratory research experiences for undergraduate and graduate students, and enhance the availability of research instrumentation.

In FY 2024, NSF intends to apply the four guiding principles to create opportunities everywhere by strengthening and scaling investments and expanding beyond the BP portfolio. For *individuals*, NSF will continue to make investments in democratizing the STEM education and workforce. Stated differently, it will double down in its efforts to make STEM more diverse, inclusive, and accessible. For

institutions, NSF will be more intentional about how it engages MSIs and ERIs in its formal and informal programs, starting with those institutions classified as MSIs, but also focusing on the importance of MSI-bridge programs (e.g., funding open to all institutions that encourage participation by MSIs). To ensure equity in access, preparation, experiences, and program delivery, NSF has established an Agency Priority Goal designed to improve representation and ensure success in the science and engineering (S&E) enterprise by actions that will increase the number and proportion of proposals submitted by investigators that are underserved in STEM and from MSIs and ERIs.³ For *jurisdictions* (e.g., U.S. states and territories), NSF will expand support for individuals and institutions in EPSCoR jurisdictions to ensure geographic diversity, by seeking to close representational and resource gaps within the most underfunded regions of the U.S.

Goal of Investment

Creating opportunities everywhere requires a strategic and tactical approach to confronting current grand challenges to equitable success within the STEM enterprise. Thus, NSF has identified the following set of goals to guide its efforts in creating meaningful opportunities in STEM, while expanding the reach of NSF investments throughout the Nation's S&E enterprise and STEM ecosystem. These goals also reach across and beyond all of NSF's FY 2024 priority themes to Build a Resilient Planet, Advance Emerging Industries for National and Economic Security, and Strengthen Research Infrastructure. FY 2024 goals to COE include:

- **Broaden the STEM Ecosystem:** Expand NSF's programmatic efforts to under-resourced and underserved communities that cover a wide set of stakeholders, from individuals traditionally identified as underrepresented or underserved, to institutions of higher education and informal science education institutions. These institutions serve groups, communities, lands, and jurisdictions that are underrepresented in STEM, are not large recipients of federal research funding, or lack resources and opportunities for robust education, workforce development, and regional innovation. This goal directly supports the CHIPS and Science Act by supporting research and data collection to identify and lower barriers facing women, minorities, and other groups underrepresented in STEM as well expand research capacity within the Nation's HBCUs, TCUs, HSIs, other MSIs, and ERIs.
- **Accelerate Student Success in STEM:** Increase preK-12, undergraduate (2-year and 4-year institutions), graduate, and post-doctoral success in STEM disciplines among those from gender, racial, ethnic, geographic, and other groups who have been historically underrepresented in STEM disciplines and careers. This directly supports the CHIPS and Science Act to address diversity in formal and informal STEM education at all levels, including preK-12, undergraduate and graduate education. For example, in FY 2023, NSF launched the Experiential Learning for Emerging and Novel Technologies (ExLENT) program with the goal of scaling efforts to support inclusive learning opportunities designed to provide cohorts of diverse learners with the crucial skills needed to succeed in key technology focus areas and prepare them to enter the workforce ready to solve the Nation's most pressing societal, economic, national, and geostrategic challenges. Further, Components that focus on diversity include increasing diversity in the STEM teacher workforce and facilitating the development of networks and partnerships to advance broadening participation research under the Eddie Bernice Johnson INCLUDES Initiative, supporting activities that address the diversification of the STEM workforce by focusing on the needs of undergraduate and graduate faculty and students, while seeking to increase submissions from MSI's, such as

³ NSF FY 2022-FY 2023 Annual Performance Plan www.nsf.gov/about/budget/fy2023/pdf/90_fy2023.pdf

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HBCUs, HSIs, TCUs, and other broad access institutions with significant numbers of students of color.

- **Strengthen Educational Institutions through Collaborative Programs and Partnerships:** Strengthen leadership development and advancement opportunities for faculty at MSIs and ERIs to foster PI and institutional success in STEM and STEM education research through a collaborative infrastructure of networks, alliances, and partnerships to broaden participation of individuals, groups, and localities/regions often excluded or underserved in STEM.
- **Accelerate Inclusion and Access in NSF's Research Portfolio:** Increase and strengthen institution and faculty engagement in NSF's many research programs and activities from those institutions not currently well represented in NSF's research programs through strategic outreach and engagement activities and programs intended to build capacity and competitiveness for these programs.
- **Develop an Evidence Foundation for COE:** Continuously inform COE efforts by supporting empirical research and the necessary and underlying research infrastructure. Such research provides theories, methods, and analytic techniques to better understand individual and compounded factors that enhance and impede the Nation's ability to expand participation in STEM education and the workforce and throughout all economic and social institutions in society. This will be an important foundation for realizing the goal of broadening participation in science and engineering (e.g., The CHIPS and Science Act, Titles III and IV). One key activity in support of this goal is the Analytics for Equity initiative, which was initiated in FY 2023. This initiative builds on the Evidence-Based Policymaking Act and E.O.13985⁴ by piloting a new way to support social, economic, and behavioral sciences research that leverages federal data assets (ensuring privacy is protected and data are secure) and scientific advances in researching equity-related topics for greater public benefit. This goal addresses CHIPS and Science Act provisions, which direct NSF to support awards that measure the impacts of Federally funded research by collecting and analyzing data STEM participant demographics in federally funded awards.

Achieving these goals is likely to strengthen the capacity and capabilities of institutions and investigators who are frequently underrepresented and underserved in STEM and reduce barriers throughout the S&E enterprise and STEM ecosystem. These efforts are designed to enable greater access to all science and engineering research and education resources in emerging and novel STEM fields, enabling new technological innovations and cutting-edge modes of employment necessary for American prosperity.

Potential for Impact, Urgency, and Readiness

NSF has had a long-standing goal of cultivating a world-class, broadly inclusive science and engineering workforce while expanding the scientific literacy of all citizens. NSF has continuously invested in foundational, curiosity-driven, discovery-oriented research and use-inspired, solutions-oriented projects. As the Nation transitions, transforms, and innovates while confronting grand challenges in reaching the Missing Millions in STEM, NSF's defining role in developing STEM talent everywhere benefits the U.S. global leadership in STEM and advances the Nation's science and engineering competitiveness through its ability to inspire curiosity, support creativity, and stimulate innovation.

⁴ www.federalregister.gov/documents/2021/01/25/2021-01753/advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government.gov

NSF recognizes the historical and emerging challenges in the U.S. workforce and what that could mean for the STEM workforce of the future. Although we have made progress in promoting STEM education and a STEM workforce that includes all Americans (*Women, Minorities, and Persons with Disabilities in Science and Engineering*, NCSES, 2023),⁵ persistent disparities remain and are at risk of worsening in the post-pandemic environment. Along with other inequities, those in education and employment are extremely salient⁶. NSF must enhance and accelerate its efforts to diversify STEM education and the STEM workforce. Over the years, through its BP portfolio, NSF has intentionally focused on equity in science and engineering, and now NSF must ensure that these efforts are reaching all parts of the U.S., regardless of geographic location, or type of organization or institution. For more detail regarding investments in broadening participation, please see the table of BP programs in the Summary Tables chapter.

There is a critical need to acknowledge, understand, value, and study the aforementioned topics to fundamentally drive success in the Nation's S&E enterprise. To this end, FY 2024 investments in COE will build on NSF's agency-wide annual investment to broaden participation in STEM, which has already created new knowledge and expanded research and training readiness across a diverse landscape of institutions. NSF has increasingly invested in BP programs over the past several decades, building individual and institutional capacity and a strong knowledge base. NSF is unique in that it supports all areas of science and engineering as well as encouraging interdisciplinary science, engineering, and education in the many programs that it supports. Science and engineering research communities are supportive and ready to tackle these challenges (see, for example, the biannual Committee on Equal Opportunity in Science and Engineering (CEOSE) reports to Congress, *Vision 2030* from the NSB, and the new *Envisioning the Future of NSF EPSCoR* report).⁷ NSF has identified new areas for investments targeting disparities in STEM education and the STEM workforce across all of its directorates and capitalizes on points of intersection to assist members of the STEM community in recognizing opportunities relevant to their needs.

In FY 2022, NSF published its FY 2022-2026 Strategic Plan *Leading the World in Discovery and Innovation, STEM Talent Development, and the Delivery of Benefits from Research*.⁸ The vision articulated in the plan is foundational to COE: A nation that leads the world in science and engineering research and innovation, to the benefit of all, without barriers to participation. And within the plan's first Strategic Goal, *Empower*, NSF defines the Agency Priority Goal: to improve representation in the S&E enterprise but also leverages its learning agenda goal (How can NSF grow STEM talent and opportunities for all Americans most equitably?) and a multitude of other activities, including acting upon recommendations from NSF's racial equity task force, responses to several equity-related Executive Orders on "Advancing Racial Equity and Support for Underserved Communities Through the Federal

⁵ *Women, Minorities, and Persons with Disabilities in Science and Engineering*, NSF/SBE/NCSES. NSF 23-315, January 30, 2023. <https://nces.nsf.gov/pubs/nsf23315/>

⁶ www.bls.gov/emp/tables/stem-employment.htm; www.pewresearch.org/science/2021/04/01/stem-jobs-see-uneven-progress-in-increasing-gender-racial-and-ethnic-diversity/

⁷ CEOSE, www.nsf.gov/od/oia/activities/ceose/index.jsp. NSB, www.nsf.gov/nsb/NSBActivities/vision-2030.jsp. EPSCoR, <https://nsf.gov/resources.nsf.gov/2022-08/Envisioning-The-Future-of-EPSCoR-Report.pdf>

⁸ NSF's FY 2022-2026 Strategic Plan: www.nsf.gov/about/performance/strategic_plan.jsp.

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Government⁹ and advancing equity in science and technology,¹⁰ and integrating outcomes from working groups throughout NSF that are increasing agency collaboration and coordination to the benefit of groups that are underrepresented and underserved in STEM.

Through NSF's FY 2024 COE investments, NSF will leverage intentional alignment of strategy and actions to broaden participation of groups underrepresented in STEM to ensure that NSF's portfolio of programs is broadly accessible and inclusive. To this end, COE will enable the scaling of established programs and introduction of new initiatives to ensure that talent is energized across broad socioeconomic demographic and geographic diversity. At the core of NSF's approach is a commitment to building strong partnerships across communities, institutions, agencies, industries, and nations to create powerful global STEM and innovation ecosystems. The aforementioned efforts are key to accelerating the frontiers of science, engineering, and technology for decades to come.

Anticipated Potential Contributors

NSF's investments in COE are crosscutting and will include contributions from all of NSF's directorates and offices.

⁹ www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/

¹⁰ www.whitehouse.gov/ostp/news-updates/2021/10/14/the-white-house-office-of-science-and-technology-policy-launches-the-time-is-now-advancing-equity-in-science-and-technology-ideation-challenge/
www.whitehouse.gov/ostp/news-updates/2022/05/26/new-guidance-to-ensure-federally-funded-research-data-equitably-benefits-all-of-america/