STEM Education

Goal Leaders:
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White House Office of Science and Technology Policy
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National Science Foundation

FY2015 Quarter 3

Overview

Goal Statement

Improve science, technology, engineering, and mathematics (STEM) education by implementing the *Federal STEM Education 5-Year Strategic Plan*, announced in May 2013, specifically:

- Improve STEM instruction
- Increase and sustain youth and public engagement in STEM
- Enhance STEM experience of undergraduate students
- Better serve groups historically under-represented in STEM fields
- Design graduate education for tomorrow's STEM workforce
- Build new models for leveraging assets and expertise
- Build and use evidence-based approaches

Urgency

- Advances in STEM have long been central to our nation's economy, security, and ability to preserve the health of its people and the environment; enhancing U.S. students' engagement and success in STEM disciplines is essential to the U.S. maintaining its preeminent position in the world.
- We have considerable progress to make given that our K-12 system ranks "middle of the pack" in international comparisons.
- Meeting the growing demand for STEM expertise and competency is important to the economy and our democracy.
- Increasing opportunities in STEM for more Americans is critical to building a just and inclusive society.

Vision

- The Federal STEM Education 5-Year Strategic Plan sets out ambitious national goals to drive federal investment in five priority STEM education areas toward which significant progress will require improved coherence and coordination across federal agencies with STEM assets and expertise and STEM education resources.

Progress Update: FY15 Quarter 3 Highlights

Federal Coordination in STEM Education (FC-STEM) updates:

- Federal Coordination STEM (FC-STEM) convened with representation from all five Interagency Working Groups (IWGs), representatives of the Office of Management and Budget (OMB), and the Performance Improvement Council (PIC) on May 27, 2015. The group discussed the remaining two and a half years of the *Federal 5-Year STEM Strategic Plan* and decided that FC-STEM leadership shall serve as the decision-making body for crucial IWG junctures as well as determining ways for FC-STEM to further support the IWG leadership.
    - A new co-lead was identified in Q3 for the Undergraduate Education IWG from the Department of Energy.

CAP Goal Collaboration Events:

- In support of the *Federal 5-Year STEM Education Strategic Plan* "Improve STEM Instruction" goal strategic objective 1 (on effective teacher preparation), the P-12 IWG completed two listening sessions in Q3 with faculty working with pre-service mathematics and science teachers to learn about current best practices for incorporating authentic STEM experiences in teacher preparation programs. These sessions illuminated the need for:
    - a convention or framework for "authentic STEM experiences."
    - a centralized repository of and dissemination strategy for information about federal STEM education programs that support STEM teachers.

Progress Update: FY15 Quarter 3 Highlights

CAP Goal Collaboration Events: (continued)

- To address the *Federal STEM Education 5-Year Strategic Plan* "Enhance STEM Experience of Undergraduate Students" goal strategic objectives 1 and 2 (on evidence-based instructional practices and support of 2-year colleges), the NSF sponsored a Community College Innovation Challenge (CCIC), informed and shaped by discussions in the Undergraduate IWG. Finalists in the challenge attended a weeklong boot camp, culminating in an event hosted on Capitol Hill on June 15, 2015. Event announcements resulted in over 9 million tweets (LINK).

- To examine undergraduate strategic objectives 1 and 4 (on evidence-based instructional practices and improving entry-level mathematics), a new survey item is being developed for inclusion in the current High School Longitudinal Study of 2009 Second Follow-Up (LINK). This is possible through collaboration among members of the Undergraduate IWG, NSF, and the Department of Education (ED). Many students enter college poorly prepared for mathematics, which is a gateway to college success in STEM and other disciplines. The new survey item will provide data on the mathematical instructional practices students experience in high school compared with those experienced in college.

- The Underrepresented Groups IWG (also referred to as the Broadening Participation (BP) IWG) addressed the *Federal STEM Education 5-Year Strategic Plan* goal to "Better Serve Groups Historically Underrepresented in STEM Fields" strategic objective 1, which concerns the need to be more responsive to rapidly changing demographics and issues for groups underrepresented in STEM, and objective 2, which calls for more focused investments to prepare students for success in higher education, through two convenings:
    - The BP IWG collaborated with Office of Science and Technology Policy (OSTP) to plan and implement the *Roundtable on Best Practices for Assessing Inclusive Environments* on June 10, 2015 inform new strategies to improve the impact of the federal portfolio of investment in broadening participation across agencies.
    - The BP IWG Co-Chairs reported on the outcomes of the *Roundtable* at the subsequent meeting, the *White House Forum on Excellence and Innovation through Diversity in the STEM Workforce,* held on June 23, 2015.

Progress Update: FY15 Quarter 3 Highlights

CAP Goal Collaboration Events: (continued)

- In support of the Undergraduate IWG strategic objective 4 that addresses the concern that students who are interested in STEM and STEM-related careers have challenges moving ahead unless they have successful experiences in mathematics within their first two years of college, NSF released a A Dear Colleague Letter (DCL) inviting work focused on *Increasing College Opportunity Through Improved Mathematics Success in the First Two Years of College*. The DCL was NSF's commitment to the White House December 4, 2014 College Opportunity Day of Action. Thirty grant awards were made in the third quarter by NSF in this area.
- The BP IWG met with staff from the White House Council on Women and Girls to discuss Advancing Equity and Empowerment and Champions of Change plans for supporting under-represented women and girls in STEM, and staff from ED to discuss the work being done on the My Brother's Keeper initiative.
- The NSF Advisory Committee for Education and Human Resources (EHRAC) held a public meeting on May 19-20, 2015, at NSF to discuss the evolving nature of graduate STEM education in the United States (LINK). Panelists affiliated with numerous universities, the Council of Graduate Schools, The National Center for Science and Engineering Statistics, the National Institutes of Health (NIH), and the National Science Board staff sought to identify appropriate graduate STEM education indicators, non-cognitive skills, and exploring the future of graduate STEM education.

Progress Update: FY15 Quarter 3 Highlights

Meetings and Outreach:

- To address Goals 1 and 2 of the *Federal STEM 5-Year Strategic Plan,* the Undergraduate Education IWG, along with the BP IWG, initiated joint outreach to the minority-serving institution (MSI) community colleges to increase participation in federal funding opportunities through the following events:
  - ED hosted an event on behalf of the Pacific Post-Secondary Education Council (PPEC) on June 24 featuring representatives from the DOE, Smithsonian, and NSF. Event participants included the presidents of community colleges and universities from Hawaii, Guam, the Marshall Islands, Palau, Micronesia, and American Samoa. PPEC leaders met with representatives of Federal agencies and left better informed to apply to Federal programs that support STEM education at their institutions.
  - ED hosted the Asian American and Native American Pacific Islander-Serving Institutions Program (AANAPISI) capacity-building workshop during the Asian Pacific Islander American Scholarship Fund API Higher Education Summit on June 22, featuring representatives from the DOE, U.S. Department of Agriculture, and NSF. AANAPISI staff, faculty, students and presidents gained information about Federal opportunities.
- To inform undergraduate strategic objective 3, focused on authentic undergraduate STEM experiences, the National Research Council study on undergraduate learning through research was launched on June 4, 2015, with NSF funding (LINK).
- To advance undergraduate strategic objective 1 focused on evidence-based teaching, the National Research Council hosted a webinar entitled *"Reaching Students: Putting the Book to Work to Improve Undergraduate Instruction,"* that was broadcast on June 8, 2015, for 500 participants. The webinar focused on the newly released federally funded practitioner's guide to implementing evidence-based practices, Reaching Students (LINK). The book has been downloaded 13,531 times and the webinar recording has received 96 downloads.
- The Engagement IWG provided outreach to the national arm of the 4-H organization at a NASA-hosted event on April 14, 2015. Engagement leaders invited select high school 4-H students from local chapters to present their vision and recommendations for improving STEM education in rural communities. Recommendations included: Make STEM more fun, introduce STEM concepts earlier in education, interact with STEM over social media platforms, increase inter-agency interaction on STEM education issues, and encourage more public/private STEM education interactions.

Progress Update: FY15 Quarter 3 Highlights

Additional Activities:

- The BP IWG completed the following tasks that are relevant to strategic objectives 2 and 3:
  - Summarized Federal investments in BP based on portfolio review and Co-STEM inventory.
  - Worked with ED's National Library of Education to provide parameters for a systematic review on underrepresented groups in STEM, spanning the literature over the past 10 years. Over 450 articles were identified that will inform a Gap Analysis in Fall 2015.
  - Drafted a report on broadening participation in STEM, highlighting challenges and recommendations.
- To examine all four undergraduate strategic objectives, the Undergraduate STEM Education IWG identified core metrics and indicators from a wide-range of datasets available from the National Science Board's dashboard and the National Center for Education Statistics (NCES).

STEM Education Goal Team and Governance Plan

Oversight and Project Management of Implementation Working Groups
Goal Leaders: Joan Ferrini-Mundy and Jo Handelsman
Deputy Goal Leaders: National Science Foundation (NSF) and Office of Science and Technology Policy (OSTP)

P-12 STEM Instruction

Co-Leads:
- ED
- NSF

Engagement

Co-Leads:
- Smithsonian
- NASA

Undergraduate STEM Education

Co-Leads:
- NSF
- DOE

Under-represented Groups

Co-Leads:
- NSF
- NIH

Graduate Education

Co-Leads:
- NSF
- NIH

Coordination Objectives

Lead:
- FC-STEM

Governance

- Co-STEM: Jo Handelsman (OSTP) and France Córdova (NSF) are Co-Chairs. Annual report from FC-STEM to Co-STEM
- FC-STEM: Joan Ferrini-Mundy (NSF) and Donald James (NASA) are Co-Chairs. Quarterly reports from Inter-agency Working Groups to FC-STEM

Action Plan Summary

Sub-goal	Major Strategies to Achieve Impact	Key indicators
1. Improve STEM instruction	• Support teacher preparation efforts that encourage use of evidence-based STEM learning opportunities • Increase and improve authentic STEM experiences for teachers	• Percentage of high school mathematics and science teachers who hold degrees in their teaching field or in science of mathematics education • Number of STEM bachelor's degrees earned annually • Percentage of bachelor's degrees awarded to women, black or African American, Hispanic, and American Indian or Alaska Native students (Plus further indicators in development – see slide 15)
2. Increase and sustain youth and public engagement in STEM	• Provide access to scientific and engineering assets of the federal government • Integrate STEM into school-readiness and after-school programs • Improve empirical understanding of how authentic STEM experiences influence learning or interest	
3. Enhance STEM experience of undergraduate students	• Implement evidence-based instructional practices and innovations • Improve STEM education at 2-year colleges and transfer to 4-year colleges • Support the development of university-industry partnerships to provide relevant and authentic experiences • Address high failure rates in introductory undergraduate mathematics	
4. Better serve groups historically under-represented in STEM fields	• Be more responsive to rapidly changing demographics • Focus investments on developing and testing strategies for improving preparation for higher education • Invest in efforts to create campus climates that are effective in improving success for students from under-represented groups	
5. Design graduate education for tomorrow's STEM workforce	• Recognize and provide financial support to students of high potential • Provide opportunities for fellows' preparation in areas critical to the Nation • Combine and enhance mechanisms that evaluate the impact of fellowships to inform future Federal investments	
6. Build new models for leveraging assets and expertise	• Collaborate to build implementation roadmaps in the goal areas • Reduce administrative barriers to collaboration • Develop a framework to guide coordinated CoSTEM agency budget requests	
7. Build and use evidence-based approaches	• Support syntheses of existing research on critical issues in STEM priority areas • Improve and align evaluation and research strategies across Federal agencies • Streamline processes for interagency collaboration	

Work Plan Sub-goal 1: P-12 STEM Education

Strategic Objectives

1. Support teacher preparation efforts that encourage use of evidence-based STEM learning opportunities
2. Increase authentic STEM experiences for teachers

Key Milestones (Lead: ED / NSF)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Identify opportunities to leverage related efforts of IWG on Undergraduate Education	12/2014	Complete	IWG P-12, IWG Undergrad	Obstacles included range of purposes motivating agency commitment to undergraduate and P-12 education, including preservice teacher prep and authentic research experiences for teachers/undergrads.
Create a repository of best practices and research related to teacher preparation and professional learning	02/2015*	Complete	IWG P-12	
Conduct an in-depth analysis of one regional "hotspot zone" to identify all relevant federal asset activity, programs, and local non-governmental efforts to improve STEM instruction	02/2015**	Complete	IWG P-12	Initial analysis was limited in scope to three areas: Hunstsville, AL; Minneapolis, MN; and, Baltimore area, MD.
Conduct focus group sessions with Institutes of Higher Education (IHE) faculty responsible for educating pre-service teachers around using evidence-based STEM learning opportunities and federal resources. Prepare analysis of sessions.	06/2015	Complete	IWG-P12	No barriers identified.
Finalize FY16 outcomes, activities and milestones	09/2015	On Track	IWG-P12	Time constraints for participants are a potential obstacle.

*Due date revised. The original due date was 09/2014. NSF is working with possible Congressional report language along this line.

**Due date revised. The original due date was 11/2014. Identifying all federal activities has been more challenging for some agencies than originally anticipated.

Work Plan Sub-goal 2: Engagement in STEM Education

Strategic Objectives

1. Access to scientific and engineering assets of the Federal government
2. Integration of STEM into school readiness and after-school programs
3. Empirical understanding of how STEM experiences influence learning

Key Milestones (Lead: ED / NSF)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Identify STEM Engagement Activities of CoSTEM agencies	12/2014*	Missed	IWG - Engagement	Group leadership is in transition; Engagement has yet to convene and host a formal meeting in FY15
Identify evaluation models used to effectively study engagement	01/2015*	Missed	IWG Engagement	Group leadership is in transition; Engagement has yet to convene and host a formal meeting in FY15
Implementation of agency commitments related to making and student engagement announced by President Obama at the White House Maker Faire	06/2015*	Unable to report	Office of Science and Technology Policy (OSTP)	No barriers identified with regard to OSTP.

*Milestones have not been started.

Work Plan Sub-goal 3: Undergraduate STEM Education

Strategic Objectives

1. Implementation of evidence-based instructional practices and innovations.
2. Improve STEM education at 2-year colleges and transfer to 4-year colleges.
3. Support the development of university-industry partnerships to provide relevant and authentic experiences.
4. Address high failure rates in introductory mathematics at undergraduate level.

Key Milestones (Lead: NSF/TBD)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Leverage related efforts of IWG on Graduate Education: A) Identify opportunities for collaboration B) Develop and launch an undergraduate research experiences portal C) Develop a communications plan for federal research experiences portal with Graduate Education IWG	12/2014 (A)	Complete	IWG Undergrad	No barriers identified at this time.
	12/2015 (B)	On track	IWG Undergrad	No barriers identified at this time.
	01/2016 (C)	On track	IWG Undergrad and IWG Graduate	Dependent on B. OSTP will lead announcement with newly revamped science.gov website.
Identify opportunities to leverage related efforts of IWG on P-12 Education	12/2014	Complete	IWG Undergrad	Potential obstacles include range of purposes motivating agency commitment to undergraduate and P-12 education, including preservice teacher education.
Develop an online, cross-agency resource of federal programs of interest to community colleges	12/2014	Complete	IWG Undergrad	No barriers identified at this time.

Work Plan Sub-goal 3: Undergraduate STEM Education (continued)

Strategic Objective:

1. Implementation of evidence-based instructional practices and innovations.
2. Improve STEM education at 2-year colleges and transfer to 4-year colleges.
3. Support the development of university-industry partnerships to provide relevant and authentic experiences.
4. Address high failure rates in introductory mathematics at undergraduate level.

Key Milestones (Lead: NSF/TBD)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Include item on undergraduate mathematics instruction in NCES 2009 High School Longitudinal Survey (HSLS) second follow up: A) Decision to do in-depth cognitive testing or field testing on new item for the HSLS on undergraduate mathematics instruction B) Item integrated into HSLS Second Follow-up (develop) C) Survey data collected from HSLS D) Survey results available	12/2014 (A)	Complete	IWG Undergrad	No barriers identified at this time.
	4/2015 (B)	Complete	IWG Undergrad	Dependent on A
	12/2016 (C)	On track	IWG Undergrad	Dependent on B
	12/2017 (D)	On track	IWG Undergrad	Dependent on C
Outreach efforts to increase implementation of evidence-based instructional practices and innovations i) Reaching Students webinar viewings ii) Reaching Students book downloads	8/2015	Complete	IWG Undergrad	

Work Plan Sub-goal 3: Undergraduate STEM Education (continued)

Strategic Objectives

1. Implementation of evidence-based instructional practices and innovations.
2. Improve STEM education at 2-year colleges and transfer to 4-year colleges.
3. Support the development of university-industry partnerships to provide relevant and authentic experiences.
4. Address high failure rates in introductory mathematics at undergraduate level.

Key Milestones (Lead: NSF/TBD)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Identify common evaluation elements for undergraduate authentic STEM experiences to be used across Federal agencies: <u>Phase 1:</u> Common Indicator Metrics Analysis *(see Key Indicators)*		On track	IWG Undergrad	Potential obstacles include range of purposes motivating agency commitment to undergraduate research and intern opportunities.
	08/2015	Complete	IWG Undergrad	No barriers identified at this time.
Collaborate with IWG on Broadening Participation: A) Identify opportunities to leverage related efforts of Broadening Participation. B) Develop a Minority Serving Community College and federal agency convening to share information and resources about agency grant opportunities with MSIs: i) PPEC ii) AANAPISI C) Host interagency convening to scale MSI outreach to all MSI community colleges	07/2015 (A)	Complete	IWG Undergrad	Potential obstacles include range of purposes motivating agency commitment to undergraduate education and broadening participation initiatives.
	10/2015 (B)	Complete	IWG Undergrad	No barriers identified at this time.
	11/2015 (C)	On track	IWG Undergrad	No barriers identified at this time.
Development of an Undergraduate Education Forum that aligns with the four strategic objectives	02/2016	On track	IWG Undergrad	No barriers identified at this time.

Work Plan Sub-goal 4: Broadening Participation in STEM Fields

Strategic Objectives

1. Be more responsive to rapidly changing demographics
2. Focus investments
3. Invest in efforts to create campus climates that are effective in improving success for students from underrepresented groups

Key Milestones (Lead: NIH/NSF)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Create a repository for reports, literature, and committee products and deliverables for subgroups assigned to each major action item	12/2014	Complete	IWG Co-leads	OMB Max site created and populated with meeting minutes, roster, and related materials. DropBox site also created with identical documents. OMB Max will be primary site for most. The IWG will make portions of this data and information public in the future.
Meet with leads for UG, Graduate, K12, and Engagement IWGs to identify opportunities for collaboration and leveraging of efforts	3/2015	Complete	IWG BP	Meetings with UG, Graduate, and K12 working groups completed. Engagement IWG meeting was attended by representative of BP IWG.
Conduct a review of existing portfolio of BP efforts (federal)and non-federal models and approaches using the FC STEM inventory, presentations, literature reviews, and reports	6/2015	Complete	IWG BP	After two meetings, it is clear that the committee needs to gain a better understanding of federal portfolio, as well as reports and literature on practices and challenges. A literature review was completed in June.
Develop a summary document which includes best practices (BP), challenges, and needs in BP to support strategies and recommendations designed to focus federal BP investments	6/2015	Complete	IWG BP	Draft Summary Document completed; will review and revise as needed
Agencies identify and begin implementation of modifications to existing program portfolio to address gaps to provide more opportunities for URMs in STEM	9/2015	New due date will be provided in Q4	IWG BP	There is a need for a gap analysis to complement the Co-STEM Inventory before programmatic changes can be proposed. The timeline for a gap analysis and related tasks will be reported in Q4.

Work Plan Sub-goal 4: Broadening Participation in STEM Fields (continued)

Strategic Objectives

1. Be more responsive to rapidly changing demographics
2. Focus investments
3. Invest in efforts to create campus climates that are effective in improving success for students from underrepresented groups

Key Milestones (Lead: NIH/NSF)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Agencies identify strategies and timeline for incorporating campus climate guidelines and best practices into funding opportunities	10/2015	Will be revised for FY16	IWG BP	Activities for FY16 will include new milestones for campus climate; will work more closely with other IWGs to develop a long-term strategy for campus climate that addresses both undergraduate and graduate education.
Ideas proposed to maximize the impact of the federal investment with a timeline for agency adoption	12/2015	Will be revised for FY16	IWG BP	Activities for FY16 will include new milestones to address the development of cross-agency initiatives to maximize the impact of the federal STEM investment; will work more closely with other IWGs to develop a long-term strategy that addresses the lack of preparation for higher education and adoption of best practices recruitment, retention and engagement of underrepresented groups in STEM

Work Plan Sub-goal 5: Graduate STEM Education

Strategic Objectives

1. Recognize and provide financial support to students of high potential
2. Provide opportunities for fellows' preparation in areas critical to the nation
3. Combine and enhance mechanisms that evaluate the impact of fellowships to inform future federal investments

Key Milestones (Lead: NSF/NIH)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Establish MOUs across agencies to broaden research opportunities of NSF fellows	10/2014	Complete	IWG Grad	No barriers identified at this time.
Assemble inventory of evaluation approaches for graduate programs	01/2015	Complete	IWG Grad	No barriers identified at this time.
Identify available resources for the evaluation of graduate programs	01/2015	Complete	IWG Grad	No barriers identified at this time.
Identify options such as courses and internships to enhance the quality of graduate training to better address the needs of a future STEM workforce	01/2015	Complete	IWG Grad	No barriers identified at this time.
Create common portal for fellowship and traineeship opportunities for graduate students	03/2015*	Complete	IWG Grad	No barriers identified at this time.
Hold a workshop with the Performance Improvement Council to begin to identify new milestones and indicators for 2016	04/2015	Complete	IWG Grad	No barriers identified at this time.

*Due date revised. The original due date was 02/2015. Additional time was needed for design of the portal.

Work Plan Sub-goal 5: Graduate STEM Education

(continued)

Strategic Objectives

1. Recognize and provide financial support to students of high potential
2. Provide opportunities for fellows' preparation in areas critical to the nation
3. Combine and enhance mechanisms that evaluate the impact of fellowships to inform future federal investments

Key Milestones (Lead: NSF/NIH)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Initiate discussions with the National Center for Science and Engineering Statistics to improve the reporting of federal support for graduate education through the Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS).	06/2015	Complete	IWG Grad	Actual modifications to the GSS survey will only be made after discussions around feasibility have been completed by NCSES and the IWG grad members.
Expand MOU partners to include most CoSTEM partners in opportunities for NSF fellows	12/2015	On track	IWG Grad	No barriers identified at this time.
Expand Portal to include undergraduate research opportunities	12/2015	On track	IWG Grad and IWG Undergrad	No barriers identified at this time.

*Key Indicators (Undergraduate Education)

**Key Implementation Data						
Indicator	**Source**	**Baseline**	**Target**	**Frequency**	**Latest data**	**Trend**
Percentage of high school mathematics and science teachers who hold degrees in their teaching field or in science of mathematics education	S&EI 2014	See Table A	⬆	Biannually but based on variable survey	2012	N/A
Number of STEM bachelor's degrees earned annually	S&EI 2014	554,365 See Tables B & C	⬆	Biannually	2011	N/A
How many undergraduate students enroll in 4-yr institutions?	S&EI 2014	21,260,976 See Table D	Stable	Biannually	2011	N/A
What is the retention rate in U.S. 4-yr institutions?	S&EI 2014	57.8% See Table E	⬆	Biannually	2011	N/A
What percentage of S&E degrees do women and racial/ethnic minorities earn?	S&EI 2014	See Tables F, G, H & I	⬆ women in computer science and engineering; ⬆ Hispanic Pop.	Biannually	2011	N/A
How many degrees are earned in STEM and what subfields are most popular?	S&EI 2014	See Table B	⬆ computer science and engineering	Biannually	2011	N/A
How many views did the Reaching Students webinar receive?	NAS, NRC, BOSE	96 times	Anticipated to ⬆ in Q4	Quarterly	2015	N/A
How many times has Reaching Students been accessed and downloaded?	NAS, NRC, BOSE	14,491 down-loads	⬆	Quarterly	2015	N/A

*The IWGs are working with the PIC to identify additional key indicators for the strategic objectives.
**Updated data will be available January 2016 in Science and Engineering Indicators, 2016.

APPENDICES

Appendix A:

Undergraduate Education IWG Source Data and Explanatory Captions

Table A. Mathematics and Science Teachers with an Undergraduate or Graduate Degree in Mathematics or Science, by Grade Level (2012)
Table B. Number of STEM Bachelor's Degrees Earned Annually (2011)
Table C. Bachelor's Degrees by Broad Field of Degree: 2000-11 (2011)
Table D. Undergraduate and total enrollment in higher education, by Carnegie institution type: 1996–2011 (2011)
Table E. Persistence and outcome of postsecondary students beginning 4-year colleges or universities in 2004:2009 (2012)
Table F. Percentage of Bachelor's Degrees Awarded to Women
Table G. Women's Share of S&E Bachelor's Degrees by Field: 2000-11
Table H. Percentage of Bachelor's Degrees Awarded by Race and Ethnicity (2011)
Table I. Share of S&E Bachelor's Degrees among U.S. Citizens and Permanent Residents by Race and Ethnicity: 2000-11

(Corresponding tables follow on next nine slides)

Table A. Mathematics and Science Teachers with an Undergraduate or Graduate Degree in Mathematics or Science, by Grade Level (2012)

Mathematics and science teachers with an undergraduate or graduate degree in mathematics or science, by grade level: 2012

(Percent)

	Mathematics teachers' degree				Science teachers' degree			
Grade level	Mathematics	Mathematics education	Mathematics or mathematics education	None of these fields	Science or engineering	Science education	Science, engineering, or science education	None of these fields
Elementary	4	2	4	96	4	2	5	95
Middle	23	26	35	65	26	27	41	59
High	52	54	73	27	61	48	82	18

SOURCE: Banilower ER, Smith PS, Weiss IR, Malzahn KA, Campbell KM, Weis AM, *Report of the 2012 National Survey of Science and Mathematics Education* (2013).

Table B. Number of STEM Bachelor's Degrees Earned Annually (2011)

S&E degrees awarded, by degree level, Carnegie institution type, and field: 2011

		S&E field									
Degree and institution type	All fields	All S&E	Agricultural sciences	Biological sciences	Computer sciences	Earth, atmospheric, and ocean sciences	Mathematics	Physical sciences	Psychology	Social sciences	Engineering
Bachelor's	1,734,229	554,365	22,759	93,654	43,586	5,299	18,021	19,198	101,568	172,181	78,099
Doctorate-granting universities—very high research activit	444,695	210,425	10,283	37,626	8,193	2,023	6,682	6,852	28,402	69,114	41,250
Doctorate-granting universities—high research activity	249,963	82,410	3,812	13,668	4,909	869	2,176	2,490	13,832	23,135	17,519
Doctoral/research universities	121,588	30,818	874	4,391	4,231	265	835	964	5,389	10,657	3,212
Master's colleges and universities	647,346	158,483	5,162	24,340	16,319	1,397	5,677	5,614	40,877	47,776	11,321
Baccalaureate colleges	199,039	64,878	2,577	12,804	5,554	728	2,626	3,206	12,620	21,163	3,600
Associate's colleges	6,079	845	33	21	778	0	0	0	6	1	6
Medical schools and medical centers	6,435	66	0	66	0	0	0	0	0	0	0
Schools of engineering	1,329	1,168	0	5	41	14	9	25	0	2	1,072
Other specialized institutions	48,610	3,929	0	623	2,679	0	5	37	320	204	61
Tribal colleges	230	68	18	0	2	0	0	0	3	45	0
Not classified	8,915	1,275	0	110	880	3	11	10	119	84	58

NOTES: Medical and other health sciences are included in non-S&E. Carnegie institution type corresponds to the 2010 Carnegie Classification of Academic Institutions.

SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey; National Science Foundation, National Center for Science and Engineering Statistics, Integrated Science and Engineering Resources Data System (WebCASPAR), http://webcaspar.nsf.gov.

Science and Engineering Indicators 2014

Table C. Bachelor's Degrees by Broad Field of Degree: 2000-11

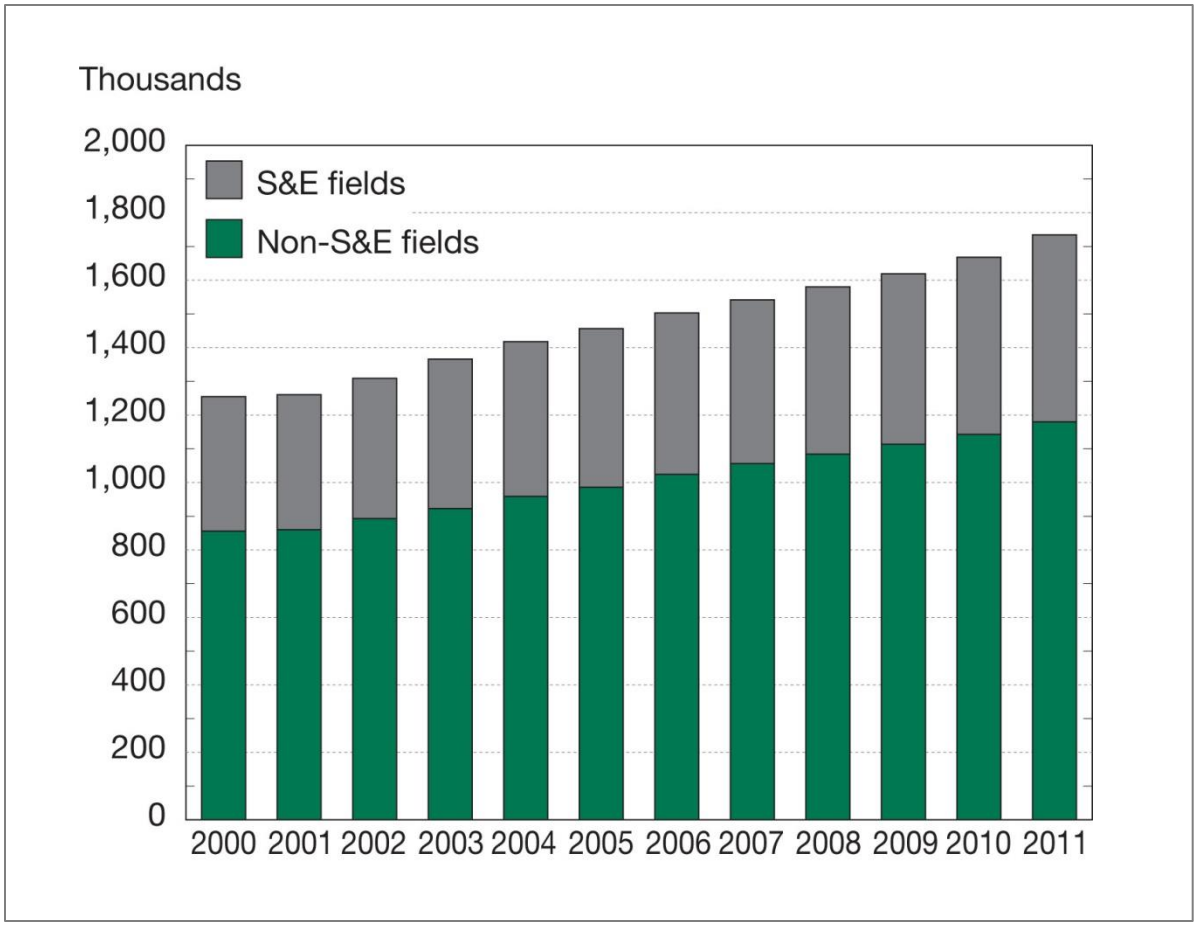


Table D. Undergraduate and total enrollment in higher education, by Carnegie institution type: 1996–2011

Undergraduate and total enrollment in higher education, by Carnegie institution type: 1996–2011

Year	All institutions	Doctorate-granting universities—very high research activity	Doctorate-granting universities—high research activity	Doctoral/research universities	Master's colleges/universities	Baccalaureate colleges	Associate's colleges	Medical schools/medical centers	Schools of engineering	Other special-focus institutions	Tribal colleges	Not classified
Undergraduate enrollment												
1996	12,492,977	1,644,593	1,070,468	437,218	2,612,051	1,020,698	5,267,882	16,734	8,478	140,561	16,239	258,055
1997	12,612,475	1,657,573	1,081,126	436,854	2,631,151	1,034,249	5,327,041	15,974	8,647	156,608	12,612	250,640
1998	12,624,375	1,685,713	1,095,420	442,904	2,639,439	1,050,440	5,243,060	15,710	8,045	165,752	12,919	264,953
2000	13,329,803	1,719,504	1,125,321	462,975	2,723,233	1,081,439	5,739,088	13,491	9,169	190,714	13,603	251,266
2001	13,895,335	1,764,724	1,156,958	489,260	2,826,759	1,117,917	6,104,082	13,268	9,244	210,579	13,835	188,709
2002	14,444,738	1,802,603	1,187,781	511,419	2,928,162	1,158,480	6,424,455	12,634	9,217	228,511	15,343	166,133
2003	14,666,119	1,824,259	1,202,071	536,510	3,006,325	1,182,415	6,485,355	12,563	9,295	242,865	17,527	146,934
2004	14,974,136	1,830,746	1,215,495	577,482	3,087,511	1,204,451	6,611,034	13,331	9,237	268,907	17,180	138,762
2005	15,157,730	1,845,961	1,220,299	580,383	3,231,039	1,219,702	6,638,361	13,325	9,291	286,259	16,879	96,231
2006	15,379,340	1,867,178	1,235,926	629,485	3,264,180	1,225,916	6,733,782	13,281	9,599	298,458	17,071	84,464
2007	15,799,911	1,889,120	1,255,393	691,830	3,345,697	1,235,007	6,947,933	13,315	9,557	310,276	17,222	84,561
2008	16,570,857	1,933,487	1,276,090	774,634	3,511,605	1,285,197	7,368,489	13,939	9,487	326,798	16,798	54,333
2009	17,778,741	1,966,982	1,309,390	866,197	3,702,312	1,355,993	8,155,018	14,113	9,377	356,043	19,507	23,809
2010	18,312,649	1,995,701	1,340,538	830,631	3,797,734	1,407,205	8,401,309	14,559	9,158	372,277	21,014	122,523
2011	18,299,791	2,023,129	1,369,440	836,182	3,836,672	1,417,598	8,211,697	14,873	9,041	355,331	18,777	207,051
Total enrollment												
1996	14,550,056	2,347,141	1,428,519	610,253	3,192,552	1,055,057	5,269,455	75,914	9,078	243,649	16,390	302,048
1997	14,680,488	2,356,066	1,440,299	607,876	3,228,823	1,069,883	5,328,274	76,861	9,359	258,231	12,734	292,082
1998	14,711,280	2,382,444	1,451,533	616,107	3,254,684	1,087,531	5,244,783	76,653	8,799	271,358	13,273	304,115
2000	15,506,922	2,424,538	1,484,966	643,689	3,388,391	1,121,015	5,740,898	76,973	10,213	303,793	13,680	298,766
2001	16,129,629	2,483,646	1,526,997	685,362	3,521,101	1,157,008	6,105,526	78,162	10,455	324,681	13,996	222,695
2002	16,822,915	2,558,455	1,577,560	730,727	3,685,743	1,198,815	6,426,331	80,595	10,663	351,093	15,468	187,465
2003	17,118,126	2,593,906	1,599,392	778,843	3,781,023	1,224,072	6,488,052	82,081	10,830	374,566	17,776	167,585
2004	17,492,964	2,604,610	1,615,367	844,762	3,882,875	1,246,922	6,613,895	87,260	10,765	409,349	17,605	159,554
2005	17,710,640	2,620,649	1,618,433	863,683	4,042,334	1,263,421	6,642,190	90,647	10,773	430,521	17,167	110,822
2006	17,985,045	2,651,949	1,636,192	921,489	4,101,270	1,270,345	6,737,208	93,438	11,094	445,196	17,255	99,609
2007	18,474,977	2,691,983	1,665,194	998,984	4,205,276	1,281,708	6,951,546	96,616	11,016	459,801	17,418	95,435
2008	19,338,981	2,748,682	1,695,467	1,110,746	4,406,031	1,336,829	7,372,093	101,675	10,883	479,510	17,014	60,051
2009	20,671,503	2,809,366	1,746,651	1,219,751	4,640,495	1,415,001	8,159,022	106,789	10,809	516,766	19,686	27,167
2010	21,280,059	2,854,408	1,785,934	1,193,468	4,741,562	1,471,538	8,406,072	111,305	10,681	540,877	21,225	142,889
2011	21,260,978	2,886,167	1,810,490	1,195,172	4,745,798	1,483,886	8,214,689	114,420	10,582	525,754	18,920	255,100

NOTES: Data are not available for 1999. Data are based on degree-granting institutions eligible to participate in Title IV federal financial aid programs. Carnegie institution type corresponds to the 2010 classification.

SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System, Fall Enrollment Survey (various years); and National Science Foundation, National Center for Science and Engineering Statistics, Integrated Science and Engineering Resources Data System (WebCASPAR), http://webcaspar.nsf.gov.

Table E. Persistence and outcome of postsecondary students beginning 4-year colleges or universities in 2004:2009

Persistence and outcome of postsecondary students beginning 4-year colleges or universities in 2004: 2009

		Cumulative persistence outcome, 2009 (%)			
Major in 2004	Number	Bachelor's	Associate's or certificate	Still enrolled	No longer enrolled
All majors	1,657,800	57.8	6.2	12.2	23.7
S&E	397,500	63.3	4.5	11.7	20.5
Agricultural/biological sciences	80,600	71.4	3.1	10.2	15.3
Physical/math/computer sciences	85,300	51.7	7.4	11.3	29.5
Engineering	107,300	60.8	4.5	14.2	20.5
Social/behavioral sciences	124,300	62.4	3.4	14.7	19.1
Non-S&E	790,900	55.2	7.3	13.0	24.5
Missing/undeclared	469,400	57.5	5.9	11.3	25.3

NOTE: Physical sciences include earth, atmospheric, and ocean sciences. Social sciences include history.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003–04 Beginning Postsecondary Students Longitudinal Study, Second Follow-Up (BPS:04/09), http://nces.ed.gov/datalab/index.aspx.

Science and Engineering Indicators 2012

Table F. Percentage of Bachelor's Degrees Awarded to Women

Women's share of S&E bachelor's degrees, by field: 2000–11

(Percent)

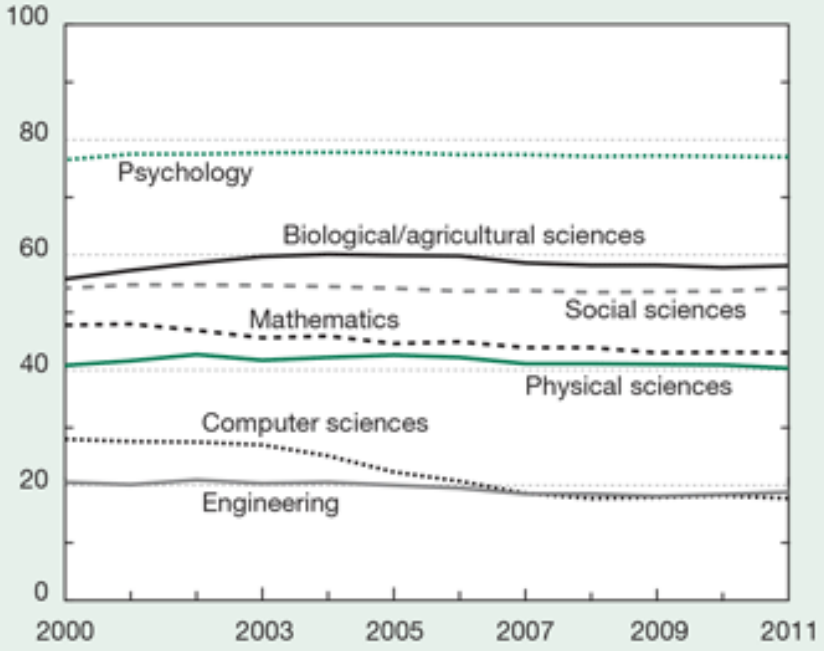
Year	Physical sciences	Biological/agricultural sciences	Mathematics	Computer sciences	Psychology	Social sciences	Engineering
2000	40.8	55.8	47.8	28.0	76.5	54.2	20.5
2001	41.6	57.3	48.0	27.6	77.5	54.8	20.1
2002	42.7	58.6	46.9	27.5	77.5	54.8	20.9
2003	41.7	59.7	45.6	27.0	77.7	54.7	20.3
2004	42.2	60.1	45.9	25.1	77.8	54.5	20.5
2005	42.6	59.9	44.6	22.3	77.8	54.2	20.0
2006	42.2	59.8	44.9	20.7	77.4	53.7	19.5
2007	41.1	58.6	43.9	18.6	77.4	53.8	18.5
2008	41.1	58.2	43.9	17.7	77.1	53.5	18.5
2009	41.0	58.2	43.0	17.9	77.2	53.6	18.1
2010	40.9	57.8	43.1	18.2	77.1	53.7	18.4
2011	40.3	58.1	43.0	17.7	77.0	54.2	18.8

NOTE: Physical sciences include earth, atmospheric, and ocean sciences.

SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey; National Science Foundation, National Center for Science and Engineering Statistics, WebCASPAR database, http://webcaspar.nsf.gov.

Table G. Women's Share of S&E Bachelor's Degrees by Field: 2000-11

Figure 2-18
Women's share of S&E bachelor's degrees, by field: 2000–11



NOTE: Physical sciences include earth, atmospheric, and ocean sciences.

SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey; and National Science Foundation, National Center for Science and Engineering Statistics, WebCASPAR database, http://webcaspar.nsf.gov.

Science and Engineering Indicators 2014

Table H. Percentage of Bachelor's Degrees Awarded by Race and Ethnicity (2011)

Share of S&E bachelor's degrees among U.S. citizens and permanent residents, by race and ethnicity: 2000–11

(Percent)

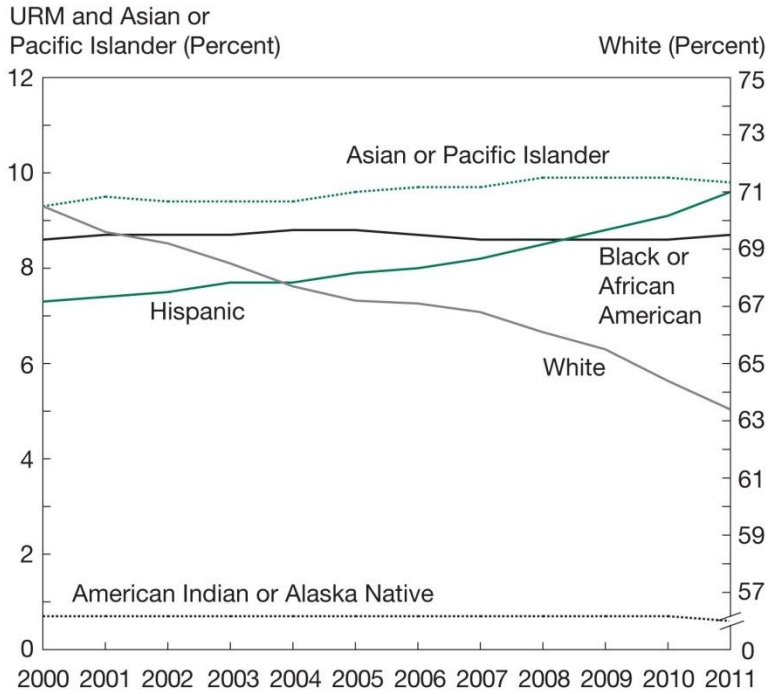
Year	Asian or Pacific Islander	Black or African American	Hispanic	American Indian or Alaska Native	White
2000	9.3	8.6	7.3	0.7	70.5
2001	9.5	8.7	7.4	0.7	69.6
2002	9.4	8.7	7.5	0.7	69.2
2003	9.4	8.7	7.7	0.7	68.5
2004	9.4	8.8	7.7	0.7	67.7
2005	9.6	8.8	7.9	0.7	67.2
2006	9.7	8.7	8.0	0.7	67.1
2007	9.7	8.6	8.2	0.7	66.8
2008	9.9	8.6	8.5	0.7	66.1
2009	9.9	8.6	8.8	0.7	65.5
2010	9.9	8.6	9.1	0.7	64.4
2011	9.8	8.7	9.6	0.6	63.4

NOTES: Hispanic may be any race. American Indian or Alaska Native, Asian or Pacific Islander, black, or African American and white refer to individuals who are not of Hispanic origin. Percentages do not sum to 100 because data do not include individuals who did not report their race and ethnicity.

SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey; National Science Foundation, National Center for Science and Engineering Statistics, WebCASPAR database, http://webcaspar.nsf.gov.

Science and Engineering Indicators 2014

Table I. Share of S&E Bachelor's Degrees among U.S. Citizens and Permanent Residents by Race and Ethnicity: 2000-11



URM = underrepresented minorities (black, Hispanic, and American Indian or Alaska Native).

NOTES: Hispanic may be any race. American Indian or Alaska Native, Asian or Pacific Islander, black or African American, and white refer to individuals who are not of Hispanic origin. Percentages do not sum to 100 because data do not include individuals who did not report their race and ethnicity.

Appendix B:

FY2016/17 Proposed Milestones for Sub-goal 4: Broadening Participation in STEM Fields (Goal 1)

Activities	Possible measures/indicators	Possible milestones	Owner	Due Date
Build a strong national broadening participation community by Identifying conferences, foundations, and/or organizations in STEM that address the education needs of underrepresented groups, including military children and individuals with disabilities	A community meeting of leaders from underrepresented minority organizations, societies, and foundations, as well as STEM industry leaders to exchange knowledge, develop partnerships, and make federal recommendations to improve and retain diversity in STEM	• Identify organizations that are appropriate for planning the meeting • Identify invitees that are appropriate for attending the meeting • BP IWG agrees on goals and objectives • Share meeting description with society, foundation, and organization leadership	TBD: Agency #1 Agency #2	
Establish a protocol to receive feedback from targeted audiences on federally funded broadening participation in STEM education opportunities	• BP component of the web portal includes a mechanism for communication with target audiences	• Discuss content to include in web portal • Identify target audiences • Review website	TBD: Agency #1 Agency #2	

FY2016/17 Proposed Milestones for Sub-goal 4: Broadening Participation in STEM Fields (Goal 2)

Activities	Possible measures/indicators	Possible milestones	Owner	Due Date
Conduct a gap analysis of federal broadening participation K-16 programs in to identify areas for program development based on FC-STEM inventory	• Analysis of federal investments in broadening participation showing quality and quantity of broadening participation support • Complete nine Interviews of STEM faculty/researchers to obtain input on factors related to federal program design, impact, and career trajectories	• Develop a study proposal to the BP IWG detailing parameters for a gap analysis • BP IWG agrees on design of gap analysis • Produce a white paper identifying gaps and highlighting case studies and perspectives of successful STEM researchers • Develop recommendations for new or modified programs in FY2017	NSF –Lead Agency #2- TBD	
Convene a workshop for external stakeholders and experts to discuss potential solutions to improve the STEM preparation of underrepresented groups and propose a research framework and/or agenda	• Convene an external stakeholder workshop in 2016 • Participants develop list effective strategies for K12 STEM preparation with an emphasis on mathematics • New or updated programs for FY2017 to address mathematics education in K12	• Discuss workshop goals and objectives with BP IWG • Share workshop description with UG & Grad IWGs • Discuss design with STPI and add to contract modification related to broadening participation • Identify invitees from STPI literature review on broadening participation	NSF – Lead Agency #2 - TBD	

FY2016/17 Proposed Milestones for Sub-goal 4: Broadening Participation in STEM Fields (Goal 3)

Activities/Strategies	Possible measures/indicators	Possible milestones	Owner	Due Date
Work with the Graduate Education IWG on a goal related to identifying best practices for defining and measuring diversity and broadening participation in graduate education.	• Cross agency analysis of programs with BP goals • Survey completed, issued, with appropriate response rate • Quality and quantity of information collected from college and university websites on broadening participation and inclusion programs	• Identify survey goals, parameters for college web search, target audience, and timeline • Draft survey and pilot • Establish baseline and targets	TBD: Agency #1 Agency #2	
Design a convening of campus leadership via cross-agency coordination to obtain buy-in for effective approaches to inclusion to create a campus climate where students are likely to succeed.	• Report on synthesis and/or meta-analysis of research on effective strategies for inclusion to develop draft approaches	• Plan convening with IWGs • Identify goals, objectives, leaders and federal representative to invite; convening date and location identified • Convening held in DC • Campus leaders propose and agree on effective approaches	TBD: Agency #1 Agency #2	
Working with UG and Grad IWGs, develop a cross-agency effort to eliminate bias in federally-funded higher education institutions as a strategy for enhancing inclusion and eliminating isolation. Fund interventions for evidence-based strategies for enhancing inclusion and eliminating isolation resulting from campus climate.	• Interagency RFP or program announcement released • Funded projects demonstrate leadership buy-in through active participation in the design process and research with participants.	• Identify agency programs that are appropriate for collaborative effort • Agree on goals and objectives • Draft interagency RFP or program announcement • Interagency agreements drafted and signed	TBD: Agency #1 Agency #2	
		• Proposals for federally-funded research projects include a list of available campus resources and programs designed to support diversity and eliminate biases.	TBD: Agency #1 Agency #2	

Acronyms

- AANAPISI - Asian American Native American Pacific Islander Serving Institutions
- BP – Broadening Participation
- CAP – Cross Agency Priority
- CCIC - Community College Innovation Challenge
- CCLC – Century Community Learning Center
- CoSTEM – Committee on Science, Technology, Engineering, and Mathematics
- DHS – Department of Homeland Security
- E.O. – Executive Order
- EHR – Education and Human Resources
- EPA – Environmental Protection Agency
- FBI – Federal Bureau of Investigation
- FY – Fiscal Year
- GRIP – Graduate Research Internship Program
- HSLS – High School Longitudinal Survey
- IHE – Institutes of Higher Education
- IWG – Interagency Working Group
- MET – Measures of Effective Teaching
- MOU – Memoranda of Understanding
- MSI – Minority Serving Institution
- NASA – National Aeronautics and Space Administration
- NAEP – National Assessment of Educational Progress
- NCSES – National Center for Science Engineering Statistics
- NIH – National Institute of Health
- NOAA – National Oceanic and Atmospheric Administration
- NSB – National Science Board
- NSF – National Science Foundation
- NSSME – National Survey of Science and Mathematics Education
- OMB – Office of Budget and Management
- OSTP – Office of Science and Technology
- P-12 – Grades preschool through twelve
- PIC – Performance Improvement Council
- PPEC - Pacific Postsecondary Education Council
- S&E – Science and Engineering
- SBE – Social, Behavioral, and Economic Sciences
- SEI – Science and Engineering Indicators
- TALIS – Teaching and Learning International Survey
- TIMSS – Trends in International Mathematics and Science Study
- URM – Underrepresented Minorities