Progress Report on Coordinating Federal Science, Technology, Engineering, and Mathematics (STEM) Education

March 2016

About the Office of Science and Technology Policy

The Office of Science and Technology Policy (OSTP) advises the President on the effects of science and technology on domestic and international affairs. The Office serves as a source of scientific and technological analysis and judgment for the President with respect to major policies, plans, and programs of the Federal Government. OSTP leads an interagency effort to develop and implement sound science and technology policies and budgets. The Office works with the private sector to ensure Federal investments in science and technology contribute to economic prosperity, environmental quality, and national security. For more information, visit http://www.ostp.gov.

About this document

As called for in the America COMPETES Reauthorization Act of 2010, the National Science and Technology Council's (NSTC) Committee on STEM Education (CoSTEM) released, in May of 2013, the *Federal Science, Technology, Engineering, and Mathematics (STEM) Education 5-Year Strategic Plan* (Strategic Plan).[1]

As required by the Act, this report includes an update on Strategic Plan implementation activities, an update on efforts being taken to increase efficiency and coherence across the Federal STEM education portfolio, and a discussion of methods to disseminate information about Federally-supported STEM education research and resources.

This report also includes tables containing estimated and actual Federal STEM Education funding by agency and program (FY2015-2017). These data build on historical reporting of Federal STEM-education investments that appear in the Strategic Plan and in the *Federal Science, Technology, Engineering, and Mathematics (STEM) Education Portfolio* released by CoSTEM in December 2011.[2]

Copyright information

[1] http://www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf

[2] http://www.whitehouse.gov/sites/default/files/microsites/ostp/costem__federal_stem_education_portfolio_report.pdf

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20502

March 31, 2016

Members of Congress,

I am pleased to transmit this update on the Administration's efforts to coordinate Federal investments in science, technology, engineering, and mathematics (STEM) education.

President Obama believes that every American student deserves access to a high-quality education in STEM for both their future and for the Nation's future. Over the past seven years, the Obama Administration's efforts have resulted in unprecedented levels of public-private collaboration in support of STEM education; policies and budgets focused on maximizing Federal investment in active, rigorous STEM-learning experiences; and innovative and wide-ranging efforts to inspire and recognize young inventors, discoverers, and makers.

The Administration's actions to accelerate progress include:

- Setting and working to achieve ambitious national goals. These goals have included preparing 100,000 excellent STEM teachers and producing 1 million more STEM college graduates over a decade. Thanks to deep public and private commitments, our nation is halfway towards achieving the goal the President set in 2011 of preparing 100,000 new math and science teachers by 2021, and 25,000 additional engineers are graduating yearly compared to when President Obama took office. Earlier this year, the President announced a bold new call to action: to give every child the opportunity to learn computer science (CS). In just the past two months, there has already been a strong response to the President's call to action.

- Deploying the President's personal passion for getting more students excited about science and math. The President has hosted the first-ever White House Science Fairs—five so far—which celebrate student winners of math, science, and robotics competitions and hosted the first-ever Maker Faire in 2014, which showcased students and adults applying the tools and skills necessary to design and make just about anything. In addition, President Obama has led by example as the first President to write a line of computer code as part of an "Hour of Code" in 2014 and issued a video calling on students, parents, and teachers across the country to do the same.

- Maintaining a strong investment in STEM education even during difficult budgetary times. Throughout the President's tenure, the Administration has worked hard to incorporate STEM education into the Administration's overall education reform strategy. For example, the Department of Education's $4 billion *Race to the Top* program included preference to states whose proposals emphasized innovation in STEM education. The

President's 2017 Budget builds on this strong focus, invests $3 billion in discretionary funds for STEM education, and proposes $4 billion in mandatory funds to support the Computer Science for All initiative.

- Building a strong "all hands on deck" effort that includes business, nonprofits, foundations, and others. The Administration has secured more than $1 billion in private investment for improving STEM education as part of the President's Educate to Innovate campaign. More than 230 organizations have formed a coalition called *100Kin10* and made over 250 measurable commitments to increase the supply of excellent STEM teachers. Institutions and organizations made more than 100 individual commitments as part of the 2014 White House College Opportunity Days of Action to attract and retain tens of thousands more students on a pathway to STEM degrees to support the President's goal of one million more STEM college graduates.

- Expanding the impact of existing Federal STEM programs. The Administration has made strong strides in Federal agency collaboration to improve STEM education. In support of that shared goal, Congress passed and President Obama signed the America COMPETES Reauthorization Act of 2010, a key piece of legislation supporting the Federal Government's STEM education enterprise. As called for in this Act, the Administration formed a Committee on STEM Education (CoSTEM) under the National Science and Technology Council and produced a Federal STEM Education 5-Year Strategic Plan (Strategic Plan) released in May 2013.[3] CoSTEM and its subgroups have transitioned to implementation of the STEM Education Strategic Plan through the creation of a STEM education Cross Agency Priority Goal (CAP), in early 2014. This step institutionalizes the STEM Education Strategic Plan into agency performance metrics and requires agencies to issue public implementation updates every quarter.

In addition, we've made real overall progress in education——over the past seven years, 49 states and Washington, D.C. have raised expectations by adopting higher standards to prepare all students for success in college and careers. President Obama signed the bipartisan Every Student Succeeds Act (ESSA) in December 2015. This law cements this progress by requiring that all students in America be taught to high academic standards that will prepare them to succeed in careers and in college.

Yet there remains work to be done in 2016 and beyond. To meet the projected workforce need of 1 million additional STEM graduates by 2022 and to realize the vision of a highly diverse, creative, and sufficient STEM workforce and a STEM-literate citizenry, the Nation must engage all students. This effort must include women and minorities who are poorly represented in many STEM fields—despite the fact that these demographic groups comprise more than two-thirds of college students. Failing to engage underrepresented groups will lead to shortfalls in our nation's STEM workforce. Importantly, it will also prevent the STEM professions from capitalizing on the power of human diversity, a historical strength and competitive edge of the American

[3] http://www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf

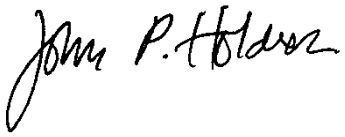
economy, and will deprive some of our citizens from engaging in the rewarding and remunerative careers that STEM fields offer.

The change needed to broaden access, success, and diversity in STEM education may seem daunting, but a vast array of evidence-based teaching strategies and methods that inspire and support all students will pave the way. The last half-century of education research has helped to shed light on the reasons that students—and in particular women and ethnic minorities—abandon study and careers in STEM fields. We must also continue to change the image of STEM jobs and the people who do them. That means providing role models to inspire diverse young people to pursue STEM careers and offering the public a more realistic and positive image of STEM fields than is evident in current media.

That is why the 2017 Budget prioritizes three major areas for investment to support STEM education for all students: (1) expanding access to rigorous STEM courses, including computer science, (2) improving STEM teaching and supporting active learning, and (3) addressing bias and expanding opportunities for underrepresented students in STEM**.** This progress report further describes STEM-education investments in the President's 2017 Budget request, their alignment with the Strategic Plan, and continuing efforts to coordinate agency activities under the CoSTEM to improve STEM-education investments and outcomes towards shared national goals.

I thank you for your leadership on this national priority and look forward to working with you on this shared agenda.

Sincerely,



John P. Holdren

Assistant to the President for Science and Technology

Director, Office of Science and Technology Policy

Table of Contents

Department and Agency Abbreviations

Corporation for National and Community Service	CNCS
Department of Agriculture	USDA
Department of Commerce	DOC
Department of Defense	DOD
Department of Education	ED
Department of Energy	DOE
Department of Health and Human Services	HHS
Department of Homeland Security	DHS
Department of the Interior	DOI
Department of Transportation	DOT
Environmental Protection Agency	EPA
National Aeronautics and Space Administration	NASA
National Institute of Standards and Technology (part of DOC)	NIST
National Institutes of Health (part of HHS)	NIH
National Oceanic and Atmospheric Administration (part of DOC)	NOAA
National Science Foundation	NSF
National Science and Technology Council	NSTC
Nuclear Regulatory Commission	NRC
Office of Science and Technology Policy	OSTP
Smithsonian Institution	SI
United States Geological Survey (part of DOI)	USGS

I. Science, Technology, Engineering, and Mathematics (STEM) Education in the 2017 Budget

> *"In the coming years, we should build on that progress, by … offering every student the hands-on computer science and math classes that make them job-ready on day one."*
>
> **President Barack Obama**
> 2016 State of the Union Address

President Obama believes that every student in the United States should be given the high-quality STEM education opportunities that allow them to join the innovation economy, have the tools to solve our toughest challenges, and be active citizens in our increasingly technological world. That's why the President's 2017 Budget invests $4 billion in mandatory spending and more than $3 billion in discretionary spending across the Federal Government on STEM education. The 2017 Budget prioritizes three major areas for investment to support STEM education for all students:

- Expanding access to rigorous STEM courses, with $4 billion in mandatory funding and $100 million in discretionary funding for the *Computer Science for All* initiative, which has the goal of giving every student from preschool to high school the opportunity to learn hands-on computer science (CS). Additional investments to support course access include $80 million for Next Generation High Schools.

- Improving STEM teaching and supporting active learning, with a $125 million Teacher and Principal Pathways program to support teacher preparation programs, $10 million for a newly authorized STEM Master Teacher Corps program, and $109 million from the National Science Foundation (NSF) to ensure that undergraduate students have the most effective learning experiences. These investments will also advance progress on the President's 2011 State of the Union call to action to prepare 100,000 excellent STEM teachers over 10 years.

- Overcoming stereotypes and expanding opportunities for all students in STEM, including a comprehensive NSF effort that will invest $16 million to support alliances and backbone organizations dedicated to increasing diversity and successfully engaging traditionally underrepresented groups in STEM education and careers.

Expanding Access to Rigorous STEM Courses

To ensure that all students have access to high-quality and relevant STEM coursework, starting in preschool and progressing through the rest of their formative years, we, as a Nation, must increase opportunities for every student to have access to a full suite of advanced STEM courses in high school. For high school students, access to core and advanced STEM coursework is an essential part of preparing to enter the workforce equipped with relevant skills for a broad range of jobs and to successfully pursue STEM courses and degrees in college. Exposure to STEM education correlates with success in higher education, regardless of major.

Despite the critical importance of student access to rigorous STEM courses, the most recent survey from the Department of Education's Office for Civil Rights' Civil Rights Data Collection shows that 50 percent of U.S. high schools do not offer calculus and 27 percent do not offer physics. Between 10 and 25 percent of high schools lack more than one of the core courses in the typical sequence of high school mathematics and science education, such as algebra I and II, geometry, biology, or chemistry. Twenty-five percent of high schools with the highest proportion of African-American and Latino students do not offer algebra II, and 33 percent of these schools do not offer chemistry.

The Nation must take action to expand the number of schools that offer core and advanced STEM courses. The President's 2017 Budget includes key investments to address the STEM course gap.

Computer Science for All

By some estimates, just one quarter of all K-12 schools in the United States offer computer science with programming and coding. The President's 2017 Budget includes a Computer Science for All plan that builds on momentum at the state and local level to offer rigorous coursework in computer science to all students in preschool through grade 12. The 2017 Budget proposes $4 billion in mandatory funding at the Department of Education (ED), available over three years, for states to increase access to hands-on computer science (CS) in P-12 classrooms. Under the program, all fifty states would be able to submit comprehensive five-year Computer Science for All plans, and every state with a well-designed strategy would receive funds. In addition to state-level grants, the 2017 Budget also dedicates $100 million in competitive grants specifically for leading districts to execute ambitious CS expansion efforts for all students—with a focus on reaching traditionally underrepresented students—and to serve as models for national replication. Participating states and districts would also be encouraged to create plans for expanding overall access to rigorous STEM classes, utilizing CS as a catalyst for increased interest in STEM more broadly, and reducing course equity gaps for

all students including underrepresented groups such as minorities, girls, and youth from low-income families.

The Computer Science for All initiative also includes a $20 million investment from NSF in FY 2017. The Directorate for Education and Human Resources (EHR) and the Directorate for Computer and Information Science and Engineering (CISE) will build on ongoing efforts to enable rigorous and engaging computer science education in schools across the Nation. Funds will support the development and assessment of prototype instructional materials, scalable and sustainable professional development models, approaches to pre-service preparation for computer science teachers, and teacher resources. The NSF effort will also fund research that will add to knowledge of effective approaches to the teaching and learning of computer science across grades P-12.

More information on this initiative can be found in the January 2016 Computer Science for All fact sheet.

The 2017 Budget also includes additional investments to help narrow STEM course gaps, including:

- $500 million for Student Support and Academic Enrichment Grants, a new block grant at ED authorized by the Every Student Succeeds Act (ESSA) that would provide flexible-formula grant funds to assist school districts in delivering a well-rounded education to their students through a range of locally determined activities, including STEM education, the arts, student support services, and effective use of educational technology in schools. In addition, building on the STEM Education Act of 2015 and the new ESSA, this year ED will release guidance on funding opportunities for STEM and CS to states, districts, and the broader education sector.

- Creating Next Generation High Schools. Building on the momentum from the first-ever Summit on Next Generation High Schools held last year, the 2017 Budget proposes a new $80 million competitive program at ED to equip communities across America with the resources to launch Next Generation High Schools that will be laboratories for cutting-edge STEM teaching and learning. These schools will showcase the tenets of high school reform that the President has championed: promoting active and personalized learning for students, strengthening relationships with business and post-secondary partners, and linking student work to real-world expectations and experiences that reflect college and careers in order to better prepare students for their futures. The 2017 Budget also supports a number of complementary ED investments in high school reform more generally, including an increase in Title I to support school improvement, $350 million for charter schools, and $115 million for magnet schools.

- Identifying and Scaling What Works in STEM Education. The 2017 Budget funds $180 million for ED's Education Innovation and Research (EIR) program, the successor to the Investing in Innovation (i3) program. The EIR program expands support for evidence-based initiatives to develop, validate, and scale-up effective education interventions—including interventions involving STEM education—that will help states and districts meet ESSA requirements emphasizing the use of such interventions wherever possible. A portion of these funds will be reserved for the proposed Advanced Research Projects Agency - Education (ARPA-ED), which would pursue the development of breakthrough educational technology and tools. Complementary investments in building evidence for effective STEM programs include the Administration's proposal for $83 million to support NSF's Discovery Research PreK-12, which invests in research and development on STEM teaching and learning.

- Expanding course access for military-impacted students. The 2017 Budget calls for the Department of Defense (DoD) to invest $11 million in expanding STEM opportunities for children of military families. The DoD investments build on a multi-year record of success under the National Math and Science Initiative's (NMSI) Initiative for Military Families. In FY16, the Department of Defense (DOD) is investing $8 million to expand STEM opportunities for children of military families. To promote STEM education among military dependents, DOD is continuing to partner with the NMSI in military-connected schools, building on documented success in improving students' performance in rigorous STEM coursework and associated assessments. Results have been dramatic, with an 87- percent average increase in Advanced Placement (AP) Math and Science scores within the first year of implementation and 139 percent after three years. Benefits among underrepresented minority and gender groups are even higher. Up through the FY15 investment, through this partnership with NMSI, DOD will reach 117 military-connected public high schools with the potential of reaching over 31,000 military children. DOD will explore additional opportunities to build cross-agency partnerships to leverage its science and engineering workforce, expertise, and resources to enhance this multi-year record of success in STEM learning for military children.

- Leveraging the disciplinary expertise of the Federal agencies. The 2017 Budget provides $17 million for the National Institutes of Health (NIH) to invest in the Science Education Partnership Award (SEPA) program, leveraging the expertise of the biomedical research community to support innovative STEM curricula in P-12 schools, and $4 million for the Environmental Protection Agency (EPA) to invest in environmental education grants.

Improving STEM Teaching and Supporting Active Learning

Abundant evidence shows that STEM teaching methodologies matter for learning. Active and hands-on, inquiry-based engagement enhances learning for students of all demographics and has

especially beneficial effects for women and other underrepresented groups, likely due to a greater sense of belonging that can be achieved in active classrooms.[4,5,6] In STEM disciplines, use of active-learning techniques by educators—both in classrooms and informal settings—not only improves learning outcomes, but also helps to retain students in STEM majors. Active-learning strategies encompass a suite of practices in which students are engaged in thinking or problem-solving rather than passively listening to a lecture. These strategies can be as simple as challenging students to try to figure out how to solve problems on their own before being taught how to do so; or they can require more dramatic changes, such as engaging students in original research or design in introductory college courses.

In particular, the 2017 Budget supports effective STEM teaching by:

- Making Progress on the President's Goal of Preparing 100,000 Excellent New STEM Teachers over a Decade: In his 2011 State of the Union address, the President called for a new effort to prepare 100,000 STEM teachers over the next decade with strong teaching skills and deep content knowledge. Answering the President's call to action, more than 230 organizations formed a coalition called *100Kin10*. These organizations have made over 350 measurable commitments to increasing the supply of excellent STEM teachers, including recruiting and preparing more than 43,000 teachers in the first five years of the initiative alone. In addition, under this Administration, ED has announced more than $175 million in STEM-focused five-year grants under the Teacher Quality Partnership Grant program, which will support more than 11,000 new teachers in high-need schools. The 2017 Budget builds on this progress with the $125 million Teacher and Principal Pathways program to support teacher preparation programs and nonprofits partnering with school districts to create or expand high-quality pathways into the teaching profession, particularly into high-need schools and high-need subjects such as STEM. Finally, the 2017 Budget provides $61 million at NSF for the Robert Noyce Teacher Scholarship program to prepare new STEM teachers.

- Creating a STEM Master Teacher Corps: The 2017 Budget includes $10 million at ED to establish a new program that responds to the President's July 2012 call to create a national STEM Master Teacher Corps that would enlist America's best and brightest science and mathematics teachers to improve STEM education. As part of this program, investments in the 2017 Budget will help States create leadership pathways for excellent

[4] For example, see the white paper "Promising Practices in Undergraduate STEM Education" (2008) by J.E. Froyd (available online at: http://sites.nationalacademies.org/cs/groups/dbassesite/documents/webpage/dbasse_072616.pdf). See also Baldwin, Roger G., ed. (2009). *Improving the Climate for Undergraduate Teaching and Learning in STEM Fields*. San Francisco: Jossey-Bass.
[5] Freeman et al., 2014. "Active learning increases student performance in science, engineering, and mathematics." Proc Natl Acad Sci 111:8410-8415.
[6] National Research Council (U.S.), Donovan, S., & Bransford, J. (2005). *How Students Learn: History, Mathematics, and Science in the Classroom.* Washington, D.C: National Academies Press; *Journal of Educational Psychology*, 93, 579–588; *Cognition and Instruction*, 4, 137-166.

STEM educators to improve STEM teaching and learning. Corps members will build their capacity to be leaders in the field and enhance the professional learning of other STEM teachers; identify and share promising practices in their schools, districts, and States; and help students excel in STEM subjects while taking on coaching and mentorship roles in their schools and communities. In addition, collaborative efforts among NSF's Excellence Awards in Science and Engineering (EASE), Robert Noyce Teacher Scholarship Program (Noyce), and Discovery Research in PreK-12 (DRK-12) programs will support the professional development of preK-12 teachers.

- Supporting K-12 STEM Teachers by Leveraging Federal STEM Assets: The National Oceanic and Atmospheric Administration (NOAA) will leverage over $1 billion of STEM assets to provide rigorous STEM education experiences for K-12 teachers. Teachers will be placed on NOAA research vessels to work side-by-side with NOAA scientists as part of their research team. By participating in this opportunity, teachers will gain great insight into scientific practices, cross-cutting concepts, and core disciplinary ideas, which they can bring back to their classrooms.

- Transforming Undergraduate Teaching and Learning: The 2017 Budget proposes approximately $109 million at NSF to support Improving Undergraduate STEM Education (IUSE), a Foundation-wide integrated framework for the agency's investments in undergraduate STEM education. NSF investments in undergraduate STEM education are coordinated through the IUSE framework to enhance coherence and impact and to use shared metrics and evaluation approaches where appropriate. These investments support specific disciplinary needs, such as the need to reform the "middle years" in the undergraduate preparation of professional engineers, the need to recruit more women and minorities into majors in computer science, and the data science preparation of undergraduates in the geosciences and the biological sciences. The NSF investments include $76 million for NSF's Research Experiences for Undergraduates (REU) program to provide early opportunities for college students to conduct research, which can be especially influential in maintaining a student's interest in science, engineering, and mathematics.

Overcoming Stereotypes and Expanding Opportunities for All Students in STEM

One of the greatest strengths of the American talent pool and workforce is diversity. To engage the diversity of Americans more fully, access the full potential of the STEM talent pool, and provide equitable opportunities, we, as a Nation, must utilize the growing research on the impact of barriers generated by unconscious bias driving interested students away from STEM.

This Administration has taken a range of steps to address these barriers and expand STEM opportunities for all students. These steps include starting the tradition of the White House Science Fair, and launching and growing the Educate to Innovate initiative, which has catalyzed more than $1 billion of private-sector investment in STEM education and includes a number of media organizations committed to broadening attitudes about who is capable of succeeding in STEM fields.

To build upon past efforts, the Administration is working with the media and entertainment industries to change the image of STEM jobs and the people who do them. This work will provide role models to inspire diverse young people to pursue STEM careers and offer the public a more realistic and positive image of STEM fields than is evident in current programming. In addition, the Administration is convening Federal STEM agencies to delineate a comprehensive set of policies to mitigate the effects of bias on workplace behaviors through increased government-wide coordination, demonstrated Federal agency leadership commitment, and incorporation of bias-mitigation strategies throughout the grant review process for Federally-funded institutions of higher education.

The 2017 Budget builds on these efforts and expands STEM opportunities for all groups through investments including:

- NSF Investments in Intermediary Organizations. As part of its "Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science" (NSF INCLUDES) program, NSF, through a comprehensive R&D effort, will invest $16 million in FY 2017 to support alliances and other intermediary and backbone organizations in developing new solutions to increase diversity and inclusion and successfully engage traditionally underrepresented groups in STEM education and workforce development on an impactful scale.

- ED Investments to Expand Higher Education Opportunities for Underrepresented Groups. ED will invest in a set of programs that have a strong focus on increasing access to STEM education, including $100 million in the Hispanic-Serving Institutions (HSI) STEM and Articulation program, sustained funding for Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP), and increased funding for the Federal TRIO programs under which some grant funds may be used for STEM access and activities.

Continued Investments on Priorities in the Federal STEM Education 5-Year Strategic Plan

The 2017 Budget continues to target investment in the five priority areas identified in the Federal STEM Education 5-Year Strategic Plan, building on the interagency collaboration that has

helped to reduce the number of STEM programs by forty percent over the past three years. In addition to investments focused on improving P-12 instruction and undergraduate education and broadening participation in STEM education, the Budget includes investments for graduate education and workforce training, education activities that typically take place outside the classroom, and educational innovation.

STEM-workforce and graduate-level STEM-education investments include:

- Strengthening American Cybersecurity. With a $70 million investment in the "CyberCorps®: Scholarship for Service" (SFS) program, NSF will support cybersecurity education at higher education institutions to prepare and train experts to respond to cybersecurity challenges. Of the $70 million, $25 million will be invested in laying the groundwork for SFS alumni to be available over the course of their careers to serve the Federal government, including by helping to respond rapidly to cybersecurity challenges.

- Preparing Graduate Students for Careers in High-Priority STEM Fields. The President's 2017 Budget includes $10 million for the Computational Sciences Graduate Fellowship (CSGF) at the Department of Energy (DOE) to continue training new graduate students in high-performance computing (HPC), thereby supporting a pipeline of future DOE leaders in HPC and equipping graduate students with the skills to help solve the Nation's complex science and engineering problems. The 2017 budget also includes $66 million for NSF's Advanced Technological Education (ATE) program, which invests in the education of technicians for in-demand high-technology fields, with a focus on partnerships between academic institutions and employers. Given the importance of oceans and our coastal areas, the President's 2017 Budget includes funding for the National Oceanic and Atmospheric Administration's (NOAA) Dr. Nancy Foster Scholarship Program. This program recognizes outstanding scholarship and encourages independent graduate-level research—particularly by female and minority students—in science, engineering, and resource management of ocean and coastal areas.

- Continuing Support for Major Graduate Training Programs. NSF is developing a strategic framework for graduate education that will be released in spring of 2016. In FY 2017, the framework will guide the review, renewal, and development of solicitations for fellowship and traineeship programs, promote effective collaboration across the NSF directorates, and enhance professional development opportunities for graduate students. The 2017 Budget also provides $332 million at NSF for the Graduate Research Fellowship Program and $59 million for the NSF Research Traineeship Program to support thousands of outstanding graduate student researchers who will be tomorrow's innovative leaders in a range of careers. Graduate students can access additional STEM opportunities in the Federal agencies under the Graduate Research Internship Program

(GRIP), which has a number of Federal agencies and national laboratories as partners. The 2017 Budget also includes $473 million for the National Institutes of Health (NIH)'s Ruth L. Kirschstein National Research Service Award Institutional Research Training Grants (T32 and T35 awards only), which provide funding to prepare individuals for careers in the biomedical, behavioral, and social sciences. In addition, DoD will invest over $90 million in the Science, Mathematics, and Research for Transformation (SMART) Scholarship and the National Defense Science and Engineering Graduate (NDSEG) programs to meet key national security workforce needs.

- Additional NSF steps to support graduate education. NSF also has established an Agency Priority Goal (AGP) for FY 2016 and FY 2017 on improving graduate student preparedness. By September 30, 2017, NSF will fund at least three summer institutes and 75 supplements to existing awards to provide STEM doctoral students with opportunities to expand their knowledge and skills to prepare for a range of careers. The implementation of the APG will be integrated with the implementation of the strategic framework for graduate education. In addition, Alliances for Graduate Education and the Professoriate (AGEP), Louis Stokes Alliances for Minority Participation's Bridge to the Doctorate (LSAMP-BD) track, and NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) support the successful entry and transition of underrepresented and underserved populations into STEM graduate education and into the STEM workforce.

Informal STEM Education

The President believes that we need to give many more students STEM experiences that engage them and show them the potential to use their STEM skills to have high-wage careers, tackle our world's toughest challenges, and be engaged citizens in our increasingly technological world. That's why the President has challenged students to be "makers of things" and hosted the first-ever White House Maker Faire, and the Administration will celebrate a National Week of Making this summer. That's also why the President led by example as the first to ever write a line of code with students, and called on the Nation's 200,000 Federal scientists and engineers to volunteer in their local communities and think of creative ways to engage students in STEM subjects. In addition, several efforts, including public-private partnerships such as the STEM Learning Ecosystems initiative, are underway nationwide to build and sustain partnerships that support the intersection of informal and formal STEM learning.

The 2017 Budget builds on the President's leadership with key investments that include:

- Identifying Best Practices to Engage Youth in Hands-On STEM. The 2017 Budget includes $63 million for NSF's Advancing Informal STEM Learning program, which will

support design, adaptation, implementation, and research on innovative modes of learning in the informal environment, including emphases on public participation in scientific research, making, and cyberlearning. ED's 21st Century Community Learning Centers (21st CCLC) program will also continue to foster interagency partnerships to bring hands-on STEM learning opportunities to high-need students during after-school and out-of-school time.

- Supporting High-Quality STEM-Education Programs at NASA. The 2017 Budget supports the NASA Office of Education's efforts to enhance coordination with other agencies and use competition to identify and fund the most effective education activities across the agency. The Budget also provides $25 million to the NASA Science Mission Directorate education program which connects NASA science experts and content to learners of all ages.

- Supporting Informal STEM Education by Expanding Public Participation in STEM Research and Citizen Science. In FY 2017, NSF will make progress on its Agency Priority Goal focused on building the capacity of the Nation to solve research challenges and improve learning by investing strategically in crowdsourcing and other forms of public participation, including students, in STEM research. In addition, as part of its 2017 Budget, the National Oceanic and Atmospheric Administration will continue to promote community engagement through citizen science. NOAA supports over 65 citizen science projects that are estimated to result in more than half a million volunteer hours per year. A powerful example of such collaborations was the Visualize Your Water Challenge, by EPA with support from ED, which challenged high school students to better understand nutrient pollution.

Supporting Next-Generation Learning Technologies

Building on the President's *Strategy for American Innovation* and the Administration's commitment to tackle the Grand Challenges of the 21st Century, the 2017 Budget provides up to $30 million for the Advanced Research Projects Agency - Education (ARPA-ED). ARPA-ED would allow ED to rapidly advance breakthrough innovations in education technology by creating interdisciplinary teams comprised of the nation's top experts in education, technology, and other key disciplines. ARPA-ED will identify promising new approaches being pioneered in the private sector and other Federal agencies in the areas of distance learning, intelligent tutoring systems, and real-time assessment. Applying research and development strategies learned from the Defense Advanced Research Projects Agency (DARPA), these technologies would be rapidly prototyped and transitioned to practice, allowing the nation to expand both the quality of and access to STEM coursework for all students.

In addition, the 2017 Budget includes an increase in funding at ED for Competitive Assessment Grants, the successor to the Enhanced Assessment Grants program, which supports projects designed to increase innovation and quality in education assessment design and delivery and to help States address pressing needs they have identified for developing and implementing next generation assessment systems.

Making the Most of Our STEM Investments

The President's 2017 Budget maintains a strong commitment to the goals of the Federal STEM Education Five-Year Strategic Plan. This means:

- Agencies will coordinate their STEM-education investments through implementation of the Strategic Plan, looking for opportunities to build the evidence base, share what works, and leverage each other's expertise and resources. Agency members of the National Science and Technology Council's Committee on STEM Education (CoSTEM) have convened working groups focused on each of the five priority areas identified in the Strategic Plan and are working to coordinate and better align existing programs, develop joint pilot projects, and develop common data collection strategies.

- Agencies will continue to look for internal consolidations that increase the overall effectiveness of their STEM investments. The 2017 Budget continues to reduce fragmentation, building on the internal consolidations that agencies began implementing in 2013.

- The Administration is not requesting further reorganization of the overall STEM budget, but instead is ensuring that agencies have enough resources to continue strong interagency coordination. To support these and related activities, the Budget provides support for the work agencies are doing to implement the Strategic Plan, with a focus on building and using evidence-based practices and developing new interagency models for leveraging assets and expertise.

II. Progress on Implementation of the Federal STEM Education 5-Year Strategic Plan

The Federal STEM Education 5-Year Strategic Plan (Strategic Plan),[7] released in May 2013, was the result of substantial work by the Administration to identify strategic priorities for STEM education investment, ways that agencies could collectively contribute to advance those priorities, and areas where such efforts could grow the evidence base of what works in STEM education.

Many Federal agencies prioritize STEM education and have developed related initiatives that are unique to their respective missions, visions, and resources. Building on these efforts, the Strategic Plan identifies five priority investment areas, each with a corresponding national goal toward which Federal agencies and collaborators in state and local entities and the private sector should aspire:

- Improve STEM teacher training. Prepare 100,000 excellent new P-12 STEM teachers by 2020 and support the existing STEM teacher workforce.

- Increase and sustain youth and public engagement in STEM. Support a 50-percent increase in the number of youth in America who have authentic STEM experiences each year prior to completing high school.

- Enhance STEM experience of undergraduate students. Graduate 1 million additional students with degrees in STEM fields over a decade.

- Better serve groups historically underrepresented in STEM fields. Increase the number of underrepresented groups that graduate with STEM degrees in the next 10 years and improve women's participation in areas of STEM where they are significantly underrepresented.

- Design graduate education for tomorrow's STEM workforce. Provide graduate-trained STEM professionals with foundational expertise in basic research, options to acquire specialized skills in areas of national importance and mission agency's needs, and ancillary skills needed for success in a broad range of careers.

In addition, CoSTEM agencies recognize that improved coordination and collaboration across the Federal STEM-education investment portfolio is necessary to make the most effective use of

[7] http://www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf

resources and expertise. Accordingly, the Strategic Plan outlines two priority coordination approaches:

- Build new models for leveraging assets and expertise. Implement a concept of lead and collaborating agencies to leverage capabilities across agencies to ensure the most significant impact of Federal STEM-education investments.

- Build and use evidence-based approaches. Conduct STEM education research and evaluation to build evidence about promising practices and program effectiveness, use across agencies, and share with the public to improve the impact of the Federal STEM education investment.

The Strategic Plan laid out draft implementation roadmaps in each of the priority STEM education investment and coordination areas and proposed potential short, medium, and long-term objectives and strategies to help Federal agencies achieve the goals described.

With the release of the Strategic Plan, the CoSTEM directed the Task Force on Federal Coordination in STEM Education (FC-STEM) to undertake planning for Strategic Plan implementation. Since 2014, FC-STEM has played this implementation role and has been re-chartered as the Subcommittee on Federal Coordination in STEM Education under the CoSTEM. In addition, since the release of the plan, FC-STEM has created five working groups, each tasked with executing one of the five strategic objectives described above.

These interagency groups have continued to convene over the past two years to advance the Strategic Plan's implementation. Across priority areas, these working groups have continued to expand projects that leverage agency assets and expertise to improve the reach of STEM content in formal school and afterschool settings; increase coordination across agencies to identify meaningful opportunities and experiences for P-12 teachers, undergraduate, and graduate students; identify localities with common grantees to best leverage Federal investment; and develop common data collection strategies for improved evaluation.

Going forward, CoSTEM and FC-STEM will continue to make progress on Strategic Plan implementation, with a shift from short-term goals to a focus on medium- and long-term strategies. The working groups will also continue to incorporate input from the STEM education community and make the adjustments needed to ensure progress on the shared goal of giving more Americans access to critical STEM skills.

Strategic Plan Codified as a Cross-Agency Priority Goal

Since early 2014, the STEM Education Strategic Plan has also been incorporated into a Cross-Agency Priority Goal (CAP).[8] This step institutionalizes the STEM Education Strategic Plan through agency performance metrics and requires agencies to issue public implementation updates every quarter.

To read the 2015 Quarter 1, 2, 3, and 4 reports, see the Appendix.

[8] http://www.performance.gov/node/3404?view=public#apg

III. Reducing Fragmentation of STEM Education Programs and Increasing Cross-Agency Partnerships

The Administration has made progress to reduce fragmentation of STEM education programs and increase cross-agency partnerships. Over the past three years, the overall number of STEM education programs has been reduced by 40 percent, and agencies have continued to expand their cross-agency partnerships.

Internal Consolidations

The 2017 Budget maintains the Administration's focus on reducing fragmentation through internal consolidations at the agencies. Notable examples include:

- Consolidation of NASA's education investments, by merging education efforts previously distributed throughout the agency into the Office of Education. Through a competitive process, the Office has identified and supported the most effective STEM education activities across NASA.

- Consolidation of NSF education investments in priority areas. The Budget proposes approximately $109 million at NSF for a comprehensive Foundation-wide effort to improve undergraduate STEM education. In addition, NSF will use its strategic framework for graduate education—which will be released in spring of 2016—to guide the review, renewal, and development of solicitations for fellowship and traineeship programs, promote effective collaboration across the NSF directorates, and enhance professional development opportunities for graduate students.

Cross-Agency Partnerships

Under CoSTEM, the Strategic Plan, and the STEM CAP Goal, agencies are undertaking a number of efforts to increase coordination and collaboration. Specific examples include:

- Launch This Year of a Single Portal to Search for Federally-Sponsored Opportunities for STEM Undergraduate and Graduate Students. Led by the Office of Science in the U.S. Department of Energy, the CoSTEM agencies, in collaboration with *Science.gov*, have launched a pair of websites that serve as searchable portals for undergraduate students, graduate students, and institutions that provide undergraduate and graduate education, providing the first single source where students and providers can find information on Federally-sponsored STEM education training and funding opportunities. On these portal sites, students can search for a range of opportunities such as research internships and

fellowships that they can apply for directly. Likewise, academic institutions can search for Federal funding opportunities to establish innovative training programs for undergraduates or graduate students. In either case, based upon taxonomy and metadata, the faceted portal search results return direct links to agency-sponsored programs. The site includes targeted searching capabilities for opportunity characteristics that include program type, sponsoring agency, location where the opportunity takes place, and STEM discipline. These sites are hosted on *Science.gov*, a gateway to government science information and research results, which is governed by 15 Federal agencies under the *Science.gov Alliance*. Consistent with the Coordination goal outlined in the CoSTEM Five-Year Strategic Plan, CoSTEM agencies will curate the information made available on these sites to keep the information current. The sites will also serve as a platform to make new information and resources relevant to the objectives of the CoSTEM working groups available to their target audiences.

- High-Impact STEM volunteering by Federal STEM employees. Building on the President's call to action to the 200,000 Federal scientists and engineers to inspire the next generation of students, the Corporation for National and Community Service (CNCS), in 2015 announced a goal to work with Federal agencies and support one million hours of volunteering by Federal employees in STEM- and making-related activities. This campaign, *FedServe: One Million Hours of STEM Volunteering*, builds upon the ongoing efforts to support STEM initiatives that are already happening within the Federal government such as the Department of Energy's STEM Mentoring Café series, Office of Naval Research Science and Engineering Apprentice Program (SEAP), and CNCS's STEM AmeriCorps. CNCS leads an interagency working group focused on achieving this goal and is creating a community for sharing best practices, policies, volunteer opportunities, and lessons learned on STEM volunteering across the Federal government. In support of the President's vision, FedServe: (1) promotes the Office of Personnel Management memo, which encourages participation in STEM activities and initiatives by Federal employees; (2) identifies key demonstrated practices of existing Federal efforts; (3) provides support to Federal agencies looking to develop or expand their STEM volunteering footprint; and (4) helps connect Federal STEM employees with local STEM programming.

- Expanded interagency partnerships to give NSF-funded graduate students knowledge of STEM opportunities in the Federal agencies: The Budget provides approximately $400 million at NSF for the Graduate Research Fellowship and Research Traineeship Programs to support thousands of outstanding graduate student researchers who will lead our Nation's innovation economy through a range of STEM careers. To leverage the STEM expertise and career experiences available across Federal agencies, NSF has continued to develop partnerships with a growing number of agencies. New partners

include the U.S. Census Bureau, Environmental Protection Agency, U.S. Geological Survey, Department of Homeland Security, National Oceanic and Atmospheric Administration, and Federal Bureau of Investigation. Participating graduate students will gain valuable knowledge of STEM opportunities across the government and STEM fields under the Graduate Research Internship Program (GRIP).

- ED's interagency collaboration to add more STEM education into its $1.2 billion after-school program. ED's 21st Century Community Learning Centers (21st CCLC) program is the Federal government's largest investment in after-school programming, serving more than 1 million students a year. The 21st CCLC program is spearheading interagency collaborations that effectively leverage the STEM-education investments at other CoSTEM Federal agencies, with lessons learned from successful projects conducted in 2015. These collaborations will support important goals in the STEM Strategic Plan: offering students authentic STEM content and experiences, as well as opportunities to engage with STEM subject-matter experts.

  In 2015, NASA and 21st CCLC expanded an existing collaboration to include two other Federal agencies – the National Park Service (NPS) and the Institute of Museum and Library Services (IMLS). The number of participating sites was expanded fivefold (from around 20 to over 100), with plans to benefit students nationwide. Participating sites represent broad geographic diversity and encompass rural and urban settings. The collaborations between Federal agencies, with support from national STEM experts, are powerful examples of the merits of well-structured interagency partnerships.

  - The NASA collaboration provided students with the opportunity to solve challenges based on real mission data and experiences that occur during exploration of the solar system. NASA staff provided face-to-face as well as ongoing online professional development to the 21st CCLC staff. Throughout the program, both staff and students were provided with several opportunities to interact directly with NASA scientists and engineers as they learned firsthand about engineering design and practices. In 2015, 80 21st CCLC sites across 10 states participated and had the option of choosing from six engineering challenges.

  - The NPS program introduced environmental monitoring and citizen-science programs to students in 21st CCLC programs at schools overseen by the Bureau of Indian Education (BIE) at 11 sites in five states. Native Americans are the most underrepresented group in the STEM fields. These programs are site-based, located in national parks, and focused on introducing students, including BIE students, to the natural resources in their region and related science. Working

with Hands on the Land, a national network of field classrooms and agency resources that connects students, teachers, families, and volunteers with public lands and waterways, NPS engaged park rangers and other subject matter experts to provide professional development to 21st CCLC staff at participating sites throughout the program and will provide subject matter expertise to students.

- The program with IMLS introduced students at 25 sites across five states to making and tinkering projects—part of a growing "Maker Movement" that is providing a powerful way to get young people interested in STEM. The site-based programs, coordinated through science centers, linked science center youth-serving staff and programs with students at nearby 21st CCLC sites. Participating staff were trained by the Exploratorium, a San Francisco-based science center with a history of innovation in maker education, so that they can serve as subject-matter experts, provide training to their colleagues, and work with youth participants.

- Coordinating the Administration's education initiatives: CoSTEM agencies are also taking a leadership role with, and building partnerships in support of, a number of the Administration's education initiatives.

  - Under *Computer Science for All*, the Department of Education (ED), the National Science Foundation (NSF), CNCS, the Department of Defense (DoD) and the U.S. Patent and Trademark Office (PTO) will all be taking steps this year to expand access to P-12 computer science. For example, in FY16, DOD is extending its partnership with NSF to expand STEM AP courses to include computer science as a core component of the curriculum as well as providing teacher professional development. In addition, the Department of Education's Office of Career, Technical, and Adult Education (OCTAE) and NSF will participate in a joint effort to expand the field of CS educators in Career and Technical Education (CTE) programs. This effort will create a first cohort of educators who will provide additional CS professional development for educators across the country.

  - There is a growing focus on incorporating STEM into early learning. ED is working with NSF and HHS on an early childhood STEM workshop for April 2016 to help identify best practices in early STEM education and define a research agenda to fill in knowledge gaps.

- Interagency collaborations to expand STEM opportunities for all students, including underrepresented groups. This includes:

- As part of the My Brother's Keeper (MBK) initiative, CoSTEM agencies participated in the successful "National Week at the Labs," where more than 50 National Labs from across the Federal system in more than 20 states opened their facilities to thousands of youth from nearby neighborhoods. A number of CoSTEM agencies are also involved in the STEM track of the MBK taskforce and the newly launched Summer Opportunity Project.

- DOE and HUD have partnered with the U.S. Department of Education (ED) and are developing an innovative place-based initiative to create economic opportunity and energy-literate communities: STEM, Energy, and Economic Development (SEED): Coalitions for Community Growth.

- In commemoration of the White House Initiative on Educational Excellence for Hispanics Initiative's (Initiative) 25th anniversary in 2015, the Initiative made a national call for Commitments to Action, encouraging public, private, and nonprofit investments in the creation and/or expansion of quality education programming throughout the nation, serving Hispanics, with STEM being one of the main tracks, and featuring the work of a number of CoSTEM agencies. The White House Initiative on Historically Black Colleges and Universities also includes a STEM priority and STEM was a featured topic at its annual conference last year.

- Collaborating as part of multi-sector coalitions. Agencies are also collaborating as part of larger multi-sector coalitions, such as *100Kin10*, a partnership of over 230 organizations working together to meet the President's goal of training 100,000 excellent STEM teachers over the next decade. In addition to private-sector and philanthropic organizations, *100Kin10* includes as members ED, DOE, NASA, NSF, and NOAA.

IV. Dissemination of Information about Federal STEM Education Resources and Opportunities

Federal agencies, both directly and as part of CoSTEM, communicate via a number of methods to the general public. This includes a range of information for the broader STEM education community: Federal STEM education resources; improvements to and new collaborations within existing programs; results and best practices from Federally-funded research; and progress on the Federal STEM education 5-Year Strategic Plan. Federal agencies also solicit input on how best to organize future STEM-education investments.

CoSTEM has shared a number of resources with the STEM education community to communicate its work on the Strategic Plan and to solicit feedback. These include:

- Quarterly CAP goal implementation updates. To inform the STEM education community of progress made toward Strategic Plan implementation, quarterly updates on the STEM education CAP goal are published at performance.gov, with CAP goal 2015 Quarter 1, 2, 3, and 4 reports in the Appendix.

- Stakeholder meetings. In 2015, the P-12 Interagency Working Group hosted two workshops with faculty at institutions of higher education responsible for educating pre-service teachers about using evidence-based STEM learning opportunities and Federal resources. The Undergraduate Education and Broadening Participation Interagency Working Groups hosted a "Minority Serving Community College and Federal Agency" meeting to share information and resources about agency grant opportunities with minority-serving institutions.

Examples of specific topics where CoSTEM agencies have shared or expanded their research insights include:

- Creating next generation high schools. In November 2015, NSF hosted the Next-Generation STEM Learning for All Forum (Forum). The Forum included researchers, policymakers, practitioners from the public and private sectors, school leaders and teachers, and NSF program officers. The goals of the Forum were to: (a) showcase NSF-funded research and development and inform policy makers and practitioners about the potential to transform STEM learning and education, (b) engage a broad community of stakeholders in envisioning the future of STEM learning and in strategizing how to best achieve collective impact, and (c) facilitate networking across stakeholder groups to leverage skills and strengthen connections, collaboration, and coordination toward

national goals for STEM education. The NSF Forum was followed by the first-ever White House Summit on Next Generation High Schools, with participation from ED and NSF.

- Computer Science for All. Building on the STEM Act of 2015, the Department of Education published information on the many existing Federal resources that can be utilized to expand access to rigorous coursework, including CS, with additional updates in recent months.

Table 1. Federal STEM Education Funding by Agency

Table 1. Federal STEM Education Funding by Agency

(budget authority in millions)

	2015 Actual	2016 Enacted	**2017 Budget**
Agriculture	90	91	**90**
Commerce	35	35	**24**
Defense	142	138	**130**
Education	528	531	**561**
Energy	50	52	**60**
Health and Human Services	616	629	**629**
Homeland Security	5	5	**5**
Interior	3	3	**3**
Transportation	90	98	**100**
Environmental Protection Agency	19	8	**10**
NASA	164	155	**136**
National Science Foundation	1,258	1,192	**1,222**
Nuclear Regulatory Commission	16	15	**1**
Corp. for Nat'l and Community Service	14	32	**32**
Total Federal STEM Education Funding	2,946	2,979	**3,003**

TABLE 2. STEM EDUCATION FUNDING IN MILLIONS BY AGENCY AND PROGRAM, FY 2015-2017

AGENCY	SUB-AGENCY	PROGRAM	2015 Enacted	2016 Enacted	2017 Budget
Agriculture	NIFA	1890 Facilities Grant Program	19.7	19.7	21.7
Agriculture	NIFA	1890 Institutions Capacity Building Grants Program:	6.4	6.4	10.1
Agriculture	NIFA	1890 Institutions Capacity Building Grants Program: Teaching	6.4	6.4	10.1
Agriculture	NIFA	4-H Science, 4-H Youth Development Program	23.5	24.0	24.0
Agriculture	APHIS	AgDiscovery	0.8	0.9	0.9
Agriculture	NIFA	Agriculture in the Classroom	0.6	0.6	-
Agriculture	NIFA	AITC Secondary Postsecondary Agriculture Education Challenge Grants (SPECA)	0.9	0.9	-
Agriculture	NIFA	Alaska Native-Serving and Native Hawaiian-Serving Institutions Education Competitive Grants Program	3.2	3.2	3.2
Agriculture	NIFA	Hispanic-Serving Institutions Education Grants Program	9.2	9.2	9.2
Agriculture	NIFA	Insular Programs	2.0	2.0	1.8
Agriculture	NIFA	Multicultural Scholars, Graduate Fellowship and	9.0	9.0	-
Agriculture	NIFA	NIFA Fellowship Grants Program	7.5	8.1	8.6
Agriculture	NIFA	Women and Minorities in Science, Technology, Engineering and Mathematics Fields Program (WAMS)	0.4	0.4	-
CNCS	AmeriCorps	CNCS STEM Programs	13.9	32.5	32.5
Commerce	NOAA	Competitive Education Grants (including	4.0	3.0	-
Commerce	NOAA	Dr. Nancy Foster Scholarship Program	0.5	0.5	0.5
Commerce	NOAA	Educational Partnership Program with Minority Serving Institutions	14.4	14.4	14.4
Commerce	NOAA	Ernest F. Hollings Undergraduate Scholarship Program	5.4	5.8	5.9
Commerce	NOAA	National Sea Grant College Program	1.0	1.0	-
Commerce	NIST	NIST Summer Institute for MIddle School Teachers	0.3	0.3	0.3
Commerce	NOAA	NOAA Bay Watershed Education and Training (B-WET)	7.2	7.2	-
Commerce	NOAA	NOAA Teacher at Sea Program	0.6	0.6	0.6

TABLE 2. STEM EDUCATION FUNDING IN MILLIONS BY AGENCY AND PROGRAM, FY 2015-2017

AGENCY	SUB-AGENCY	PROGRAM	2015 Enacted	2016 Enacted	2017 Budget
Commerce	NIST	STEM Pipeline for the Next Generation Scientists and	1.0	1.0	1.0
Commerce	NIST	Summer Undergraduate Research Fellowship (SURF)	0.8	0.8	0.8
Defense		Army Educational Outreach Program (AEOP)	9.3	9.4	9.5
Defense		Awards to Stimulate and Support Undergraduate	4.5	4.5	4.5
Defense		DoD STARBASE Program	25.0	25.0	-
Defense		National Defense Education Program (NDEP) Military Child STEM Educational Programs	13.0	8.9	11.1
Defense		National Defense Education Program (NDEP) Science,	45.5	40.0	53.6
Defense		National Defense Science and Engineering Graduate (NDSEG) Fellowship Program	36.0	42.4	43.3
Defense		Navy - Science and Engineering Apprenticeship Program (SEAP)	1.0	0.6	0.7
Defense		Navy Historically Black Colleges and Universities/Minority Institutions Research and	3.6	4.0	4.0
Defense	NSA	Stokes Educational Scholarship Program	1.6	1.5	1.5
Defense		The Naval Research Enterprise Intern Program (NREIP)	1.3	1.2	1.4
Defense		University NanoSatellite Program	0.8	0.8	0.8
Education	OII	Computer Science for All Development Grants		-	100.0
Education	OPE	Developing Hispanic Serving Institutions STEM and	92.7	93.2	100.0
Education	OPE	Graduate Assistance in Areas of National Need (GAANN)	29.3	29.3	29.3
Education	IES	High School Longitudinal Study of 2009	4.8	9.2	8.7
Education	OII	Investing in Innovation	25.0	25.0	40.0
Education	OESE	Mathematics and Science Partnerships/Effective Teaching and Learning for a Complete Education	152.7	152.7	-
Education	OPE	Minority Science and Engineering Improvement Program	9.0	9.7	9.7
Education	OII	Next Generation High Schools	-	-	48.0
Education	IES	Research in Special Education	9.7	6.0	6.4
Education	IES	Research, Development, and Dissemination	37.0	33.1	37.9
Education	OII	STEM Master Teacher Corp		-	10.0
Education	OPE	Strengthening Predominantly Black Institutions	5.7	7.2	7.2

TABLE 2. STEM EDUCATION FUNDING IN MILLIONS BY AGENCY AND PROGRAM, FY 2015-2017

AGENCY	SUB-AGENCY	PROGRAM	2015 Enacted	2016 Enacted	2017 Budget
Education	OESE	Teacher Incentive Fund	29.9	29.9	32.5
Education	OPE	Teacher Loan Forgiveness	89.0	86.0	87.0
Education	OPE	Upward Bound Math and Science Program	43.1	49.4	44.0
Energy	Office of Energy Efficiency and Renewable Energy, Vehicle Technologies	Advanced Vehicle Competitions	2.5	2.5	2.5
Energy	Office of Science, Office of Nuclear Physics and Office of Basic Energy Sciences	American Chemical Society Summer School in Nuclear and Radiochemistry	-	0.6	0.6
Energy	Office of Science, Office of Workforce Development for Teachers and Scientists	Community College Internship (formerly Community College Institute of Science and Technology)	1.0	1.0	1.3
Energy	Office of Science, Advanced Scientific Computing Research	Computational Sciences Graduate Fellowship	3.0	10.0	10.0
Energy		DOE Traineeship in Advanced Technology		-	1.0
Energy		DOE Traineeship in Radiochemistry and Nuclear Chemistry with an emphasis in isotope production		-	1.0
Energy	Office of Science, Office of Workforce Development for	Graduate Student Research Program	2.5	2.5	2.6
Energy	Office of Environmental	HBCU Mathematics, Science & Technology,	8.0	8.0	8.0
Energy	Office of Energy Efficiency and Renewable Energy, Advance	Industrial Assessment Centers	6.0	6.0	10.0
Energy	Office of Nuclear Energy	Integrated University Program	5.0	-	-
Energy	Office of Science, Office of Workforce Development for	National Science Bowl	2.9	2.9	3.0
Energy	Office of Science, Office of Fusion Energy Sciences	National Undergraduate Fellowship Program in Plasma Physics and Fusion Energy Sciences	0.3	-	-
Energy	Office of Science, Office of Workforce Development for	Science Undergraduate Laboratory Internships	8.3	8.3	9.3

TABLE 2. STEM EDUCATION FUNDING IN MILLIONS BY AGENCY AND PROGRAM, FY 2015-2017

AGENCY	SUB-AGENCY	PROGRAM	2015 Enacted	2016 Enacted	2017 Budget
Energy	Office of Energy Efficiency and Renewable Energy, Building Technologies	Solar Decathlon	3.0	2.5	3.0
Energy	Office of Fossil Energy	Special Recuitment Programs/Mickey Leland Fellowship	0.7	0.7	0.7
Energy	Office of Environmental Management	Subsurface Remediation and Project Management Traineeship	2.0	2.0	2.0
Energy	Office of Science, High Energy Physics	U.S. Particle Accelerator Training	0.6	0.6	0.6
Energy	Office of Science, Office of	Visiting Faculty Program (formerly Faculty and Student	1.7	1.7	1.8
Energy	Office of Energy Efficiency and	Wide Bandgap Power Electronics Traineeship	2.0	2.7	2.5
Energy	Office of Energy Efficiency and	Wind for Schools	0.6	-	-
EPA	ORD	Cooperative Training Partnership in Environmental	0.1	0.3	1.0
EPA	Office of Environmental	Environmental Education Grants	3.3	3.3	4.2
EPA	ORD	Greater Research Opportunities (GRO) Fellowships for	1.8	-	-
EPA	Office of Environmental	National Environmental Education and Training	2.2	2.2	2.8
EPA	ORD	P3-People, Prosperity & the Planet-Award: A National	1.7	1.4	1.3
EPA	NCER	Science to Achieve Results Graduate Fellowship	9.3	-	-
EPA	ORD	University of Cincinnati/EPA Research Training Grant	0.6	0.6	0.6
HHS	NIH, NIGMS	Bridges to the Baccalaureate Program	6.2	12.4	12.4
HHS	NIH, NCI	Cancer Education Grants Program	6.6	6.6	6.6
HHS	NIH, NINDS	Diversity Research Education Grants in Neuroscience	1.0	-	-
HHS	NIH, Intramural Training	Graduate Program Partnerships	11.7	11.7	11.7
HHS	HRSA	Health Careers Opportunity Program	14.2	14.2	14.2
HHS	NIH, NIGMS	MARC U-STAR NRSA Program	20.4	20.7	20.7
HHS	NIH, NICHD	Mathematics and Science Cognition and Learning	10.1	6.3	6.3
HHS		Medical Research Scholars Program (MRSP)	0.1	0.1	0.1
HHS	NIH, NCI	National Cancer Institute Cancer Education and Career	17.5	17.5	17.5
HHS	NIH, Intramural Training	Post-baccalaureate Intramural Research Training	19.8	26.9	26.9
HHS	NIH	Ruth L. Kirschstein National Research Service Award Institutional Research Training Grants (T32, T35)	473.2	473.2	473.2

TABLE 2. STEM EDUCATION FUNDING IN MILLIONS BY AGENCY AND PROGRAM, FY 2015-2017

AGENCY	SUB-AGENCY	PROGRAM	2015 Enacted	2016 Enacted	2017 Budget
HHS	NIH	Ruth L. Kirschstein NRSA for Individual Predoctoral Fellows, including Underrepresented Racial/Ethnic	3.8	3.8	3.8
HHS	NIH, OD	Science Education Partnership Award	14.6	17.1	17.1
HHS	NIH, NICHD	Short Courses in Population Reseach (Education	0.6	1.6	1.6
HHS	NIH, NIGMS	Short Courses on Mathematical, Statistical, and	1.9	1.4	1.4
HHS	NIH, NHLBI	Short-Term Research Education Program to Increase Diversity in Health-Related Research	4.4	4.9	4.1
HHS	NIH, Intramural Training	Student Intramural Research Training Award Program	5.3	6.3	6.4
HHS	NIH, NHLBI	Summer Institute for Training in Biostatistics	1.5	0.9	1.8
HHS	NIH, Intramural Training	Undergraduate Scholarship Program for Individuals from Disadvantaged Backgrounds	2.8	3.4	3.4
Homeland Security	DNDO	National Nuclear Forensics Expertise Development Program	5.0	5.1	5.0
Interior	Bureau of Land Management	Conservation and Land Management Internship Program	1.5	1.5	1.5
Interior	USGS	EDMAP	0.5	0.5	0.5
Interior	National Park Service	Geoscientists-in-the-Parks Program	0.7	1.0	1.0
NASA	Science Mission Directorate (SMD)	GLOBE Program	6.0	6.0	6.0
NASA	Education Office	MUREP	32.0	32.0	30.0
NASA	Science Mission Directorate (SMD)	NASA Science Mission Directorate STEM Projects	42.0	37.0	25.0
NASA	Education Office	Space Grant - National Space Grant College and	40.0	40.0	24.0
NASA	OCT-ST	Space Technology Research Fellowships	15.0	14.7	14.2
NASA	Education Office	STEM Education & Accountability Project	29.0	25.0	37.1
NRC	Office of the Chief Human Capital Officer	Grants to Universities (Curriculum Development) Program	5.0	5.0	-
NRC	Office of the Chief Human Capital Officer	Integrated University Program	10.0	10.0	-
NRC	Small Business and Civil Rights Office	Minority Serving Institutions Program (MSIP)	0.9	0.3	0.6

TABLE 2. STEM EDUCATION FUNDING IN MILLIONS BY AGENCY AND PROGRAM, FY 2015-2017

AGENCY	SUB-AGENCY	PROGRAM	2015 Enacted	2016 Enacted	2017 Budget
NSF	Directorate for Education and Human Resources (EHR)	Advanced Informal STEM Learning (AISL), formerly Informal Science Education (ISE)	55.0	62.5	62.5
NSF	Directorate for Education and Human Resources (EHR)	Advanced Technological Education (ATE)	66.0	66.0	66.0
NSF	Directorate for Education and Human Resources (EHR)	Alliances for Graduate Education and the Professoriate (AGEP)	8.0	8.0	8.0
NSF	Directorate for Education and Human Resources (EHR)	Cybercorps: Scholarship for Service (SFS)	45.0	50.0	70.0
NSF	Directorate for Education and Human Resources (EHR)	Discovery Research K-12 (DR-K12)	83.8	82.7	82.7
NSF	Office of International & Integrative Activities (OIIA)	East Asia & Pacific Summer Institutes for U.S. Graduate Students (EAPSI)	2.4	1.8	2.5
NSF	Directorate for Math and Physical Sciences (MPS)	Enhancing the Mathematical Sciences Workforce in the 21st Century (EMSW21)	5.7	-	-
NSF	Directorate for Education and Human Resources (EHR)	Excellence Awards in Science and Engineering (EASE)	5.8	5.8	5.8
NSF	Directorate for Education and Human Resources (EHR) & Office	Graduate Research Fellowship Program (GRFP)	333.4	331.9	332.2
NSF	Directorate for Education and Human Resources (EHR)	Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)	32.0	35.0	35.0
NSF	Directorate for Education and	Improving Undergraduate Education	105.4	100.5	109.0
NSF		Inclusion across the Nation of Communities of Learners that have been Underrepresented for	-	15.5	16.0
NSF	Directorate for Education and Human Resources (EHR)	Innovative Technology Experiences for Students and Teachers (ITEST)	25.0	25.0	25.0
NSF	Office of International & Integrative Activities (OIIA)	International Research Experiences for Students (IRES)	2.3	6.5	6.5
NSF	Directorate for Education and Human Resources (EHR)	Louis Stokes Alliances for Minority Participation (LSAMP)	46.0	46.0	46.0
NSF	NSF	NSF Research Traineeships (NRT)	61.6	54.2	58.6
NSF	Directorate for Education and Human Resources (EHR)	NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM)	75.0	75.0	75.0
NSF	Directorate for Engineering (ENG) and Directorate for Computer &	Research Experiences for Teachers (RET) in Engineering and Computer Science	6.0	6.0	6.1

TABLE 2. STEM EDUCATION FUNDING IN MILLIONS BY AGENCY AND PROGRAM, FY 2015-2017

AGENCY	SUB-AGENCY	PROGRAM	2015 Enacted	2016 Enacted	2017 Budget
NSF	Directorate for Education and Human Resources (EHR)	Research Experiences for Undergraduates (REU)	73.2	75.4	75.6
NSF	Directorate for Education and Human Resources (EHR)	Robert Noyce Scholarship (Noyce) Program	60.9	60.9	60.9
NSF	Directorate for Education and Human Resources (EHR) and Directorate for Computer &	STEM-C Partnerships	69.6	64.4	64.4
NSF	Directorate for Education and Human Resources (EHR)	Tribal Colleges and Universities Program (TCUP)	13.5	14.0	14.0
Transportation	Federal Aviation Administration (FAA)	Air Transportation Centers of Excellence	13.0	18.0	18.0
Transportation	Federal Highway Administration (FHWA)	Garrett A. Morgan Technology and Transportation Education Program	0.4	0.4	0.4
Transportation	Federal Highway Administration (FHWA)	National Summer Transportation Institute Program (STI)	2.8	2.6	2.6
Transportation	Federal Railroad Administration	Rail-based University Transportation Centers Program	-	3.0	3.0
Transportation	Office of the Secretary	Summer Transportation Institute Program for Diverse Groups (STIPDG)	1.3	1.3	1.3
Transportation	Office of the Secretary	University Transportation Centers Program	72.5	73.0	75.0

Cross Agency Priority Goal Quarterly Progress Update

STEM Education

Goal Leaders:

Jo Handelsman, Associate Director for Science, White House Office of Science and Technology Policy

Joan Ferrini-Mundy, Assistant Director, National Science Foundation, Education and Human Resources

FY2015 Quarter 1

1

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.

2

Progress Update

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

- FC-STEM finalized charters for the five Inter-agency Working Groups (IWGS).
- Agreement that FC STEM will address the coordination objectives as a committee of the whole.
- New leads identified for the P-12, Graduate, and Engagement IWGs to replace people who have left.

Collaborations examples:

- Cross-agency partnership examples:
  - The Department of Education's 21st Century Community Learning Centers (CCLC) program is piloting collaborations with the National Park Service and the Institute of Museum and Library Services and is expanding its NASA collaboration to include additional sites and engineering challenges (Engagement Priority Goal).
  - In addition to the existing four agencies (Office of Naval Research, Smithsonian Institution, Federal Bureau of Investigation (FBI), and Department of Homeland Security(DHS)), the Graduate Research Internship Program (GRIP) added two partners, Environmental Protection Agency (EPA) and National Oceanic and Atmospheric Administration (NOAA) (Graduate Priority Goal).

Meetings and Outreach

- CoSTEM received a briefing on the progress towards implementation of the 5-year Strategic Plan (October 2014).
- Office of Management and Budget (OMB) leadership and representatives from the CAP Goal team met to review progress of the goal and to discuss key initiatives for the next year (October 2014).
- Following the discussion with OMB, representatives from the IWGs attended a retreat supported by the Performance Improvement Council (PIC) to identify innovative, focused efforts that could be accomplished during FY 2015.
- All of the IWGs met jointly to discuss accomplishments from each group, share challenges, and make recommendations for better integration of cross-IWG work (October 2014).
- White House College Opportunity Day of Action summit emphasized expanding opportunity for more students to enroll and succeed in college, especially low-income and underrepresented students (December 2014).

3

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	

4

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:
- Department of Education
- NSF

Engagement
Co-Leads:
- Smithsonian
- NASA

Undergraduate STEM Education
Co-Leads:
- NSF
- Department of Defense

Under-represented Groups
Co-Leads:
- NSF
- National Institutes of Health (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

5

Work Plan: Governance and Coordination

- Build new models for leveraging assets and expertise.
- Build and use evidence based approaches.

Barriers/Challenges
- Working groups are at varying stages of development of goal priorities, indicators, and milestones.
- Coordination of goals among IWGs needs to be strengthened.
- Baseline data are not easily available for several key areas.
- There is changing participation in the IWGs.
- External input from stakeholders outside the government is needed.

Key Milestones	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Working groups finalized for each sub-goal, including executive secretary	06/2014	Missed	FC-STEM	NSF co-lead for PK-12 IWG has been announced. The IWG co-lead for Undergrad IWG needs to be selected.
Identify baseline data, when appropriate, using relevant data sources	08/2014	Complete	FC-STEM	
Identify and support opportunities for collaboration across working groups	12/2014	Complete	FC-STEM	
Key milestones/metrics/indicators established for all sub-goals	01/2015*	At risk	FC-STEM	A potential obstacle may be the lack of regularly collected metrics. A joint meeting of all co-leads to develop milestones was held in August and discussed in October at an FC-STEM meeting.
Simplification of key processes such as development of Memoranda of Understandings (MOU) to encourage common procedures and collaborations	03/2015	On track	FC-STEM	No barriers identified.

*Due date revised. The original due date was 08/2014. The interagency working groups required more time to develop milestones for each sub-goal.

6

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

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

Key Milestones (Lead: Department of Education / 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	Potential obstacles include 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*	On track	IWG P-12	Potential obstacles include range of efforts from various agencies to engage teachers in professional development and limited programs that directly support teacher preparation.
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**	On track	IWG P-12	Initial analysis has been limited in scope to three areas: Hunstsville, AL; Minneapolis, MN; and, Baltimore area, MD. Limitations may include agency presence in selected areas.
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	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.

7

Work Plan Sub-goal 2: Engagement in STEM Education

- Access to scientific and engineering assets of the federal government
- Integration of STEM into school readiness and after-school programs
- Empirical understanding of how STEM experiences influence learning

Key Milestones (Lead: Smithsonian Institute / NASA)	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; FC-STEM co-chairs are involved in finding solutions.
Identify evaluation models used to effectively study engagement	01/2015**	At risk	IWG-Engagement	Group leadership is in transition; FC-STEM co-chairs are involved in finding solutions.
Implementation of agency commitments related to making and student engagement announced by President Obama at the White House Maker Faire	06/2015	On track	OSTP	No barriers identified.

*Due date revised. The original due date was 07/2014. The IWG met only occasionally until July 2014 when a co-chair was added, although it was possible to accomplish some collection of materials prior to that.
**Due date revised. The original due date was 09/2014. The IWG did not start meeting until July.

8

Work Plan Sub-goal 3: Undergraduate STEM Education

- Implementation of 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 mathematics at undergraduate

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	12/2014 (A)	Complete	IWG Undergrad	No barriers identified.
B) Develop an undergraduate research experiences portal	12/2015 (B)	On track	IWG Undergrad	No barriers identified.
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.

9

Work Plan Sub-goal 3: Undergraduate STEM Education

- Implementation of 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 mathematics at undergraduate

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 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	12/2014 (A)	Complete	IWG Undergrad	No barriers identified.
	4/2015 (B)	On track	IWG Undergrad	Dependent on A
B) Item integrated into HSLS Second Follow-up	12/2016 (C)	On track	IWG Undergrad	Dependent on B
C) Survey data collected from HSLS	12/2017 (D)	On track	IWG Undergrad	Dependent on C
D) Survey results available				

10

Work Plan Sub-goal 3: Undergraduate STEM Education

- Implementation of 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 mathematics at undergraduate

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:		On track	IWG Undergrad	Potential obstacles include range of purposes motivating agency commitment to undergraduate research and intern opportunities.
Phase 1: Common Indicator Metrics Analysis	08/2015	On track	IWG Undergrad	
Phase 2: Preliminary Research Study to Pool Common Data	02/2016	On track	IWG Undergrad	Dependent on Phase 1.
Identify opportunities to leverage related efforts of IWG on Broadening Participation	07/2015	On track	IWG Undergrad	Potential obstacles include range of purposes motivating agency commitment to undergraduate education and broadening participation initiatives.
Develop a Minority Serving Community College and federal agency convening to share information and resources about agency grant opportunities with MSIs	10/2015	On track	IWG Undergrad	
Development of an Undergraduate Education Forum that aligns with the four strategic objectives	02/2016	On track	IWG Undergrad	

11

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

- Be more responsive to rapidly changing demographics
- Focus investments
- 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.
Meet with leads for UG, Graduate, K12, and Engagement IWGs to identify opportunities for collaboration and leveraging of efforts	3/2015*	On track	IWG BP	Meetings with working groups are progressing; however, scheduling is a challenge.
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	On track	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.
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	On track	IWG BP	No barriers identified.
Agencies identify and begin implementation of modifications to existing program portfolio to address gaps to provide more opportunities for URMs in STEM	9/2015**	On track	IWG BP	No barriers identified.

**Due date revised. The original due date was 02/2015. IWG-BP is holding joint meetings with the other IWGs, not just the co-leads, so scheduling is a challenge.
**Due date revised. The original due date was 01/2015. The IWG held its first meeting in August 2014 and needs time to review existing research, programs, and exemplary models both within and outside of the federal government to help identify gaps and make recommendations for enhancements.

12

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

- Be more responsive to rapidly changing demographics
- Focus investments
- 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*	On track	IWG BP	No barriers identified.
Ideas proposed to maximize the impact of the federal investment with a timeline for agency adoption	12/2015**	On track	IWG BP	No barriers identified.

*Due date revised. The original due date was 06/2015. The IWG held its first meeting in August 2014 and needs more time to complete this milestone.
**Due date revised. The original due date was 10/2014. The IWG held its first meeting in August 2014.

13

Work Plan Sub-goal 5: Graduate STEM Education

- 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

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.
Assemble inventory of evaluation approaches for graduate programs	01/2015	Complete	IWG Grad	No barriers identified.
Identify available resources for the evaluation of graduate programs	01/2015	Complete	IWG Grad	No barriers identified.
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.
Create common portal for fellowship and traineeship opportunities for graduate students	03/2015*	On track	IWG Grad	No barriers identified.
Expand MOU partners to include most CoSTEM partners in opportunities for NSF fellows	12/2015	On track	IWG Grad	No barriers identified.
Expand Portal to include undergraduate research opportunities	12/2015	On track	IWG Grad and IWG Undergrad	No barriers identified.

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

14

Key Indicators

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	Science and Engineering Indicators (S&EI) 2014	2012 (See slide 18)	N/A	Reported in S&EI 2014 biannually but based on variable survey	2012	
Number of STEM bachelor's degrees earned annually	S&EI 2014	554,365 (See slides 19 and 20)	N/A	Biannually	2011	Increasing
Percentage of bachelor's degrees awarded to women, black or African American, Hispanic, and American Indian or Alaska Native students	S&EI 2014	2011 (See slides 21-24)	N/A	Biannually	2011	Increasing

Indicators in Development:	
Potential High Level Indicator	**Potential Target Areas**
• Teachers' science and mathematics content knowledge for teaching • Number of STEM graduate students at institutions by mechanism of support and supporting federal agency	

*Updated data will be available January 2016 in Science and Engineering Indicators, 2016.

15

Teachers' Science and Mathematics Content Knowledge for Teaching

The Education and Human Resources (EHR) Directorate partnered with NSF's National Center for Science and Engineering Statistics (NCSES) in the Directorate of the Social, Behavioral, and Economic Sciences (SBE) to develop a two-year task, awarded to SRI, to provide insight on ways to reconfigure the K-12 chapter in the biennial *Science and Engineering Indicators* (SEI) that incorporates, over time, the 14 indicators identified in the *Monitoring Progress* report. Indicator 6 is **Teachers' science and mathematics content knowledge for teaching.** SRI created a "roadmap" of indicators available in the short-term, as well as those that will require further research and development:

Currently Available Data
- Data from Hill (Harvard) and the MET Project
- Teacher perceptions of preparedness from National Assessment of Educational Progress (NAEP), Trends in International Mathematics and Science Study (TIMSS), and National Survey of Science and Mathematics Education (NSSME)
- B&B, HSLS, and Teaching and Learning International Survey (TALIS) data on college coursework

Near-Term Activities
- Assemble and compare existing survey data and data from Hill and MET studies
- Review and synthesize what is known about correlations between these measures and student achievement

Long-Term Activities
- Develop instruments to measure teacher content knowledge for teaching for science and high school math
- Develop non-survey measures to get at knowledge in use

Additional Research Needs
- Relationship between college backgrounds and self-reports of preparedness and direct assessments of content knowledge for teaching
- Cost-effective measures for direct assessments at scale

16

Contributing Programs

The Federal Science, Technology, Engineering, and Mathematics (STEM) Portfolio is a report from the Federal Inventory of STEM Education Fast-Track Action Committee that was published in December 2011.

The inventory details federal agencies' spending on STEM education and differs from previous such inventories in several ways.

- A consistent unit of analysis was used across all agencies (henceforth labeled as an "investment");
- the design and implementation of the inventory survey included extensive agency involvement; and
- a more thorough and detailed characterization of each agency's investments was obtained.

The result of these differences is a clearer and more complete picture of the federal investment in STEM education than has previously been available.

http://www.whitehouse.gov/sites/default/files/microsites/ostp/costem__federal_stem_education_portfolio_report_1.pdf

17

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).

18

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

Appendix table 2-1

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

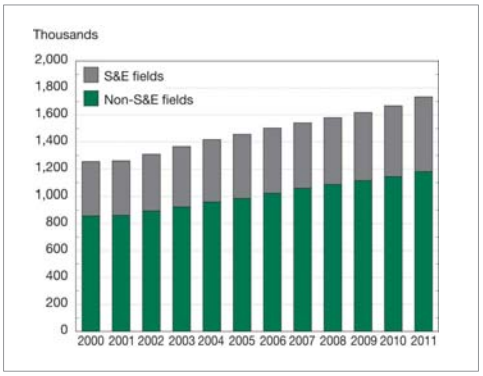
		S&E field									
Degree and institution type	All fields	All S&E fields	Agricultural sciences	Biological sciences	Computer sciences	Earth, atmospheric, and ocean sciences	Mathematics	Physical sciences	Psychology	Social sciences	Engineering
Bachelor's	1,734,229	554,365	22,759	93,654	43,586	5,299	18,021	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.

19

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



20

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.

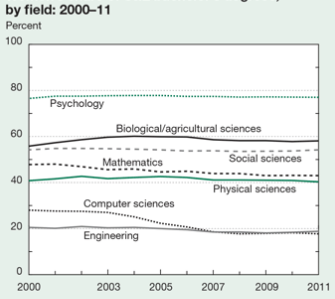
SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey; National Science Foundation, National Center for Science and Engineering Statistics, WebCASPAR database, http://webcaspar.nsf.gov.

Science and Engineering Indicators 2014

21

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

22

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

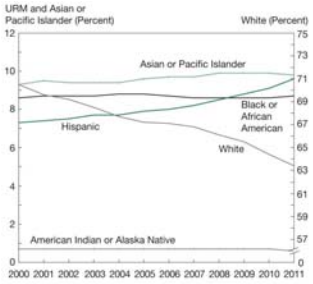
NOTES: Hispanic may be any race. American Indian or Alaska Native, Asian or Pacific Islander, black, or African American and white refer to individuals who are not of Hispanic origin. Percentages do not sum to 100 because data do not include individuals who did not report their race and ethnicity.

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

23

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.

24

Cross Agency Priority Goal Quarterly Progress Update

STEM Education

Goal Leaders:

Jo Handelsman, Associate Director for Science, White House Office of Science and Technology Policy

Joan Ferrini-Mundy, Assistant Director, National Science Foundation, Education and Human Resources

FY2015 Quarter 2

1

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.

2

Progress Update

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

- New leads identified for the P-12, Graduate, and Engagement IWGs to replace people who have left.

Collaborations examples:

- Cross-agency partnership examples:
  - The Department of Education's 21st Century Community Learning Centers (CCLC) program is piloting collaborations with the National Park Service and the Institute of Museum and Library Services and is expanding its NASA collaboration to include additional sites and engineering challenges (Engagement Priority Goal).
  - In addition to the existing four agencies (Office of Naval Research, Smithsonian Institution, Federal Bureau of Investigation (FBI), and Department of Homeland Security(DHS)), the Graduate Research Internship Program (GRIP) added three partners, Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), and Census Bureau (Graduate Priority Goal).
  - The Graduate Education IWG created a common portal for fellowship and traineeship opportunities across the federal government for graduate students and is working with the Undergraduate Education IWG to include undergraduate opportunities.

Meetings and Outreach

- The Performance Improvement Council facilitated an interactive brainstorming session for FC-STEM to discuss how to increase access to, and availability of, authentic experiences for both pre-service teachers and students at the P-12 through graduate levels. The session focused on a plan of action for meaningful impact (March 2015).
- The Broadening Participation IWG met with the P-12, Undergraduate, and Graduate IWGs to discuss potential collaborations. The IWGs are developing possible joint milestones to achieve common objectives.

3

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	

4

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:
- Department of Education
- NSF

Engagement
Co-Leads:
- Smithsonian
- NASA

Undergraduate STEM Education
Co-Leads:
- NSF
- Department of Defense

Under-represented Groups
Co-Leads:
- NSF
- National Institutes of Health (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

5

Work Plan: Governance and Coordination

- Build new models for leveraging assets and expertise.
- Build and use evidence based approaches.

Barriers/Challenges
- Baseline data are not easily available for several key areas.
- There is changing participation in the IWGs.
- External input from stakeholders outside the government is needed.

Key Milestones	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Working groups finalized for each sub-goal, including executive secretary	06/2014	Missed	FC-STEM	The IWG co-lead for Undergrad IWG needs to be selected.
Identify baseline data, when appropriate, using relevant data sources	08/2014	Complete	FC-STEM	
Identify and support opportunities for collaboration across working groups	12/2014	Complete	FC-STEM	
Key milestones/metrics/indicators established for all sub-goals	01/2015*	Missed	FC-STEM	A potential obstacle may be the lack of regularly collected metrics. Several of the IWGs are working with the PIC to identify key indicators.
Simplification of key processes such as development of Memoranda of Understandings (MOU) to encourage common procedures and collaborations	03/2015	Missed	FC-STEM	Greater collaboration among agencies has occurred, but common procedures still need to be implemented.

*Due date revised. The original due date was 08/2014. The interagency working groups required more time to develop milestones for each sub-goal.

6

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

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

Key Milestones (Lead: Department of Education / 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	Potential obstacles include 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 has been 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	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.

7

Work Plan Sub-goal 2: Engagement in STEM Education

- Access to scientific and engineering assets of the federal government
- Integration of STEM into school readiness and after-school programs
- Empirical understanding of how STEM experiences influence learning

Key Milestones (Lead: Smithsonian Institute / NASA)	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; FC-STEM co-chairs are involved in finding solutions.
Identify evaluation models used to effectively study engagement	01/2015**	Missed	IWG-Engagement	Group leadership is in transition; FC-STEM co-chairs are involved in finding solutions.
Implementation of agency commitments related to making and student engagement announced by President Obama at the White House Maker Faire	06/2015	On track	OSTP	No barriers identified.

*Due date revised. The original due date was 07/2014. The IWG met only occasionally until July 2014 when a co-chair was added, although it was possible to accomplish some collection of materials prior to that.
**Due date revised. The original due date was 09/2014. The IWG did not start meeting until July.

8

Work Plan Sub-goal 3: Undergraduate STEM Education

- Implementation of 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 mathematics at undergraduate

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	12/2014 (A)	Complete	IWG Undergrad	No barriers identified.
B) Develop an undergraduate research experiences portal	12/2015 (B)	On track	IWG Undergrad	No barriers identified.
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.

9

Work Plan Sub-goal 3: Undergraduate STEM Education

- Implementation of 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 mathematics at undergraduate

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 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	12/2014 (A)	Complete	IWG Undergrad	No barriers identified.
	4/2015 (B)	On track	IWG Undergrad	Dependent on A
B) Item integrated into HSLS Second Follow-up	12/2016 (C)	On track	IWG Undergrad	Dependent on B
C) Survey data collected from HSLS	12/2017 (D)	On track	IWG Undergrad	Dependent on C
D) Survey results available				

10

Work Plan Sub-goal 3: Undergraduate STEM Education

- Implementation of 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 mathematics at undergraduate

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:		On track	IWG Undergrad	Potential obstacles include range of purposes motivating agency commitment to undergraduate research and intern opportunities.
Phase 1: Common Indicator Metrics Analysis	08/2015	On track	IWG Undergrad	
Phase 2: Preliminary Research Study to Pool Common Data	02/2016	On track	IWG Undergrad	Dependent on Phase 1.
Identify opportunities to leverage related efforts of IWG on Broadening Participation	07/2015	On track	IWG Undergrad	Potential obstacles include range of purposes motivating agency commitment to undergraduate education and broadening participation initiatives.
Develop a Minority Serving Community College and federal agency convening to share information and resources about agency grant opportunities with MSIs	10/2015	On track	IWG Undergrad	
Development of an Undergraduate Education Forum that aligns with the four strategic objectives	02/2016	On track	IWG Undergrad	

11

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

- Be more responsive to rapidly changing demographics
- Focus investments
- 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.
Meet with leads for UG, Graduate, P-12, and Engagement IWGs to identify opportunities for collaboration and leveraging of efforts	3/2015*	Complete	IWG BP	Meetings with UG, Graduate, and P-12 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	On track	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.
Develop a summary document which includes BP, challenges, and needs in BP to support strategies and recommendations designed to focus federal BP investments	6/2015	On track	IWG BP	No barriers identified.
Agencies identify and begin implementation of modifications to existing program portfolio to address gaps to provide more opportunities for URMs in STEM	9/2015**	On track	IWG BP	No barriers identified.

*Due date revised. The original due date was 02/2015. IWG-BP is holding joint meetings with the other IWGs, not just the co-leads, so scheduling is a challenge.
**Due date revised. The original due date was 01/2015. The IWG held its first meeting in August 2014 and needs time to review existing research, programs, and exemplary models both within and outside of the federal government to help identify gaps and make recommendations for enhancements.

12

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

- Be more responsive to rapidly changing demographics
- Focus investments
- 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*	On track	IWG BP	No barriers identified.
Ideas proposed to maximize the impact of the federal investment with a timeline for agency adoption	12/2015**	On track	IWG BP	No barriers identified.

*Due date revised. The original due date was 06/2015. The IWG held its first meeting in August 2014 and needs more time to complete this milestone.
**Due date revised. The original due date was 10/2014. The IWG held its first meeting in August 2014.

13

Work Plan Sub-goal 5: Graduate STEM Education

- 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

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.
Assemble inventory of evaluation approaches for graduate programs	01/2015	Complete	IWG Grad	No barriers identified.
Identify available resources for the evaluation of graduate programs	01/2015	Complete	IWG Grad	No barriers identified.
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.
Create common portal for fellowship and traineeship opportunities for graduate students	03/2015*	Complete	IWG Grad	No barriers identified.
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.

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

14

Work Plan Sub-goal 5: Graduate STEM Education

- 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

Key Milestones (Lead: NSF/NIH)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Expand MOU partners to include most CoSTEM partners in opportunities for NSF fellows	12/2015	On track	IWG Grad	No barriers identified.
Expand Portal to include undergraduate research opportunities	12/2015	On track	IWG Grad and IWG Undergrad	No barriers identified.

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

15

Key Indicators*

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	Science and Engineering Indicators (S&EI) 2014	2012 (See slide 18)	N/A	Reported in S&EI 2014 biannually but based on variable survey	2012	
Number of STEM bachelor's degrees earned annually	S&EI 2014	554,365 (See slides 19 and 20)	N/A	Biannually	2011	Increasing
Percentage of bachelor's degrees awarded to women, black or African American, Hispanic, and American Indian or Alaska Native students	S&EI 2014	2011 (See slides 21-24)	N/A	Biannually	2011	Increasing

Indicators in Development:	
Potential High Level Indicator	**Potential Target Areas**
• Teachers' science and mathematics content knowledge for teaching • Number of STEM graduate students at institutions by mechanism of support and supporting federal agency	

*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.

16

Teachers' Science and Mathematics Content Knowledge for Teaching

The Education and Human Resources (EHR) Directorate partnered with NSF's National Center for Science and Engineering Statistics (NCSES) in the Directorate of the Social, Behavioral, and Economic Sciences (SBE) to develop a two-year task, awarded to SRI, to provide insight on ways to reconfigure the K-12 chapter in the biennial *Science and Engineering Indicators* (SEI) that incorporates, over time, the 14 indicators identified in the *Monitoring Progress* report. Indicator 6 is **Teachers' science and mathematics content knowledge for teaching.** SRI created a "roadmap" of indicators available in the short-term, as well as those that will require further research and development:

Currently Available Data
- Data from Hill (Harvard) and the MET Project
- Teacher perceptions of preparedness from National Assessment of Educational Progress (NAEP), Trends in International Mathematics and Science Study (TIMSS), and National Survey of Science and Mathematics Education (NSSME)
- B&B, HSLS, and Teaching and Learning International Survey (TALIS) data on college coursework

Near-Term Activities
- Assemble and compare existing survey data and data from Hill and MET studies
- Review and synthesize what is known about correlations between these measures and student achievement

Long-Term Activities
- Develop instruments to measure teacher content knowledge for teaching for science and high school math
- Develop non-survey measures to get at knowledge in use

Additional Research Needs
- Relationship between college backgrounds and self-reports of preparedness and direct assessments of content knowledge for teaching
- Cost-effective measures for direct assessments at scale

17

Contributing Programs

The Federal Science, Technology, Engineering, and Mathematics (STEM) Portfolio is a report from the Federal Inventory of STEM Education Fast-Track Action Committee that was published in December 2011.

The inventory details federal agencies' spending on STEM education and differs from previous such inventories in several ways.

- A consistent unit of analysis was used across all agencies (henceforth labeled as an "investment");
- the design and implementation of the inventory survey included extensive agency involvement; and
- a more thorough and detailed characterization of each agency's investments was obtained.

The result of these differences is a clearer and more complete picture of the federal investment in STEM education than has previously been available.

http://www.whitehouse.gov/sites/default/files/microsites/ostp/costem__federal_stem_education_portfolio_report_1.pdf

18

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).

19

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

Appendix table 2-1

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

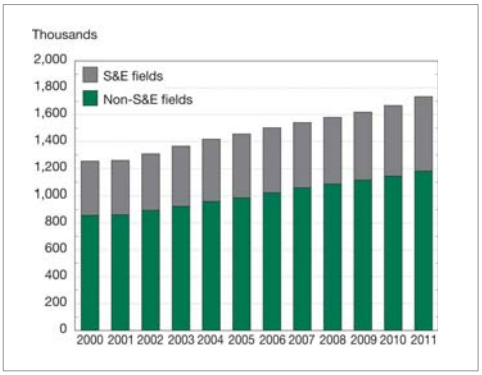
		S&E field									
Degree and institution type	All fields	All S&E	Agricultural sciences	Biological sciences	Computer sciences	Earth, atmospheric, and ocean sciences	Mathematics	Physical sciences	Psychology	Social sciences	Engineering
Bachelor's	1,734,229	554,365	22,759	93,654	43,586	5,299	18,021	19,198	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.

20

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



21

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.

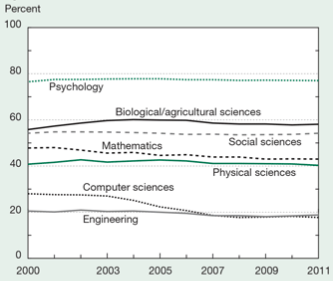
SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey; National Science Foundation, National Center for Science and Engineering Statistics, WebCASPAR database, http://webcaspar.nsf.gov.

Science and Engineering Indicators 2014

22

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

23

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

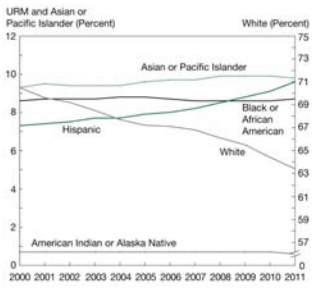
NOTES: Hispanic may be any race. American Indian or Alaska Native, Asian or Pacific Islander, black, or African American and white refer to individuals who are not of Hispanic origin. Percentages do not sum to 100 because data do not include individuals who did not report their race and ethnicity.

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

24

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.

25

Acronyms

- BP – Best Practices
- CCLC – Century Community Learning Center
- CoSTEM – Committee on Science, Technology, Engineering, and Mathematics
- DHS – Department of Homeland Security
- EHR – Education and Human Resources
- EPA – Environmental Protection Agency
- FBI – Federal Bureau of Investigation
- 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
- NSF – National Science Foundation
- NSSME – National Survey of Science and Mathematics Education
- OMB – Office of Budget and Management
- OSTP – Office of Science and Technology
- PIC – Performance Improvement 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

26

Cross Agency Priority Goal Quarterly Progress Update

STEM Education

Goal Leaders:
Jo Handelsman, Associate Director for Science,
White House Office of Science and Technology Policy
Joan Ferrini-Mundy, Assistant Director,
National Science Foundation

FY2015 Quarter 3

1

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.

2

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.

3

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.

4

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.

5

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.

6

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	Engagement	Undergraduate STEM Education	Under-represented Groups	Graduate Education	Coordination Objectives
Co-Leads: • ED • NSF	Co-Leads: • Smithsonian • NASA	Co-Leads: • NSF • DOE	Co-Leads: • NSF • NIH	Co-Leads: • NSF • NIH	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.

11

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	12/2014 (A)	Complete	IWG Undergrad	No barriers identified at this time.
B) Develop and launch an undergraduate research experiences portal	12/2015 (B)	On track	IWG Undergrad	No barriers identified at this time.
C) Develop a communications plan for federal research experiences portal with Graduate Education IWG	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.

12

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	12/2014 (A)	Complete	IWG Undergrad	No barriers identified at this time.
	4/2015 (B)	Complete	IWG Undergrad	Dependent on A
B) Item integrated into HSLS Second Follow-up (develop)	12/2016 (C)	On track	IWG Undergrad	Dependent on B
C) Survey data collected from HSLS D) Survey results available	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	

13

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:		On track	IWG Undergrad	Potential obstacles include range of purposes motivating agency commitment to undergraduate research and intern opportunities.
Phase 1: Common Indicator Metrics Analysis *(see Key Indicators)*	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.	07/2015 (A)	Complete	IWG Undergrad	Potential obstacles include range of purposes motivating agency commitment to undergraduate education and broadening participation initiatives.
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	10/2015 (B)	Complete	IWG Undergrad	No barriers identified at this time.
C) Host interagency convening to scale MSI outreach to all MSI community colleges	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.

14

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.

15

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

16

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.

17

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.

18

*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.

19

APPENDICES

20

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)

21

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).

22

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

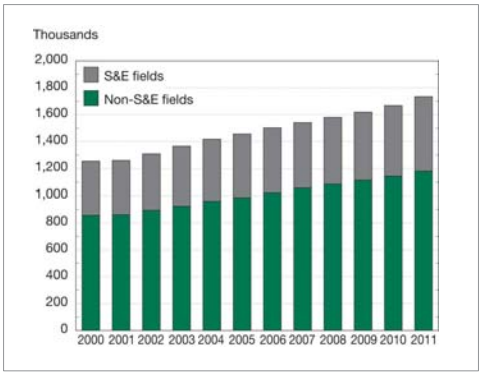
NOTES: Medical and other health sciences are included in non-S&E. Carnegie institution type corresponds to the 2010 Carnegie Classification of Academic Institutions.

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

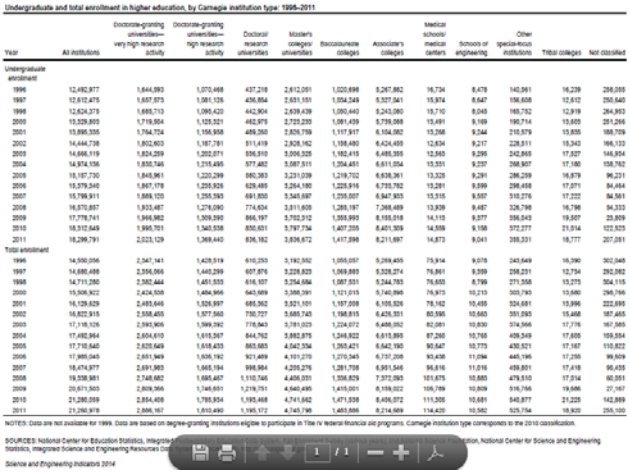
23

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



24

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	12,492,877	1,644,593	1,070,468	437,218	2,612,091	1,020,696	5,267,882	16,734	8,478	140,561	16,239	258,065
1997	12,612,475	1,657,573	1,081,126	456,854	2,631,151	1,054,249	5,327,041	15,974	8,647	156,608	12,612	250,640
1998	12,624,373	1,668,713	1,095,420	442,904	2,639,439	1,060,440	5,243,080	15,710	8,049	160,732	12,919	264,963
2000	13,328,805	1,719,954	1,125,521	482,975	2,723,255	1,081,439	5,739,588	15,491	9,169	190,714	15,605	251,264
2001	13,895,555	1,764,724	1,156,958	489,260	2,826,759	1,117,917	6,104,582	13,268	9,244	210,579	15,835	188,709
2002	14,444,738	1,802,603	1,187,781	511,419	2,928,162	1,156,480	6,424,405	12,834	9,217	228,511	15,343	166,133
2003	14,966,119	1,824,259	1,202,071	526,510	3,006,325	1,192,415	6,486,398	12,563	9,296	242,865	17,927	146,954
2004	14,974,136	1,850,746	1,215,495	577,482	3,087,511	1,254,451	6,611,054	13,551	9,257	268,907	17,180	158,762
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	286,299	16,879	96,231
2006	15,379,340	1,867,178	1,255,926	629,485	3,264,180	1,225,916	6,793,782	13,281	9,599	298,458	17,071	84,464
2007	15,799,911	1,889,120	1,256,290	691,850	3,345,697	1,255,007	6,947,903	13,315	9,557	310,276	17,222	94,561
2008	16,570,857	1,913,487	1,276,090	774,634	3,511,608	1,285,197	7,266,489	13,939	9,487	326,798	16,796	94,333
2009	17,778,741	1,946,982	1,309,590	866,197	3,702,312	1,355,993	8,155,018	14,115	9,377	356,043	19,507	23,809
2010	18,512,649	1,995,701	1,340,538	850,651	3,797,734	1,407,205	8,401,309	14,559	9,158	372,277	21,014	122,525
2011	18,299,791	2,023,129	1,369,440	836,182	3,836,672	1,417,896	8,211,697	14,873	9,041	388,331	18,777	207,091
Total enrollment												
1996	14,550,056	2,347,141	1,428,519	610,253	3,192,592	1,055,057	5,269,455	75,914	9,678	243,649	16,390	302,048
1997	14,680,488	2,356,066	1,440,299	607,876	3,228,825	1,069,883	5,328,274	76,861	9,559	258,231	12,754	292,562
1998	14,711,280	2,382,444	1,451,533	616,107	3,254,694	1,087,531	5,244,785	76,635	8,799	271,358	13,275	304,115
2000	15,506,822	2,424,506	1,484,966	640,669	3,388,391	1,121,015	5,740,896	76,973	10,215	303,790	13,680	296,766
2001	16,128,629	2,483,646	1,526,997	685,362	3,521,101	1,157,508	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	1,196,815	6,426,101	80,595	10,663	351,593	15,468	187,465
2003	17,118,126	2,595,906	1,599,292	778,943	3,781,023	1,224,072	6,488,052	82,081	10,830	374,566	17,776	167,585
2004	17,482,964	2,604,610	1,618,367	844,762	3,882,879	1,246,922	6,615,895	87,290	10,768	409,349	17,605	159,554
2005	17,710,540	2,620,549	1,618,433	865,665	4,042,704	1,265,421	6,642,190	90,647	10,775	430,521	17,167	110,822
2006	17,965,045	2,651,949	1,636,192	921,489	4,101,270	1,270,345	6,797,208	93,436	11,094	445,196	17,256	99,609
2007	18,474,977	2,691,983	1,665,194	998,564	4,205,276	1,281,708	6,951,546	96,616	11,016	459,801	17,418	96,455
2008	19,338,981	2,748,682	1,698,467	1,110,746	4,406,031	1,336,829	7,372,093	101,675	10,883	479,510	17,014	60,051
2009	20,671,505	2,809,366	1,746,651	1,219,751	4,640,495	1,415,091	8,159,022	106,789	10,809	516,746	19,586	27,167
2010	21,280,059	2,854,408	1,785,934	1,195,468	4,741,662	1,471,938	8,406,572	111,305	10,681	540,877	21,225	142,889
2011	21,260,978	2,886,167	1,810,490	1,195,172	4,745,796	1,483,886	8,214,569	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; 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

25

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

26

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.

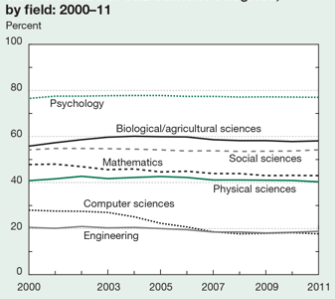
SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey; National Science Foundation, National Center for Science and Engineering Statistics, WebCASPAR database, http://webcaspar.nsf.gov.

Science and Engineering Indicators 2014

27

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

28

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

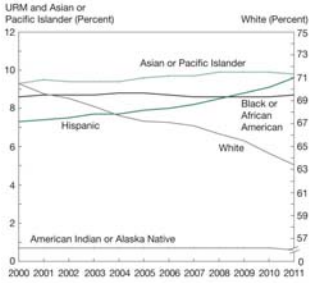
NOTES: Hispanic may be any race. American Indian or Alaska Native, Asian or Pacific Islander, black, or African American and white refer to individuals who are not of Hispanic origin. Percentages do not sum to 100 because data do not include individuals who did not report their race and ethnicity.

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

29

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.

30

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	

31

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	

32

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	

33

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

34

Cross Agency Priority Goal Quarterly Progress Update

STEM Education

Goal Leaders:
Jo Handelsman, Associate Director for Science,
White House Office of Science and Technology Policy
Joan Ferrini-Mundy, Assistant Director,
National Science Foundation

FY2015 Quarter 4

1

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.

2

Progress Update: FY15 Quarter 4 Highlights

- Representatives of the of FC-STEM five Interagency Working Groups (IWGs), the Office of Management and Budget (OMB) , the Office of Science and Technology Policy (OSTP) and the Performance Improvement Council (PIC) convened to discuss progress on the STEM Education Cross Agency Priority (CAP) goal on September 30, 2015. The group :
  - Discussed key milestones accomplished.
  - Strategies to make the most impact in FY 2016 and FY 2017 based on the review of ideas drawn from IWG Workplans, OSTP policy priorities, and the *Federal STEM Education 5-Year Strategic Plan*.
  - Evaluated the potential impact and level of difficulty of the potential ideas, prioritized projects, and collaborated over a rapid project planning activity.
- In September, 2015 the National Science Foundation (NSF) launched the Second Annual Community College Innovation Challenge (CCIC) to address the Federal STEM Education 5-Year Strategic Plan goal "Enhance STEM Experience of Undergraduate Students." The CICC is informed and shaped by discussions of the Undergraduate IWG. The submission window for entries to the CICC is October 15, 2015 through February 15, 2016.
- To encourage sharing of best practices across agencies, the Undergraduate Education IWG has begun regularly sharing dissemination tools to reach broader audiences, including tools such as NASA's Express Newsletter and the Department of Education's (ED) Community College Communities of Practice. For example, NASA Express, through social media such as Twitter, has the potential to be shared with approximately 13.17 million people.
- On August 17-18, 2015 the NSF and the Department of Agriculture (USDA) convened the Tribal Colleges and Universities Program (TCUP) Research Symposium. The activity is sponsored by NSF's Tribal Colleges and Universities Program and the 1994 Land Grant Program of the National Institute for Food and Agriculture (USDA). Over 40 students and faculty from TCUP institutions present their research findings at NSF.

3

Progress Update: FY15 Quarter 4 Highlights

- Activities that will support implementation of the Federal STEM Education 5-Year Strategic Plan Goal, "Enhance STEM Experience of Undergraduate Students" initiated this quarter included:
  - The NSF funded a National Research Council study to develop a conceptual framework for an indicator system to document the current state of Undergraduate STEM education and track improvements over time. These indicators will focus on the first two years of undergraduate education, document the status and quality of undergraduate STEM education, and be used to track improvements at the national level.
  - Interpersonal and intrapersonal competencies are associated with college completion. Measuring and assessing these competencies will be improved by a National Academies of Science, Engineering, and Medicine project to assess and establish priorities for the use of such measurements.
- To examine trends and set benchmarks for improving access to STEM degrees and decertifications, the Undergraduate STEM Education IWG analyzed data on the number of degrees and certificates awarded from 2008-2013, with data disaggregated by gender, race, and degree type.

4

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:
- Department of Education
- NSF

Engagement
Co-Leads:
- Smithsonian
- NASA

Undergraduate STEM Education
Co-Leads:
- NSF
- Department of Energy

Under-represented Groups
Co-Leads:
- NSF
- National Institutes of Health (NIH)

Graduate Education
Co-Leads:
- NSF
- National Institutes of Health (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

5

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 13)
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	

6

Work Plan Sub-goal 1: Improve STEM Instruction

Strategic Objectives
- Support teacher preparation efforts that encourage use of evidence-based STEM learning opportunities
- Increase and improve authentic STEM experiences for teachers

Key Milestones (Lead: Department of Education / 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	
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 institutions of higher education (IHE) faculty responsible for educating pre-service teachers about using evidence-based STEM learning opportunities and federal resources. Prepare summary of sessions	06/2015	Complete	IWG-P12	
Finalize FY16 outcomes, activities and milestones	09/2015	Complete	IWG-P12	

*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.

7

Work Plan Sub-goal 1: Improve STEM Instruction (continued)

Key Milestones (Lead: Department of Education / NSF)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Finalize FY16 outcomes, activities and milestones	09/2015	Complete	IWG-P12	
Compile information about Federal resources for P-12 STEM teachers in an online repository, one-pager and a powerpoint presentation for use at STEM education conferences and events and for distribution to P-12 STEM educators	04/2016	On Track	IWG P-12	Comment: The P-12 IWG is exploring science.gov as the host for the repository.
Utilizing the Federal resources online repository created by the P-12 IWG (see milestone above), develop a set of recommendations for evaluating professional development for STEM teachers	06/2016	On Track	IWG P-12	
Reach consensus on a definition of activities that are considered "authentic STEM experiences" as a reference for cataloging IWG activities that are considered to be authentic STEM experiences	04/2016	On Track	FC-STEM Task Group	
Collect information on successful inter-agency collaborations that have impacted educators and share these examples	06/2016	On Track	IWG P-12	
Finalize FY17 outcomes, activities and milestones	10/2016	On Track	IWG P-12	

8

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 or interest

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	2/1/2016*	On Track	IWG - Engagement	
Identify evaluation models used to effectively study engagement	2/1/2016*	On Track	IWG Engagement	
Implementation of agency commitments related to making and student engagement announced by President Obama at the White House Maker Faire	06/2015	Complete	OSTP and Agencies	

*Due dates revised with new IWG leadership

9

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	12/2014 (A)	Complete	IWG Undergrad	
B) Develop and launch an undergraduate research experiences portal	12/2015 (B)	On track	IWG Undergrad	
C) Develop a communications plan for federal research experiences portal with Graduate Education IWG	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	
Develop an online, cross-agency resource of Federal programs of interest to community colleges	12/2014	Complete	IWG Undergrad	
Identify common evaluation elements for undergraduate authentic STEM experiences to be used across Federal agencies, beginning with a Common Indicator Metrics Analysis	08/2015	Complete	IWG Undergrad	
Outreach efforts to increase implementation of evidence-based instructional practices and innovations i) NAS Reaching Students webinar viewings ii) NAS Reaching Students book downloads iii) NAS Reaching Students number of countries	8/2015	Complete	IWG Undergrad	

10

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

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 National Center for Education Statistics (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	12/2014 (A)	Complete	IWG Undergrad	
B) Item integrated into HSLS Second Follow-up (develop) C) Survey data collected from HSLS	4/2015 (B)	Complete	IWG Undergrad	Dependent on A
D) Survey results available	12/2016 (C)	On track	IWG Undergrad	Dependent on B
	12/2017(D)	On track	IWG Undergrad	Dependent on C
Undergraduate Education Forum that aligns with the four strategic objectives	06/2016	On track	IWG Undergrad	
Develop an Undergraduate STEM Research Playbook.	12/2016	On track	IWG Undergrad	
Collaborate with IWG on Broadening Participation: A) Identify opportunities to leverage related efforts of Broadening Participation IWG	07/2015 (A)	Complete	IWG Undergrad	
B) Develop a Minority Serving Community College and Federal agency convening to share information and resources about agency grant opportunities with Minority Serving Institutions: i) PPEC ii) Asian American Native American Pacific Islander (AANAPISI)	10/2015 (B)	Complete	IWG Undergrad	
C) Host interagency convening to scale MSI outreach to all MSI community colleges	11/2015 (C)	On track	IWG Undergrad	

11

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

Strategic Objectives
- Be more responsive to rapidly changing demographics
- Focus investments
- 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
Activities to support the Broadening Participation objective on improving campus climate:				
A) Agency IWG representatives identify strategies and timeline for Incorporating campus climate guidelines and best practices into funding opportunities	A) 10/2015	On Track	IWG BP	
B) Conduct a gap analysis to assess programs that support changes to campus climate and culture in post-secondary institutions to identify areas for program development based on the FC-STEM inventory	B) 3/2016	On Track	IWG BP	Potential Barriers: • Obtaining current information from other agencies on campus climate programs • Narrowing focus of analysis and targeted variables in the FC-STEM inventory so that analysis can be completed in a reasonable period of time
C) 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.	C) 7/2016	Not Started	IWG BP	• Identifying appropriate participants • Scheduling convening to allow for maximum participation • Obtaining buy-in from federal agencies and campus leadership

12

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

Key Milestones (Lead: NIH/NSF)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Agencies identify and begin implementation of modifications to existing program portfolio to address gaps to provide more opportunities for URMs in STEM	12/2015	On Track	IWG BP	
Ideas proposed to maximize the impact of the federal investment with a timeline for agency adoption	12/2015	On Track	IWG BP	
Establish a protocol to receive feedback from targeted audiences on Federally funded programs with broadening participation in STEM education opportunities	9/2016	Not Started	IWG BP	Creation of protocol will depend on website portal and feedback from convening of campus leadership
Convene a workshop for external stakeholders and experts to discuss potential solutions to improve the STEM preparation of underrepresented groups (in K-12 settings) and propose a research framework and/or agenda	6/2016	On track	IWG BP	
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	9/2017	Not Started	IWG BP	
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	9/2017	Not Started	IWG BP	

13

Work Plan Sub-goal 5: Graduate STEM Education

Strategic Objectives
- 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

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-funded fellows	10/2014	Complete	IWG Grad	
Assemble inventory of evaluation approaches for Federally funded programs in graduate education	01/2015	Complete	IWG Grad	
Identify available resources for the evaluation of graduate programs	01/2015	Complete	IWG Grad	
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	
Create common portal for fellowship and traineeship opportunities for graduate students	03/2015*	Complete	IWG Grad	
Hold a workshop with the PIC to begin to identify new milestones and indicators for 2016	04/2015	Complete	IWG Grad	
Initiate discussions with the National Center for Science and Engineering Statistics (NCSES) to explore the possibility of modifying the Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS) to provide better quality and more complete information about federal support for graduate education.	06/2015	Complete	IWG Grad	

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

14

Work Plan Sub-goal 5: Graduate STEM Education (continued)

Key Milestones (Lead: NSF/NIH)	Milestone Due Date	Milestone Status	Owner	Anticipated Barriers or Other Issues Related to Milestone Completion
Based on the discussions with the NCSES: • Design a modification to the survey instrument to allow universities to report support from any federal agency, including small agencies	06/2016	On Track	IWG Grad	
• Determine if information about federally-funded teaching assistantships should continue to be collected on the survey	06/2016	On Track	IWG Grad	
Expand MOU partners to include most CoSTEM agencies in opportunities for NSF-funded fellows	12/2015	On track	IWG Grad	
Expand Portal to include undergraduate research opportunities	12/2015*	On track	IWG UG and IWG Grad	
Initiate discussions with the Broadening Participation IWG to develop a goal related to identifying best practices for defining and measuring diversity and broadening participation in graduate education	02/2016		IWG BP and IWG Grad	
Convene a Graduate Research Internship Program (GRIP) Host Agency Summit As of 11/15, host agencies include: U.S. Census Bureau, Department of Homeland Security, the Environmental Protection Agency, the Federal Bureau of Investigation, the National Oceanic and Atmospheric Administration, the Office of Naval Research, Smithsonian Institution, and the U.S. Geological Survey	06/2016	On Track	IWG Grad	No barriers identified at this time.
Expand the outreach for GRIP with a goal of increasing the number of applications by 25% in 2016	06/2016	On Track	IWG Grad	
Work with the Undergraduate IWG to explore expanding GRIP to undergraduate students supported by NSF's S-STEM program	12/2016	On Track	IWG UG and IWG Grad	

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

15

Key Indicators

Key Implementation Data

Indicator	Source	Baseline Date/Data	Target	Frequency	Latest data	Trend
Percentage of high school mathematics and science teachers who hold degrees in their teaching field or in science or mathematics education	S&EI 2014	2012/ 73% and 82% [Table A]	↑	Biannually but based on variable survey	2012	N/A
Number of STEM bachelor's degrees earned annually	S&EI 2014	2011/ 554,365 [Table B and C]	↑	Biannually	2011	N/A
Number of STEM Certificates earned annually	NCES, IPEDS	2013/ 60,887 [Table J]	↑	Biannually		
Number of STEM Associate's Degrees earned annually	NCES, IPEDS	2013/88,795 [Table J]	↑	Biannually		
How many undergraduate students enroll in 4-yr institutions?	S&EI 2014	2013/ 21,260,976 [Table D]	Stable	Biannually	2011	N/A
What is the retention rate in U.S. 4-yr institutions?	S&EI 2014	2011/ 57.8% [Table E]	↑	Biannually	2011	N/A
What percentage of STEM certificates and degrees do women and racial/ethnic minorities earn?	S&EI 2014	2011[Tables F, G, H, I,K,L,M,N]	↑ 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	2011/ 554,365; Computer Science and Engineering [Table B]	↑ computer science and engineering	Biannually	2011	N/A
How many views did the Reaching Students webinar receive?	NAS, NRC, BOSE	114 times	Anticipated to ↑ in Q4	Quarterly	2015	N/A
How many times has Reaching Students been accessed and downloaded?	NAS, NRC, BOSE	16,512 downloads	↑	Quarterly	2015	↑
In how many countries has Reaching Students been accessed and downloaded?	NAS, NRC, BOSE	149	↑	Quarterly	2015	

16

Appendices

Appendix A: Undergraduate Education IWG Source Data and Explanatory Captions
(corresponding tables on following slides)

Appendix B: Acronyms

17

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).

18

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 a	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 activi	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

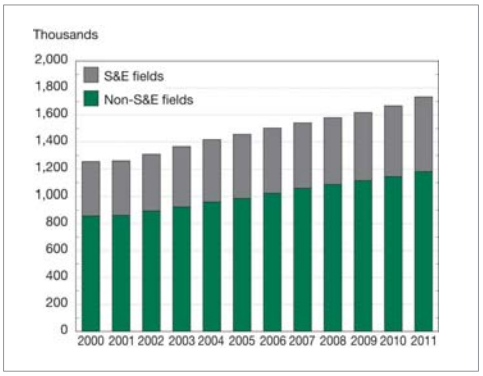
NOTES: Medical and other health sciences are included in non-S&E. Carnegie institution type corresponds to the 2010 Carnegie Classification of Academic Institutions.

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

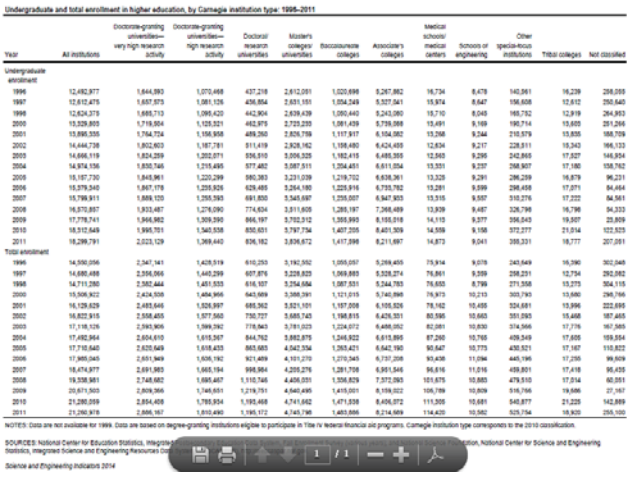
19

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



20

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

Science and Engineering Indicators 2014

21

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

Major in 2004	Number	Cumulative persistence outcome, 2009 (%) 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

22

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.

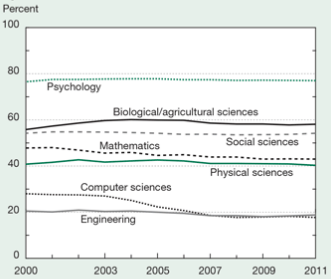
SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey; National Science Foundation, National Center for Science and Engineering Statistics, WebCASPAR database, http://webcaspar.nsf.gov.

Science and Engineering Indicators 2014

23

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

24

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

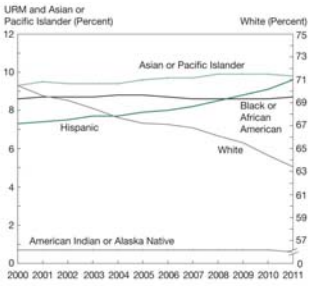
NOTES: Hispanic may be any race. American Indian or Alaska Native, Asian or Pacific Islander, black, or African American and white refer to individuals who are not of Hispanic origin. Percentages do not sum to 100 because data do not include individuals who did not report their race and ethnicity.

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

25

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.

26

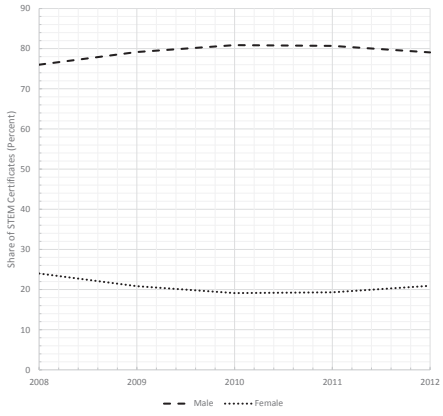
Table J. Number of STEM Certificates and Associate's Degrees, disaggregated by gender (2008-2012)

		2008-09	2009-10	2010-11	2011-12	2012-13
Number of STEM Certificates		45,525	55,121	66,649	60,304	60,887
	Males	34,601	43,631	53,910	48,658	48,133
	Females	10,924	11,490	12,739	11,646	12,754
Number of STEM Associate's Degrees		83,046	88,526	86,031	92,464	88,795
	Males	68,402	73,292	67,699	73,348	69,839
	Females	14,644	15,234	18,332	19,116	18,956

SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System Completions Survey.

27

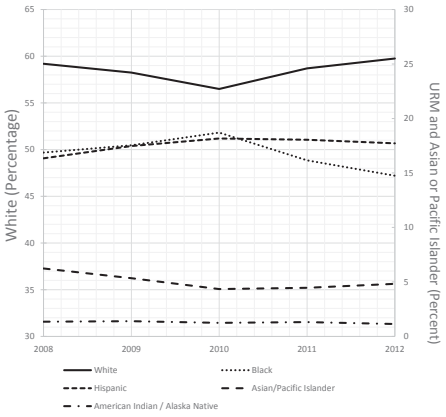
Table K. Percentage of STEM certificates awarded by gender (2008-2012)



SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System Completions Survey.

28

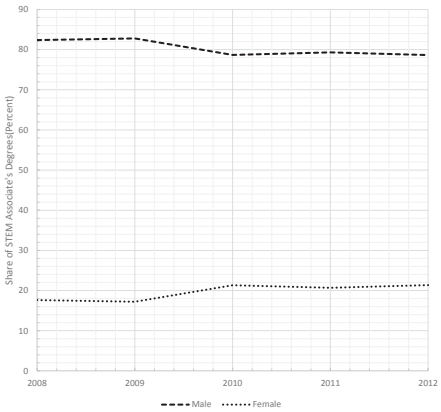
Table L. Percentage of STEM certificates awarded by race and ethnicity (2008-2012)



SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System Completions Survey.

29

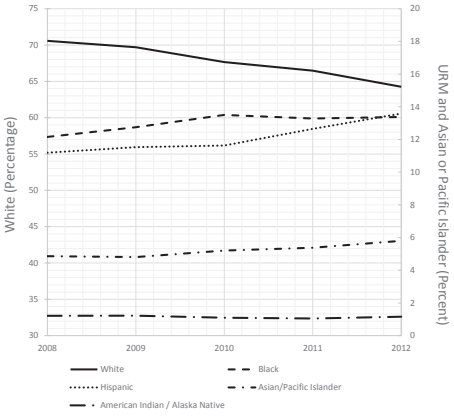
Table M. Percentage of STEM Associate's Degrees awarded by gender (2008-2012)



SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System Completions Survey.

30

Table N. Percentage of STEM Associate's Degrees awarded by race and ethnicity (2008-2012)



SOURCES: National Center for Education Statistics, Integrated Postsecondary Education Data System Completions Survey.

31

Appendix B: Acronyms

Acronym	Description
AANAPISI	Asian American Native American Pacific Islander Serving Institutions
CAP	Cross Agency Priority
CCIC	Community College Innovation Challenge
E.O.	Executive Order
ED	US Department of Education
FY	Fiscal Year
GRIP	Graduate Research Internship Program
GSS	Survey of Graduate Students and Postdoctorates in Science and Engineering
HSLS	High School Longitudinal Study
IHE	Institutes of Higher Education
IWG	Interagency Working Group
MOU	Memorandum of Understanding
MSI	Minority Serving Institutions
NAS	National Academies Press
NASA	National Aeronautics and Space Administration
NCES	National Center for Education Statistics
NCSES	National Center for Science and Engineering Statistics
NIH	National Institutes of Health
NSB	National Science Board
NSF	National Science Foundation
OMB	Office of Management and Budget
OSTP	Office of Science and Technology Policy
P-12	Grades preschool through twelve
PIC	Performance Improvement Council
PPEC	Pacific Postsecondary Education Council
Q(Q1)	Quarter (1-4)
S&EI	NSB Science and Engineering Indicators Report
STEM	Science, Technology, Engineering and Mathematics
TCUP	Tribal Colleges and Universities Program
UG	Undergraduate
URM	Underrepresented Minorities
USDA	US Department of Agriculture

32