Guide to FY2014 Research Funding
STEM Education Initiative
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Summary and Index

A national Science, Technology, Engineering and Mathematics (STEM) Education Innovation initiative has been established with Federal, State, Foundation and Industrial contributions. In the FY2014 budget request there is a major restructuring of the Federal investment, with the National Science Foundation (NSF) given lead for graduate and undergraduate, Department of Education (ED) for K-12 and the Smithsonian Institution (SI) for informal education. Other agencies will continue to participate, but their education budgets have been reduced. The focus of this Guide is mainly on University research programs rather than programs for support of students or for assistance to state and local educational agency (SEA, LEA) efforts.

Initiative Overview

STEM Education Definition

Formal or informal (in school or out) education that is primarily focused on physical and natural sciences, technology, engineering, and mathematics disciplines, topics, or issues (including environmental science education or environmental stewardship).

Federal STEM Education Strategic Plan

www.whitehouse.gov/sites/default/files/.../ostp/stem_stratplan_2013.pdf)

A Federal interagency subcommittee (CoSTEM) in the National Science and Technology Council (NSTC) was created to coordinate the Federal STEM investments. It produced a 2013 plan that addresses: a) an overview of the importance of STEM education to American scientific discovery and innovation; b) the need to better prepare students for today's jobs and those of the future; c) the importance of a STEM-literate society; and d) the current state of Federal STEM education efforts. The document presents five priority STEM education investment areas where a coordinated Federal strategy can be developed over five years. Also included in the plan are initial implementation roadmaps for each of the priority STEM education investment areas, proposing potential short-, medium-, and long-term objectives and strategies that might help Federal agencies achieve the outlined goals.

Federal STEM Education Portfolio

http://www.whitehouse.gov/sites/default/files/microsites/ostp/costem_federal_stem_education_portfolio_report_1.pdf

A 2011 report showed the distribution of Federal agency funding in support of STEM education (see Figure 1). Approximately 28% of the investment was targeted toward agency mission-specific workforce investment; NSF (with 47%) and Education (with 40%) provided the majority of the broader STEM investments.

Figure 1
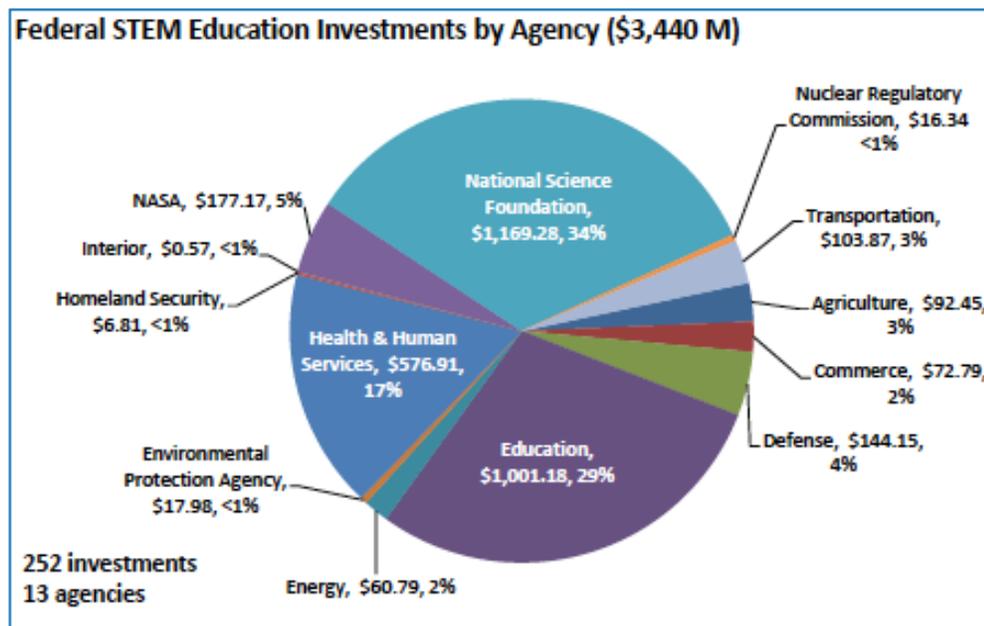
In the 2014 Budget request, the mission agency programs have been targeted for reduction. The NSF would have responsibility for undergraduate and graduate STEM education (with continued attention to research into learning/teaching at the K-14 levels). The Department of Education would have responsibility for K-14 STEM Education (mostly aid to state and local education authorities). The Smithsonian Institution would have responsibility for informal STEM education. However, this plan has been met with some resistance in Congress, with concern that some proven education efforts funded by mission agencies might be lost (especially at NIH and NASA).

Participating Agency Programs:
1. National Science Foundation (NSF)
The NSF has many programs addressing STEM education (see Table 1); the Education and Human Resource (EHR) Directorate plays a major role for the research component (a data sheet on the EHR Director is in Appendix 2). As part of the STEM initiative, there are a number of new and/or revised efforts.

a. <u>Core Research Program (ECR, NSF 13-555)</u>   <u>EHR Directorate</u>
  * STEM Learning (Div. of Res on Learning in Formal and Informal Settings (DRL))
    The program encourages projects that focus on such areas as: the learning of specific STEM subject matter content and practices; learning progressions, assessments and instruction-assisted development to support STEM learning; STEM learning and engagement outside of formal schooling; and dissemination of knowledge and learning within social networks.
  * STEM Learning Environments (Division of Undergraduate Education (DUE))
    Of particular interest are proposals that examine changing and emerging environments such as online/media learning at scale, blended instruction, virtual reality, personalized learning environments, and evidence-based approaches to undergraduate STEM teaching.
  * STEM Workforce Development (Division of Graduate Education (DGE))
    Evidence-based understanding of STEM learning is necessary with respect to STEM career pathways and transitions; academic and non-academic STEM careers; emerging practices and changing contexts of STEM workforces; and the changing higher education climate and capacity for reforming STEM workforce development efforts.
  * Broadening Participation in STEM (Div. of Human Resource Development (HRD))
    This program seeks proposals that will pursue fundamental research questions about what it takes to broaden participation in STEM effectively, including better understanding how to build institutional capacity and informal learning environments that foster the untapped potential of underrepresented minority groups in STEM fields.

b. <u>Discovery Research K-12 (DRK-12, NSF 11-588)</u>
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500047
The DRK-12 program supports projects that lead to significant and sustainable improvements in STEM learning, advance STEM teaching, and contribute to improvements

in the nation's formal education system. Successful DRK-12 projects emphasize both research on and development of innovative STEM resources, models, and tools.

c.   Catalyzing Advances in Undergraduate STEM Education (CAUSE)
The new CAUSE program is an evolution and consolidation of the Foundation's ongoing efforts to couple STEM disciplinary expertise with education research expertise to better understand and improve undergraduate STEM learning and persistence of students from all groups and to support STEM workforce development. The goals of CAUSE will be pursued through three investment strategies:
- Foundational research. These investments focus on core research questions–such as how learners   move towards expertise in a discipline, or best learn about concepts that are interdisciplinary – that are foundational for the improvement of teaching, learning, engagement, and retention and for serving as a basis for development, adoption/adaptation, and implementation of models, prototypes, and innovations.
- Design-based research. These investments support iterative approaches to design, implementation, analysis, and revision, including prototyping and building and refining models.
- Scale-up and effectiveness studies. These investments focus on the potential for leveraging NSF's investments in foundational and design and development research. Key goals include the scaling of successful efforts on learning and learning environments, broadening participation, workforce preparation, and employing emerging technologies.

d.   Advanced Technology Education (ATE, NSF 11-692)
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5464
With an emphasis on two-year colleges, the ATE program focuses on the education of technicians for the high-technology fields that drive our nation's economy. It supports curriculum development; professional development of college faculty and secondary school teachers; career pathways to two-year colleges from secondary schools and from two-year colleges to four-year institutions; and other activities.

e.   Faculty Early Career Development (CAREER, NSF 11-690)
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503214
This program will be significantly revised and re solicited late in 2013.
The CAREER Program is a Foundation-wide activity that offers the National Science Foundation's most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations.

2. U.S. Department of Education (ED or DoED)
The Department of Education has established a senior position for STEM Education, presently Ms. Camsie McAdams (see data sheet in Appendix 2). It is not yet clear how this focus will propagate through the existing organizational structure. Most of the ED funding supports the education of teachers and local/state organizations or implements STEM education improvements.

a. Institute for Education Sciences (IES)   http://ies.ed.gov
The IES mission is to provide rigorous and relevant evidence on which to ground education practice and policy and share this information broadly.   STEM is not explicitly mentioned in the IES budget line, nor in its research grants program solicitations. But there are Mathematics and Science Education programs that support research on the improvement of mathematics and science knowledge and skills of students from kindergarten through high school (CFDA 84.305A for the National Center for Education Research and 84.324 for the National Center for Special Education Research).

b. Office of Innovation and Improvement (OII)   http://www.ed.gov/oii-news
OII makes strategic investments in innovative educational programs and practices, and administers more than 25 discretionary grant programs managed by five program offices: Charter Schools Program, Improvement Programs, Parental Options and Information, Teacher Quality Programs, and the Investing in Innovation Programs.   The STEM Innovation Networks program in the ED FY2014 budget appears in the Innovation and Instructional Teams budget and may be administered in OII.

c. Office of Elementary and Secondary Education (OESE)
http://www2.ed.gov/about/offices/list/oese/index.html
The mission of the Office of Elementary and Secondary Education is to promote academic excellence, enhance educational opportunities and equity for all of America's children and families, and to improve the quality of teaching and learning by providing leadership, technical assistance and financial support. OESE has managed the "Math and Science Partnership" program (CFDA 84.366B), a formula grant program, which is projected to end in 2014. It will be replaced at essentially the same funding level by a "Effective Learning and Teaching: STEM" program included under the STEM Networks budget line. This new program would address the need to strengthen instruction comprehensively and increase student achievement in STEM subjects in high-need LEAs and schools.

d. ARPA-ED
ARPA-ED has been proposed in the FY2014 budget; $65M has been requested as part of the Investing in Innovation (i3) budget line. Its mission would be to pursue development of educational technology and tools that result in improvements for all students (especially those from low-income backgrounds) by increasing educational achievement and attainment for students in both traditional and non-traditional learning environments.

3. Smithsonian Institution (SI)
http://smithsonianeducation.org/
The Smithsonian will work with NSF, ED, the other CoSTEM agencies including the National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), U.S. Department of the Interior (DOI), U.S. Department of Agriculture (USDA), National Institutes of Health (NIH), and other science partners to harness their unique expertise and resources to disseminate relevant, evidence-based materials and curricula, on-line resources, and delivery and dissemination mechanisms to reach more teachers and students both inside and outside the classroom.
- Goal 1: Co-Creating Content and Programs

The Smithsonian will: a) identify materials from Smithsonian units and partnering federal agencies engaged in informal STEM education efforts that will be aligned with school curriculum; b) create new resources and experiences that have a measurable impact; c) engage in front-end evaluation to determine the appropriate uses for the content as well as the audiences; d) develop and implement strategies for content dissemination that might include distance learning, Web-based content, apps, games/simulations, webinars, and other scalable approaches; and e) establish feedback loops with educators and learners to facilitate course correction.

- Goal 2: Developing and Maintaining an Infrastructure to Deliver Content
  The Smithsonian is piloting MySI, an online Participant Access System that will enable centralization of education assets and interactive relationships with users. MySI will be used to tag, manage, and disseminate standards-aligned STEM content developed by partners working in the public and non-profit sectors.
- Goal 3: Creating Community/Teachers and Students/Agency Partners
  The Smithsonian is developing a toolset that allows teachers to aggregate learning resources from a variety of sources so that they may customize learning experiences and align content and activities with local standards. This tool is currently in the prototype stage.
- Goal 4: Evaluation/Learning and Evolving
  Approaches to STEM education evaluation include the use of logic models as tools for planning and assessment, front-end evaluation, rapid-prototyping, pre- and post-assessments, random control studies, the development of assessment tools and online surveys, and the collection of data on the use and effectiveness of content.

4. Department of Defense (DOD)

a. National Defense Education Program (NDEP)
http://www.ndep.us/
NDEP consists of three components: (1) Science, Mathematics, and Research for Transformation (SMART); (2) the National Security Science and Engineering Faculty Fellowship (NSSEFF); and (3) pre-Kindergarten-12th Grade (PK-12).
SMART is a scholarship-for-service program that provides support to high performing U.S. graduate and undergraduate students in the 19 academic STEM disciplines identified as areas of future workforce need by DOD. The PK-12 component: 1) builds student interest in STEM fields and disciplines and in careers specific to DOD; 2) develops DOD relevant science, engineering and mathematics skills; and 3) provides a future talent pool to fulfill DOD's demand for highly skilled STEM professionals by increasing access to authentic STEM experiences. *The PK-12 program is slated for termination in FY2014.*

b. Department of Defense Educational Activity (DODEA)
http://www.dodea.edu/
The DODEA instructional program provides a comprehensive prekindergarten through 12th grade curriculum that is dedicated to attaining highest student achievement for all students. STEM is a specific interest. DODEA's grant program provides resources to military-connected local educational agencies (LEAs) to develop and implement projects that are designed to:
- Promote student achievement in the core curricular areas.

- Ease the challenges that military students face due to transitions and deployments.
- Support the unique social and emotional needs of military students.
- Promote distance-learning opportunities.
- Improve educator professional development.
- Enhance and integrate technology.
- Encourage parental involvement.

Since 2008, DODEA has awarded nearly $200 million in grants to over 180 military-connected school districts. USC has such an effort "Building Capacity in Military Connected Schools" in the School of Social Work.

c. DARPA
Engage (DARPA-BAA-11-36)
http://www.darpa.mil/Our_Work/I2O/Programs/ENGAGE.aspx
ENGAGE seeks to develop interactive game-based technologies for pre-k through grade three students to inspire them to become future innovators. The first phase of ENGAGE focused on creating prototype games focused on physics, chemistry, systems thinking and basic sciences.

Full Spectrum Learning (DARPA-SN-13-04)
The Full Spectrum Learning program will integrate the findings and discoveries from studies of learning at all levels, e.g., individual, group, societal, to develop an optimal instruction system. The system will incorporate modern technologies, including machine learning and recommender technology, to identify and suggest optimum teaching methods.

d. Air Force / Air Force Office of Scientific Research (AFOSR)
Outreach to U.S. S&T Workforce
http://www.wpafb.af.mil/library/factsheets/factsheet.asp?id=8981
Strengthen science, mathematics, and engineering research and infrastructure in the U.S., thereby strengthening current and future Air Force S&T capabilities. Applications for these programs do not always require proposals but generally have specific deadlines, formats, and qualifications.

University Nanosatellite Program (AFOSR-BAA-2012-0006)
http://www.wpafb.af.mil/library/factsheets/factsheet.asp?id=19801
The University Nanosat Program is a joint program between the Air Force Research Laboratory's Space Vehicles Directorate, AFOSR and the American Institute of Aeronautics and Astronautics (AIAA). The primary outcome of individual projects funded under this program is the design, fabrication and functional testing of a nanosat. Secondary objectives are to foster research in enabling technologies for nanosats and the design of experiments that can be performed by nanosats in orbit.

e. Army / Army Educational Outreach Program (AEOP)
http://www.usaeop.com/
The Army Educational Outreach Program (AEOP) links and networks appropriate components to derive the best synergies to present the Army to a larger pool of technical talent and to provide students with Army-unique practical experiences at Army

laboratories, centers, and institutes to fill future Army Science and Technology workforce needs. The program includes the components: eCybermission, Educational Outreach and Workforce Development, and Educational Outreach Program Cooperative Agreement.

f. Navy/ Office of Naval Research (ONR)
Engineering and Mathematics (STEM) initiative (ONR BAA 13-007)
http://www.onr.navy.mil/Education-Outreach.aspx
The Navy has a program Stem2Stern (http://www.stem2stern.org/index). ONR is interested in proposals for developing innovative solutions that directly support the development and maintenance of a robust STEM workforce. Successful efforts will be targeted towards one or more of: K-12, Undergraduate, Graduate STEM education.

5. NASA
http://www.nasa.gov/offices/education/about/index.html#.Ufgp_FOxObI
NASA's STEM education efforts will be fundamentally restructured into a consolidated program within the NASA Office of Education. NASA seeks to make available its unique assets, such as the International Space Station, open to STEM education programs government-wide on a reimbursable basis in order to enhance their effective reach to students and educators. NASA's education portfolio will focus on the following four priorities, which will contribute toward the Administration's goals for STEM education.
- STEM Engagement: Provide opportunities for participatory and experiential learning activities that connect learners to NASA-unique resources;
- NASA Internships, Fellowships, and Scholarships: Utilize NASA facilities and assets to provide work experiences, research opportunities to improve retention in STEM and prepare students for employment in STEM jobs;
- Educator Professional Development: Prepare STEM educators and leaders to deliver quality STEM instruction utilizing unique NASA assets; and
- Institutional Engagement: Improve the capacity of U.S. institutions to deliver effective STEM education.

6. NIH
http://dpcpsi.nih.gov/orip/od/science_education_partnership_awards_index.aspx
NIH's Science Education Partnership Awards (SEPA) program is designed to improve life science literacy throughout the nation through innovative educational programs. SEPA-supported projects create partnerships among biomedical and clinical researchers and K-12 teachers and schools, museums and science centers, media experts, and other educational organizations. *The Office of Science Education at the National Institutes of Health and the Science Education Partnership Award will be terminated under the STEM Education Initiative.*

7. USDA National Institute for Food and Agriculture (NIFA)
http://www.csrees.usda.gov/nea/education/in_focus/higher_ed.html
NIFA provides funding to secondary and post-secondary institutions to increase the number of skilled agricultural scientists and enhance scientific and agricultural literacy. Some grants are offered to faculty seeking to provide innovative learning opportunities; others fund scholarships to promising students pursuing advanced degrees in agriculture-

related fields. In addition, some grants support institutions that recruit and train students to succeed in the growing field of vocational agriculture.

Resources
1. NSTC Committee on Science, Technology, Engineering, and Math Education (CoSTEM)
http://www.whitehouse.gov/administration/eop/ostp/nstc/committees/costem
The CoSTEM, in accordance with the America COMPETES Reauthorization Act of 2010, will:
   1. Review STEM education activities and programs, and the respective assessments of each, throughout Federal agencies to ensure effectiveness;
   2. Coordinate, with the Office of Management and Budget, STEM education activities and programs throughout Federal agencies; and
   3. Develop and implement through the participating agencies a 5-year STEM education strategic plan, to be updated every 5 years (first version released in May 2013.

2. STEM Education Caucus, U.S. Congress
http://stemedcaucus2.org/
A bipartisan STEM Education Caucus is co chaired by Representative Dan Lipinski (D-IL), Representative Randy Hultgren (R-IL), Representative Richard Hanna (R-NY) and Representative Susan Davis (D-CA).

3. STEM Education Executive Board
http://www.acq.osd.mil/rd/organization/stem.html
The DOD STEM Executive Board will provide strategic leadership to the Department's STEM programs to ensure the Department has enduring access to a highly competent technical workforce to support research and development of capabilities in existing and emerging technical areas.

4. National Governors Association (NGA) Center for Best Practices STEM education
http://www.nga.org/cms/stem
With a view toward state economic development, Governors are in a unique position to advance comprehensive STEM education policy agendas aligned with workforce expectations. Governors can elevate the urgency and build the political will to advance STEM education and use budgetary and policy levers to make meaningful changes across education systems.

5. National Science Teachers Association (NSTA)
http://www.nsta.org/about/
NSTA publishes books and journals for science teachers from kindergarten through college; holds conferences on science education; provides ways for science teachers to connect with one another; and informs Congress and the public on vital questions affecting science literacy and a well-educated workforce.

6. Project Lead The Way (PLTW)
http://www.pltw.org/about-us/who-we-are
PLTW is a provider of rigorous and innovative Science, Technology, Engineering, and Mathematics (STEM) education curricular programs used in middle and high schools.

7. Science, Technology, Engineering, and Mathematics (STEM) Education Coalition
http://www.stemedcoalition.org/
The coalition works to support STEM programs for teachers and students at the U. S. Department of Education, the National Science Foundation, and other agencies that offer STEM related programs. It represents all sectors of the technological workforce – from knowledge workers, to educators, to scientists, engineers, and technicians.

8. STEMconnector
http://www.stemconnector.org/
The STEM Connector™ serves as a network to link those advocating science, technology, engineering and math (STEM) education across disciplines and distances. Launched in STEMdaily® aggregates and curates news stories in STEM Education for all professionals interested in staying up-to-date on the latest developments in STEM; it is available without cost through an email distribution.

9. STEMGrants.com
http://stemgrants.com/category/grants-by-source/federal-grants/
STEMGrants.com is operated by Secor Strategies, LLC. STEM Grants features news, updates and a free downloadable guide to STEM (Science, Technology Engineering, and Mathematics) educational grants for K-12, educational non-profits, and universities.

10. For access to the information on the Research Advancement's Central Desktop website **Mission Agency Program Site (MAPS)**, contact NLWalker@usc.edu for user name and password.

The MAPS site has:
Under "Wiki" Tab - how to use the site
Under "Files/Discussion" Tab
   Mission Agency (DHS, DOD, DOE, DoED, EPA, NASA, NIST, NOAA. USDA and
      cross agency programs in Adv Manuf, Sustainability, STEM Education)
     Guide to Agency Funding for FYXX
     Agency Research Program Charts
     Agency Planning Documents
     Program Officer Data sheets (with contact info, biosketch, program descriptive,
      personal pubs)
     Program Officer presentations (when available)
   Proposal Writing Guides
Under "Database" Tab
   USC MAPS - table of all program officers / programmatic interests

Assistance in Locating Funding and Preparing Proposals
Dr. James S. Murday   DC Office of Research Advancement
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Table 1
NSF FY2014 STEM Education Programs

NSF Div.	Level	Solic. ID	Program Name		FY13 $(M)	FY14 $(M)
Minority Serving Institutions						
EHR/HRD	UG	13-516	Historically Black Colleges Undergraduate	HBCU-UP	32	32
EHR/HRD	UG	13-572	Tribal Colleges and Universities Program	TCUP	13	13
Fellowships/Scholarships						
OISE	G	12-498	East Asia & Pacific Summer Inst. for Grad Stud	EAPSI	2.4	2.4
MPS/DMS	G	11-540	Enhancing the Math Sci Workforce	EMSW21	12	12
EHR/DUE	G	12-585	CyberCorps: Scholarship for Service	SPS	45	25
	G	12-599	National Grad Res Fellowship Program	NGRF	198	325
	G	11-533	NSF Research Traineeships (includes IGERT)	NRT	60	55
EHR/DUE	UG	12-529	Scholarships in STEM	S-STEM	75	75
EHR/DUE	UG	13-526	Robert Noyce Scholarship Program		55	61
Other Grant Programs						
EHR/DUE	K-12	12-518	Math and Science Partnerships	MSP	57	-
	UG	12-609	Computing Education for 21st Century	CE21	15	
EHR/DUE	K-12		STEM Partnerships (merges MSP and CE21)	STEM-C		74
EHR/DRL	K-12	12-552	Res on Educ and Learning (was REESE)	REAL	54	60
EHR/DRL	K-12	11-588	Discovery Research K-12	DR-K12	99	102
EHR/DRL	K-12	12-597	Innovative Technology Experiences	ITEST	25	25
ENG/CISE	K-12	11-509	Res Experiences for Teachers in Engn & Comp	RET	6	6
GEO/OCE	O&I	10-527	Ctrs for Ocean Sciences Educ Excellence	COSEE	4	1
EHR/DRL	O&I	12-560	Adv Informal STEM Learning	AISL	61	48
	O&I		Excellence Awards in S&E	EASE	5	5
EHR/DUE	UG	11-692	Adv Technological Educ	ATE	64	64
	UG		Catalyzing Advances in Undergrad STEM *	CAUSE	110	123
OISE	UG	12-551	Intern Res Experiences for Students	IRES	3	2
EHR/HRD	UG	12-564	Louis Stokes Alliances for Minority	LSAMP	46	46
	UG	13-542	Research Experiences for Undergrads	REU	66	79
EHR/MPS	G	12-554	Alliances for Grad Educ and the Professioriate	AGEP	8	8
			K-12 STEM Education Programs Subtotal		**260**	**267**
			Undergraduate STEM Education Programs Subtotal		**471**	**495**
			Graduate STEM Education Programs Subtotal		**374**	**453**
			Outreach & Informal (O&I) Education STEM Programs		**71**	**54**
			Total, NSF STEM Education		**1175**	**1269**
	PD		NSF Postdoctoral Program		22	26
	Prof	11-038	CAREER		206	224

O&I - outreach and Informal, UG - undergraduate, G - graduate, PD - Postdoctorate
* CAUSE replaces a number of programs such as CCE, EE, NUE, OEDG, STEP, TUBE, STEP, TUES and WIDER that were funded at ~$110M in FY2013

Appendix 1: FY2014 New Basic Research Programs and/or Significant Change

NSF
CAUSE   from $110M in FY2013 to $123M
The National Science Foundation (NSF) will launch a $123 million new program to improve retention of undergraduates in STEM fields and improve undergraduate teaching and learning in STEM subjects to meet the President's goal of preparing 1 million more STEM graduates over the next decade. CAUSE replaces a number of programs previously funded at the $110M level.

Faculty Early Career Development (CAREER)   from $206M in FY2013 to $224M
CAREER develops the future STEM workforce through support of young faculty who are dedicated to integrating research with teaching and learning. In FY 2014, NSF will support approximately 500 new awards. Within CAREER, NSF will support more fully utilizing the talents of individuals in all sectors of the American population by promoting Career-Life Balance, including supplemental funding requests to employ research technicians or the equivalent for up to three months to sustain research when principal investigators are on family leave.

National Graduate Research Fellowship (NGRF)   from $198M in FY2013 to $325M
NGRF builds on and expands the longstanding NSF Graduate Research Fellowship program (GRF) to incorporate features and opportunities that allow fellows to gain specialized experiences and training in key STEM areas. Through this expanded program, an increase of approximately 700 fellows is expected.

EHR Core Programs (NSF 13-555)   from 0 in FY2013 to $25M
$10M DRL will provide strategic direction and program guidance for the STEM Learning component.
$5M DGE will lead to a portfolio that supports implementation of successful approaches, practices, and models for STEM professional workforce preparation.
$5M HRD will provide strategic direction and program guidance for the Broadening Participation and Institutional Capacity.
$5M DUE will provide strategic direction and program guidance for the STEM Learning Environments component.

ED Innovation and Instructional Teams Budget Line
STEM Innovation Networks   from 0 in FY2013 to $150M
The proposed STEM Innovation Networks (STEM-INs) program would provide competitive grants to local educational agencies (LEAs) or consortia of LEAs, *in partnership with institutions of higher education (IHEs)*, nonprofit organizations, other public agencies, museums, and businesses, to transform STEM teaching and learning, especially for high-need students, and accelerate adoption of practices in pre-K-12 education that help increase the number of students who seek out and are effectively prepared for postsecondary education and careers in STEM fields.

To be eligible to receive a grant, an applicant would be required to implement a set of high-quality pre-K-12 standards in mathematics and science that build toward college- and career-readiness; offer a rigorous 4-year course of study in high school science and mathematics; and have data systems that support timely collection and analysis of project implementation and impact data, including data on student outcomes such as accumulation of postsecondary credits in STEM subjects. Grantees would initially receive funding for 3 years and could receive an additional 2 years of funding if meeting performance expectations.

STEM Virtual Learning Network   from 0 in FY2013 to $7M
ED would use STEM Innovation Networks national activities funds to develop a STEM Virtual Learning Network - an online community based on the Department's Connected Educator and Learning Registry initiatives and designed both to facilitate interaction among STEM educators and to accelerate identification, dissemination, adoption, and use of effective practices. The Department would leverage the work of STEM Innovation Networks grantees by requiring them to contribute actively to this community

STEM Teacher Pathways   from 0 in FY2013 to $80M
This competition would provide grant awards to create or expand high-quality pathways to teacher certification and other innovative approaches for recruiting, training, and placing talented recent college graduates and mid-career professionals in STEM fields in high-need schools. *Traditional and nontraditional teacher preparation programs, including alternative routes to certification, would be eligible to compete for funding*, and the Department would look at ways to leverage and integrate the Pathways program with the work of the STEM Innovation Networks (STEM-INs). For example, the Department could give priority to STEM Teacher Pathways applicants that propose partnerships with schools and districts served by STEM-INs.

STEM Master Teacher Corps   from 0 in FY2013 to $35M
Selected teachers would make a multi-year commitment to the Corps and, in exchange for their expertise, leadership and service, receive an annual stipend on top of their base salary. The STEM Master Teacher Corps may also involve collaboration with nonprofit organizations and local public-private partnerships between STEM-related businesses and industries and school districts. Members of the Corps would be selected through a rigorous recruitment and selection process based on teachers' demonstrated effectiveness in teaching one or more STEM subjects, content knowledge, and contributions to the continuous improvement of teaching and learning both within their schools and across the community of STEM educators.

Effective Teaching and Learning STEM   from 0 in FY2013 to $150M
The Effective Teaching and Learning: STEM program, proposed as part of the Administration's Elementary and Secondary Education Act (ESEA) reauthorization plan in 2010, would reform the Mathematics and Science Partnerships program under current law and provide grants to SEAs, alone or in partnership with other entities, to support State and local efforts to implement a comprehensive strategy for the provision of high-quality pre-K-

12 STEM instruction. Grantees and sub grantees would be required to focus on improving teaching and learning in mathematics or science, or both, and could also carry out activities designed to increase student achievement in technology or engineering, in high-need LEAs and schools.

<u>Fund for the Improvement of Education</u>   from 0 in FY2013 to $30M
These funds will be used to expand the Improving Mathematics Achievement and Transition to College from High School program, a joint initiative between ED and NSF. The program will help develop, evaluate, and scale up effective practices that increase student achievement in mathematics during the critical transition period from the last two years of high school through the first two years of college

<u>ARPA-ED</u>   from 0 in FY2013 to $65M
The Advanced Research Projects Agency for Education (ARPA-ED) would allow the Department of Education to support high-risk, high-return research on next-generation learning technologies, including for STEM education.

Smithsonian Institute
<u>STEM Education</u>   from 0 in FY2013 to $25M
As part of the STEM Initiative, the Smithsonian will serve as a conduit between federal mission agencies, Smithsonian units, other non-profit organizations (including the Smithsonian's 170 Affiliate museums), the Department of Education, and school districts. It will work collaboratively to create informal STEM engagement resources and experiences that advance agencies' unique assets, support the creation of complementary materials, avoid duplication of effort, share a centralized portal for the broad dissemination of engagement offerings and create opportunities for the cross-referencing of content on agency sites. Informal STEM engagement resources include: curriculum development, professional development, as well as inspirational and out-of-classroom educational experiences that are aligned with State standards so that they are relevant to what students are learning in the classroom.

DARPA
<u>Engage (CCS-02, 601101E)</u>   from $8M in FY2013 to $12M
ENGAGE seeks to develop interactive game-based technologies for pre-k through grade three students to inspire them to become future innovators. FY2014 plans include:
- Develop and release Engage-based software for training additional topics.
- Continue transition efforts to include dissemination of Engage-based software based on lessons learned from relevant DOD training activities.
- Establish a collaborative, on-line, problem-solving environment that allows experts and non-experts to address complex DOD challenge problems.

AFOSR
<u>AFOSR Outreach to U.S. S&T Workforce</u>   from $11M in FY2013 to $17M
Strengthen science, mathematics, and engineering research and infrastructure in the U.S., thereby strengthening current and future Air Force S&T capabilities.

ONR

S&E Education, Career Development and Outreach   from $37M in FY2013 to $43M

Science, Technology, Engineering and Math (STEM) for FY2014 this program will include:
- Initiate new effort on undergraduate retention in STEM majors at Minority Serving Institutions.
- Initiate new effort for teacher training in STEM for schools in underserved communities.
- Initiate new computer science programs for female undergraduates.
- Initiate expansion of internships to underserved students.
- Initiate Masters in Systems Engineering program at a minority institution

Appendix 2: Data Sheets on STEM Education Leaders

Ms. Camsie McAdams
Advisor on STEM Education
U.S. Department of Education
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Biosketch:
Camsie McAdams has been teaching mathematics and science for ten years in inner-city public schools. She began her career in STEM education at the Colorado School of Mines, where she was the recipient of the Engineering Days Scholarship in 1993. After spending the summer of 1995 at the Moscow State University, McAdams transferred to the University of Denver, graduating magma cum laude and Phi Beta Kappa with a Bachelor of Arts in both General Engineering and Political Science. Following graduation from DU, she received a United States Ford Foundation Fellowship to study democratization in Eastern Europe.

Her teaching career began in 1999 in Oakland, CA, where McAdams taught at Westlake Middle School for six years. McAdams attended the Harvard Graduate School of Education in 2004-2005, earning a Master of Education in Teaching and Learning. Upon completion of her Master's, McAdams was recruited to serve in a leadership role during the opening of New Day Academy, a small public 6th-12th grade school in the South Bronx, NY. McAdams worked with several other Harvard graduates and veteran educators from New York City in the design of the school, and served as Instructional Leader for Math and Science during 2005-2006. In 2006, McAdams returned to the classroom to teach algebra at East Side Community High School in Manhattan. McAdams was the recipient of the Fund for Teachers Fellowship to spend a summer in the Yucatan, Mexico to study Mayan mathematics and Spanish language and culture. She was also named a winner of the 2009 Presidential Awards for Excellence in Mathematics and Science Teaching for the State of New York. McAdams served her Fellowship year in the Broadening Participation in Computing program at NSF. In addition to analyzing proposals and writing reviews and recommendations, she represented the agency at various events around the country, including delivering the keynote address at STEMapalooza in Denver to 800 girls, and participating in the Grace Hopper Celebration of Women in Computing in Tucson. However, her most significant contribution was the K-12 Educator on the National Lab Day Leadership Team. McAdams has represented National Lab Day at numerous events across the country, including both NSTA and NCTM National Conferences. Most recently, McAdams coordinated the Washington, DC National Lab Day celebration week and helped bring various senior members of the Cabinet and major federal agencies into DC Public Schools to celebrate hands-on STEM education.

Education
Master of Education in Teaching and Learning from Harvard in 2005
BA in General Engineering and Political Science from Univ Denver

Dr. Joan Ferrini-Mundy
Assistant Director, Education and Human Resources
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Biosketch:
Dr. Joan Ferrini-Mundy is Assistant Director of the National Science Foundation (NSF) for Education and Human Resources, a position she has held since February 2011. She is responsible for the leadership of the NSF Directorate for Education and Human Resources (EHR). She had served the Foundation in a number of capacities since 2007 including as inaugural director (through an Intergovernmental Personnel Act appointment) of the EHR Directorate's Division of Research on Learning in Formal and Informal Settings.

From 2007 through 2009, Ferrini-Mundy was a member of the National Science and Technology Council's (NSTC) Subcommittee on Education, and currently co-chairs the Strategic Plan workgroup of the National Science and Technology Council Committee on STEM Education.   She is a member of the Mathematics Expert Group of the Programme for International Student Assessment (PISA), and in 2007-2008, representing NSF, she served as an ex officio member of the President's National Mathematics Advisory Panel, and co-chaired its Instructional Practices Task Group.   From 1999 - 2011 Ferrini-Mundy held an appointment at Michigan State University (MSU), where she was a University Distinguished Professor of Mathematics Education in the Departments of Mathematics and Teacher Education, and Associate Dean for Science and Mathematics Education in the College of Natural Science. From 1983-1999 Ferrini-Mundy was a member of the Mathematics Department at the University of New Hampshire, and in 1982-1983 she was a mathematics faculty member at Mount Holyoke College, where she co-founded the SummerMath for Teachers Program. She was elected a fellow of the American Association for the Advancement of Science in 2011.

Education
PhD in mathematics education from University of New Hampshire

Illustrative Publications Reflecting Personal Research Interests:
Driven by Diversity
Ferrini-Mundy, Joan
SCIENCE 340(6130), 278-278   APR 19 2013

Teacher preparation research - An insider's view from the outside
Wilson, SM; Floden, RE; Ferrini-Mundy, J
JOURNAL OF TEACHER EDUCATION 53(3), 190-204   MAY-JUN 2002

Mathematics education research: Can the field deliver?
Ferrini-Mundy, J; D'Ambrosio, B; Dougherty, B; et al.
JOURNAL FOR RESEARCH IN MATHEMATICS EDUCATION 33(5), 313-318   NOV 2002

Dr. Laura D. Adolfie
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Biosketch:
The Science, Technology, Engineering and Mathematics (STEM) Development Office was created to lead and facilitate the coordination of the Department's STEM investments. Dr. Adolfie is responsible for guiding the development of the Department's first Science, Technology, Engineering and Mathematics (STEM) Education and Outreach Strategic Plan submitted to Congress in May 2010. With a background in health and education, she has worked in developing research and education portfolios for a number of Federal agencies. For over a decade, Dr. Adolfie served as a professional staff member of the Senate Agriculture, Nutrition and Forestry Committee. She also taught Junior High geography in Alexandria, VA and championed student engagement in academic competitions. Her research interests center on the career development of individuals under-represented in science, technology, engineering and mathematics (STEM).

Education
PhD in Education

Appendix 3: Acronym Glossary

General

AFOSR	Air Force Office of Scientific Research
ARO	Army Research Office
BAA	Broad Agency Announcement
CFDA	Catalog of Federal Domestic Assistance
DARPA	Defense Advanced Research Projects Agency
DOC	Department of Commerce
DOD	Department of Defense
DOED	Department of Education (alternative acronym)
DOE	Department of Energy
FOA	Federal Opportunity Announcement
HHS	Department of Health and Human Services
DHS	Department of Homeland Security
DOI	Department of the Interior
DOT	Department of Transportation
ED	Department of Education (alternative acronym)
EPA	Environmental Protection Agency
HBCU	Historically Black College or University
IHE	Institution of Higher Education
NASA	National Aeronautics and Space Administration
NGA	National Governors Association
NIFA	National Institute for Food and Agriculture (part of USDA)
NIST	National Institute of Standards and Technology (part of DOC)
NIH	National Institutes of Health (part of HHS)
NOAA	National Oceanic and Atmospheric Administration (part of DOC)
NSF	National Science Foundation
NSTC	National Science and Technology Council
NRC	Nuclear Regulatory Commission
MAPS	Mission Agency Program Site (USC DC Res. Adv. website)
ONR	Office of Naval Research
OSTP	Office of Science and Technology Policy
S&T	Science and Technology
USDA	Department of Agriculture
USGS	United States Geological Survey (part of DOI)

Topic Specific

AEOP	Army Education Outreach Program
AFRL	Air Force Research Laboratories
AIAA	American Institute of Aeronautics and Astronautics
ARPA-ED	Advanced Research Projects Agency for Education (in ED)
ATE	Advanced Technology Education (NSF program)
CAREER	Faculty Early Career Development (NSF program)
CAUSE	Catalyzing Advances in Undergraduate STEM Education (NSF program)

CISE	Computer and Information Sciences (NSF Directorate)
CoSTEM	Sub Committee on STEM Education (in NSTC)
DGE	Division of Graduate Education (in NSF EHR)
DMS	Division of Mathematical Sciences (in NSF MPS)
DRL	Div. of Research on Learning in Formal and Informal Settings (in NSF EHR)
DRK-12	Discovery Research K-12 (NSF program)
DODEA	DOD Education Activity (associated with educating military dependents)
DUE	Division of Undergraduate Education (in NSF EHR)
ECR	Core Research Program (for NSFs EHR)
EHR	Education and Human Resources (NSF Directorate)
GEO	GeoSciences (NSF Directorate)
HRD	Division of Human Resource Development (in NSF EHR)
i3	Investing in Innovation (program in ED OII)
IES	Institute for Education Sciences (in ED)
IGERT	Integrative Graduate Education and Research Traineeship (NSF program)
LEA	Local Education Agency
MPS	Mathematical and Physical Sciences (NSF Directorate)
NCER	National Center for Education Research (in ED IES)
NCSER	National Center for Special Education Research (in ED IES)
NCTM	National Council of Teachers of Mathematics
NDEP	National Defense Education Program (in DOD)
NGA	National Governors Association
NGRF	National Graduate Research Fellowship (NSF program)
NSSEFF	National Security Science and Engn. Faculty Fellowship (DOD program)
NSTA	National Science Teachers Association
OCE	Ocean Sciences (Division in NSF's GEO)
OESE	Office of Elementary and Secondary Education (in ED)
O&I	Outreach and Informal (NSF Education effort)
OII	Office of Innovation and Improvement (in ED)
OISE	Office of International Science and Engineering - has been restructured into the Office of International and Integrative Activities (IIA)
PD	Post-doctorate
PISA	Programme for International Student Assessment
PK-12	Education grades from pre-kindergarten through twelfth
PLTW	Project Lead the Way
RET	Research Experience for Teachers (NSF program)
REU	Research Experience for Undergraduates (NSF program)
SEA	State Education Agency
SEPA	Science Education Partnership Award (NIH program)
SI	Smithsonian Institution
SMART	Science, Mathematics and Research for Transformation (DOD program)
STEM	Science, Technology, Engineering and Mathematics (education)
STEM-INs	STEM Innovation Networks (ED program)
TCUP	Tribal Colleges and Universities Program (in NSF)