INCLUSION ACROSS THE NATION OF COMMUNITIES OF LEARNERS OF UNDERREPRESENTED DISCOVERERS IN ENGINEERING AND SCIENCE (NSF INCLUDES)

$16,000,000
+$500,000 / 3.2%

Overview

NSF INCLUDES (Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science) is a comprehensive national initiative to enhance U.S. leadership in science and engineering discovery and innovation by proactively seeking and effectively developing science, technology, engineering, and mathematics (STEM) talent from all sectors and groups in our society. The NSF INCLUDES initiative will improve the preparation, increase the participation, and ensure the contributions of individuals from groups that traditionally have been underserved and/or underrepresented in the STEM enterprise. In particular, the specific goal of NSF INCLUDES is to develop the STEM talent of women, members of racial and ethnic groups that have been underrepresented in STEM, persons with low socio-economic status, and people with disabilities.

Diversity – of thought, perspective, and experience – is essential for excellence in research and innovation in 21st century science and engineering. Full participation of all of America's STEM talent is critical to the advancement of science and engineering for national security, health, and economic competitiveness. African Americans, Hispanics, Native Americans, women, persons with disabilities, and persons with low socio-economic status are underrepresented in various fields of science and engineering across all levels – from K-12 to undergraduate and graduate levels to long-term workforce participation. Inclusion of talent from all these sectors of American society is necessary for the health and vitality of the science and engineering community and its societal relevance. Some of the key challenges to this broad participation are: *under-preparation* and lack of opportunity for members of all demographic groups to become "STEM-capable"; *under-resourcing* as seen in growing disparities of access to quality learning and technology; and *under-production* of STEM graduates from abovementioned sectors. Significant investments, including those by NSF and the larger STEM community, have been made to address these long-standing problems. However, further investment is critical so that these challenges can be overcome and the U.S. science and engineering enterprise can benefit from the creative contributions by talented people from all sectors of society, yielding a competitive advantage in a globalized world for national security, health, and economy.

The NSF INCLUDES initiative will support two of NSF's Strategic Goals and associated objectives:
Goal 1: Transform the Frontiers of Science and Engineering – Objective 2: Integrate education and research to support the development of a diverse STEM workforce with cutting-edge capabilities; and
Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education – Objective 1: Strengthen the links between fundamental research and societal needs through investments and partnerships.

Total Funding for NSF INCLUDES

(Dollars in Millions)

FY 2015 Actual	FY 2016 Estimate	FY 2017 Request
-	**$15.50**	**$16.00**

Goals

The long-term goals of NSF INCLUDES are to fund new research, models, networks, and partnerships that lead to measureable progress at the national level, and the ability to scale the concepts of diversity and inclusion in STEM. This will be achieved, in part, by increasing coherence and leveraging synergies across

the NSF broadening participation (BP) portfolio (see the Summary Table chapter for funding details), including both BP "focus" and BP "emphasis" programs, through alignment with the NSF INCLUDES framework. The multi-year goals are:

1. Synthesize and build the research base for broadening participation and foster the spread and adaptation of proven effective practices.
2. Support the identification and development of a set of shared goals and objectives developed by stakeholders, including those from specific STEM disciplines, whose attainment is essential for success in achieving inclusion in the Nation's scientific workforce and in high quality science learning opportunities.
3. Support local/regional and discipline-specific and crosscutting multi-stakeholder partnerships and networks (NSF INCLUDES Alliances) and support an NSF INCLUDES National Network.[1]

Building on activities started in fiscal years 2015 and 2016, in FY 2017 NSF will proceed to full implementation of NSF INCLUDES. The full implementation includes funding approximately five multi-year NSF INCLUDES Alliances as well as an NSF INCLUDES Backbone Organization, which will ensure that the Alliances work together and leverage each others' resources. The goals and objectives of the NSF INCLUDES Alliances will be catalogued to define the collective set of goals and objectives of the NSF INCLUDES National Network. Projects throughout the NSF BP portfolio will be engaged in supporting one or more of those objectives, using guidelines developed by the internal NSF Working Group for INCLUDES (WGI), and may affiliate in various ways with the NSF INCLUDES National Network. The NSF INCLUDES Backbone Organization will provide 1) a common system of tracking, reporting on national progress toward the goals and objectives; 2) systems for communicating across all entities involved in NSF INCLUDES; 3) ways of employing technology for scaling and sharing; 4) support for implementation research that will enable understanding and documentation of successful efforts as they are ongoing; and 5) technical assistance for managing evaluation and assessment, building effective strategies, developing networking opportunities for students, faculty, and other stakeholders.

The long-term impact of NSF INCLUDES will be continued U.S. leadership in discovery and innovation in science and engineering. This will be accomplished through the significant involvement of people from groups that have traditionally been underrepresented in all NSF-supported STEM fields.

Approach

A key tenet behind the NSF INCLUDES initiative is that achieving success will require much broader and more effective collaborations among all interested and important stakeholder communities and organizations concerned with STEM opportunities in K-12 education, community colleges, and universities. NSF will provide leadership in mobilizing concerned communities to partner with those stakeholders that may not routinely engage with NSF, e.g., community-based organizations, local education policy makers, foundations, not-for-profits, and industry. NSF INCLUDES will also leverage investments from other NSF programs and projects focused on broadening participation, building on lessons learned, best practices, and proven mechanisms for achieving success.

An NSF-funded INCLUDES National Network consisting of local/regional NSF INCLUDES Alliances and an NSF INCLUDES Backbone Organization will be created in FY 2017. NSF INCLUDES will catalyze and support networked activities to improve BP outcomes at national scale. For such collaborative networks to be successful at scale, it is essential that participating entities have common agendas, shared primary goals, shared measurement systems, and mutually reinforcing activities. The local/regional NSF INCLUDES Alliances will bring together key stakeholders to work collaboratively with a focused

[1] John Kania & Mark Kramer, "Collective Impact," *Stanford Social Innovation Review*, (Winter 2011), http://ssireview.org/articles/entry/collective_impact/; Kania and Kramer note that collective impact "requires a systematic approach to social impact that focuses on relationships between organizations and the progress toward shared objectives," p. 5.

commitment to achieve clearly defined, shared primary goals. Examples of potential primary goals that are national, but could be implemented regionally, include:

- All U.S. high schools offer Advanced Placement (AP)® courses in calculus, computer science, and physics by 2020.[2]
- All states allow engineering and/or computing courses to count toward high school graduation requirements by 2020.
- Over 75 percent of undergraduate students from underrepresented groups (URGs) have opportunities to participate in authentic STEM research experiences.
- In major urban centers, there are pre-K-20+ pathways, involving universities, community colleges, local schools, surrounding communities, not-for-profits, local businesses and industries, and science-rich institutions designed to enable success for students from URGs.
- In every NSF-supported discipline there is convergence on discipline-specific approaches to creating effective STEM pathways designed to draw in students from URGs by 2020.

An NSF-supported Backbone Organization will ensure that local and regional NSF INCLUDES Alliances collaborate among themselves. Therefore, the Backbone Organization will facilitate the creation of an NSF INCLUDES National Network that routinely communicates, shares data and knowledge, and leverages one another's best practices and strategies for success. The NSF INCLUDES National Network goals will align, shape, and inform NSF's wider BP investments at the directorate and program level.[3]

Investment Framework

NSF INCLUDES Funding by Directorate

(Dollars in Millions)

Directorate/Office	FY 2015 Actual	FY 2016 Estimate	FY 2017 Request
BIO	-	$1.47	$1.40
CISE	-	1.87	1.78
EHR	-	3.00	4.00
ENG	-	1.47	1.40
GEO	-	2.57	2.44
MPS	-	2.74	2.60
SBE	-	0.50	0.50
IA	-	1.88	1.88
Total, NSF INCLUDES	**-**	**$15.50**	**$16.00**

Totals may not add due to rounding.

FY 2015 – FY 2016

Beginning in FY 2015, a series of forums and community events were held to shape the purposes and principles of NSF INCLUDES. During FY 2015, NSF leadership, in partnership with the scientific community, launched NSF INCLUDES with a Director's Workshop held in June.[4] The meeting focused on collective impact, a coordinated approach to scaling, and catalytic innovation. This event allowed community and academic leaders to identify critical levers to increase the impact of NSF INCLUDES, including the following key ideas:

[2] According to U.S. Department of Education Civil Rights data (see http://ocrdata.ed.gov), only 50 percent of high schools in the United States offer calculus and only 63 percent offer physics, with access for minority students considerably less than access for white students. Meanwhile, a new AP® Computer Science Principles (CSP) framework is being introduced in the 2016-2017 academic year, along with additional new computer science course offerings.

[3] John Kania & Mark Kramer, "Collective Impact," *Stanford Social Innovation Review*, (Winter 2011), www.ssireview.org/articles/entry/collective_impact/

[4] www.informalscience.org/sites/default/files/INCLUDES_Convening_Synthesis.Sep1.pdf

- Learn from and build on existing successes;
- Develop wide-ranging partnerships;
- Ensure shared measurements and systematic coordination and collaboration across the network; and
- Connect the research and practices of the science of broadening participation.

Following this event, NSF leadership engaged the community through discussions with NSF and directorate advisory groups (e.g., the Committee on Equal Opportunities in Science and Engineering (CEOSE), the Advisory Committees for Mathematical and Physical Sciences, Engineering, Education and Human Resources, etc.), national study groups (e.g., National Research Council (NRC), relevant White House initiative leaders, and other experts in broadening participation), and professional societies/associations. The purpose of this national dialogue was to identify key action areas, address discipline-specific needs and goals (e.g., shortages of women in computer science and some engineering fields), and highlight differences in attrition rates among under-represented groups by field and discipline. Leaders in projects currently funded in the NSF BP portfolio and other experts are being encouraged to engage and contribute to shaping the direction of NSF INCLUDES, as appropriate.

NSF INCLUDES Launch Pilots: In FY 2016, NSF is issuing a call for proposals to fund NSF INCLUDES Launch Pilots. NSF INCLUDES Launch Pilot projects will span two years of activity for a total of up to $350,000 each for 30 to 40 projects. Launch Pilot teams will be charged to develop plans for a collective impact approach to solving a key BP challenge that is of high interest to the members of the team. Teams might come together locally, regionally, nationally, or by disciplinary focus. Key to a successful proposal will be the identification of a specific goal, measurable objectives, and an argument that the right set of partners is being assembled, and possibly that disruptive innovation is intended. These planning and start-up activities are aimed at engaging with appropriate communities to test the feasibility of developing a full-scale plan and process for change, including identifying other support mechanisms for sustaining the efforts. In the second year, teams with successful planning activities are expected to carry out projects to demonstrate their ability to implement a collective impact approach to address the selected BP challenge.

NSF INCLUDES Backbone Organization Development: In FY 2016, a series of activities, including workshops and ideas labs, will identify the necessary components of the NSF INCLUDES Backbone Organization. The collective impact approach depends on strong measurement capability, communication, and mutually reinforcing activities. The NSF INCLUDES Backbone Organization development activity will bring clarity to the optimal NSF investments for FY 2017.

For both the NSF INCLUDES Launch Pilot and Backbone Organization development activities, NSF will use multiple approaches to notify and engage a wide array of organizations and stakeholders about the intentions and possibilities for NSF INCLUDES. A communication plan for NSF INCLUDES is under development, and it will incorporate social media and outreach components. For example, the many organizations and stakeholders who participated in the recent White House Summit on Next Generation High Schools[5] will be included in these outreach efforts.

FY 2017 Request

In FY 2017, the NSF INCLUDES investment will be $16.0 million. These funds will invest in the NSF INCLUDES Alliances, for an approximate total of $12.50 million, and the NSF INCLUDES Backbone Organization, for an approximate total of $3.50 million. NSF will issue a call for proposals to the NSF INCLUDES National Network in late FY 2016 for funding of awards in FY 2017. NSF anticipates two tracks in this call: one for NSF INCLUDES Backbone Organization activities, and one for NSF INCLUDES Alliances. NSF currently envisions funding about five NSF INCLUDES Alliances at approximately $2.50 million per year for each of five years.

[5] https://whitehouse.gov/sites/default/files/docs/fact_sheet-white_house_summit_on_next-generation_high_schools.pdf

Consistent with CEOSE's recommendations for a bold new initiative, NSF INCLUDES Alliances will leverage existing programs, people, organizations, alliances, and institutions to form NSF's next generation BP investments.[6] Each NSF INCLUDES Alliance will be committed to jointly solving a specific set of challenges. As mentioned above, in FY 2016, NSF INCLUDES Launch Pilot projects are expected to demonstrate how extant teams and organizations can be re-assembled and joined together to form new alliances with common goals and purposes, and collective impact-style approaches. Early in FY 2017, NSF INCLUDES Launch Pilot principal investigators (PIs) will share their goals and plans in a live event and webinar, enabling all to learn from their pilot project experiences. NSF INCLUDES Alliances will be funded late in FY 2017, enabling them to learn from and perhaps involve some of the most promising Launch Pilot activities. Some alliances might focus on emerging fields of science, such as data science, as key domains for advancing BP. The NSF INCLUDES Alliances will propose, implement, and assess solutions to address the seepage of talent from diverse communities and advance the talent among those who have been traditionally underrepresented in the STEM enterprise.

In addition to the NSF INCLUDES Alliances, the NSF INCLUDES Backbone Organization will be established in FY 2017 for a five-year award period. Based on the input received in FY 2016, the NSF INCLUDES Backbone Organization will facilitate the NSF INCLUDES collaborative activities. Among its many capabilities, the NSF INCLUDES Backbone Organization will demonstrate a capacity to communicate, assess, and measure progress toward goals; collect and monitor data; support implementation research; scale technological innovations; and provide technical expertise in collective impact. The NSF INCLUDES Backbone Organization will serve as a neutral third party within the NSF INCLUDES Network, working in close affiliation with the NSF INCLUDES Alliances.

Building on the activities of FY 2016, in FY 2017 the NSF INCLUDES effort will increasingly leverage the current and ongoing NSF BP portfolio through supplements to form linkages among the projects in the current portfolio, as well as with the new partnerships afforded by the NSF INCLUDES Alliance investments. For instance, discipline-specific programs can be more closely aligned with the goals of NSF INCLUDES through new solicitation language and Dear Colleague letters. The vision is that, over time, the full suite of NSF's focused, emphasis, and geographic BP programs become connected to and/or affiliated with the NSF INCLUDES activities and contribute to advancing the goals of the NSF INCLUDES Alliances while benefitting from the services of the NSF INCLUDES Backbone Organization.

NSF will continue to leverage activities of the National Science and Technology Council (NSTC) Committee on STEM Education to build on existing interagency collaborations and create new partnerships as needed to support the NSF INCLUDES goals. As co-chair to the Federal Coordination in STEM Education Task Force (FC-STEM) BP Interagency Working Group (IWG), where broadening participation is critical to the success of all of the FC-STEM IWGs, NSF will present NSF INCLUDES as an opportunity for collaboration that helps meet the goals of the Co-STEM Strategic Plan.[7]

FY 2018 – FY 2021

- NSF will continue to advocate for and invest in education, mentoring, and research to create STEM experiences that empower every segment of the American population to succeed regardless of demographic characteristics.
- Building on the activities of FY 2016 and 2017, the NSF INCLUDES effort will increasingly leverage the ongoing NSF BP portfolio.

[6] CEOSE, 2011 - 2012 Biennial Report to Congress. (www.nsf.gov/od/oia/activities/ceose/reports/Full_2011-2012_CEOSE_Report_to_Congress_Final_03-04-2014.pdf)
[7] www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf

NSF INCLUDES will capitalize on NSF's role in basic research across all fields of science and engineering and across all levels and venues of STEM education. The ongoing activities in FY 2018 and beyond include supporting innovative projects to achieve new levels of partnerships at a national scale. New knowledge will continue to inform more systematic and strategic broadening participation efforts. The NSF Evaluation and Assessment Capability will be engaged in the oversight responsibilities for assessing and evaluating the NSF INCLUDES portfolio, including a three-year review to determine next steps. NSF plans to continue the convening of stakeholders to maintain the national momentum for diversifying the STEM enterprise and disseminate promising/best practices.

Evaluation Framework

To be successful, NSF INCLUDES must be systemic, have impact at scale, and be sustainable. Key to this broader impact of the initiative is an evidence-based approach that drives management decision-making, mid-course corrections, improvements, sharing of information, and enhancements for yields greater than incremental progress. NSF evaluation experts, in concert with NSF INCLUDES Backbone Organization's experts, will develop and refine the evaluation and monitoring framework for each of the major goals, including annual metrics and ambitious short- and long-term targets (three-year and five or more years, respectively) for program evaluation. In FY 2016, a feasibility assessment will begin with data collection and evaluation targeted for FY 2017.

Evaluation will be driven by a focus on the collective goals and on the design of indicators and measures for tracking collective progress toward achieving them, including the development of:

- Baseline data assembled for the collective objectives of the FY 2016 NSF INCLUDES Launch Pilots; and
- Common outcomes and metrics for NSF INCLUDES investments in collaboration with PIs, and the NSF INCLUDES Backbone Organization will be reviewed annually.

As part of the management and evaluation of NSF INCLUDES, NSF will:

- Develop and implement an NSF INCLUDES social media and communications strategy;
- Determine and implement appropriate approaches to monitoring system(s) designed for NSF INCLUDES investments and pilots;
- Collect data and report progress toward NSF INCLUDES collective objectives; and
- Plan for post-program activity with a report of recommendations for future NSF BP directions (FY 2021).

NSF INCLUDES provides the opportunity to implement a coordinated approach for evaluating ongoing efforts across NSF's efforts in broadening participation. NSF anticipates using a portfolio approach and innovative text-mining tools for portfolio analysis. Results from the NSF INCLUDES evaluation activities will help strengthen, improve, or refine ongoing programs. This investment priority will be closely monitored for its successes in breaking new ground in both assessment practices and innovative solutions for addressing the underrepresentation challenge in STEM.