



Preparing a 21st Century Workforce

Science, Technology, Engineering, and Mathematics (STEM) Education in the 2013 Budget

“And that’s why when I took office, I called for an all-hands-on-deck approach to science, math, technology and engineering. Let’s train more teachers. Let’s get more kids studying these subjects. Let’s make sure these fields get the respect and attention that they deserve.”

President Barack Obama
February 2012

In 2009, President Obama set an ambitious goal: restoring the United States to first place in the world in the percentage of people earning a college degree. To support this goal, the President has made significant commitments to improve the quality of science, technology, engineering, and mathematics (STEM) education at all levels, so that over the next decade more U.S. students will be well prepared to pursue a STEM degree and more actually attain such a degree. **The 2013 Budget invests \$3.0 billion in programs across the Federal government on STEM education, a 2.6 percent increase over 2012 enacted funding levels (see Table).** A considerable proportion of this funding is for STEM-education programs that strive to address two critical aspects of the education system: post-secondary STEM education and K-12 teacher effectiveness.

The 2013 Budget establishes a government-wide goal to increase, over the next decade, the number of well-prepared college graduates with STEM degrees by one-third, or one million, as called for in a recent report on undergraduate STEM education by the President’s Council of Advisors on Science and Technology (PCAST). Federal agencies will contribute to this goal through programs designed to engage students and improve teaching and learning in STEM fields from early learning through K-12 and college undergraduate levels. For example, the 2013 Budget proposes a significant boost in funding at the National Science Foundation (NSF) for undergraduate education and improved coordination between undergraduate STEM education programs at NSF and the Department of Education (ED).

In his 2011 State of the Union address, the President called for a new effort to prepare 100,000 effective STEM teachers with strong teaching skills and deep content knowledge over the next decade, a call that is renewed in 2012. As a crucial component of achieving this goal, the 2013 Budget proposes an investment of \$135 million through ED and NSF to provide effective teachers in every classroom across America who are well qualified to teach STEM subjects.

The Administration is releasing a description of a 5-year Federal STEM-education strategic plan along with the Budget. The strategic plan itself, to be released this spring, will increase coordination and collaboration among the 13 agencies that support STEM education, and increase the efficiency and impact of the portfolio of Federal STEM-education programs.

Undergraduate STEM Education

The focus of the 2013 Budget’s undergraduate STEM-education investments is on identifying and supporting effective approaches that will increase completion rates in STEM subjects and increase the number and quality of graduates prepared for employment in STEM fields. This focus is a first step to achieving the goal of graduating one million additional well-prepared STEM students over the next decade. Some of the components of this commitment are:

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- **Improving undergraduate STEM retention and graduation rates.** The Budget proposes \$61 million for NSF's Transforming Undergraduate Education in STEM (TUES) program. This program will provide funds to design, test, and implement more effective educational materials, curriculum, and methods to improve undergraduate learning and completion rates in STEM for a diverse population.
 - **Building and scaling effective K-16 math-education strategies.** The Budget proposes \$60 million for a jointly administered NSF and ED mathematics-education initiative that will support early research, development, validation, and scale-up of effective practices. Similar to ED's Investing in Innovation (i3) program, this initiative will support collaborations between researchers and practitioners to develop and test promising approaches and support widespread adoption of practices found to be effective through rigorous evaluations. It will draw upon the strengths of both agencies, forging stronger connections between NSF's network of research universities and ED's network of State and local K-12 school leaders. This multi-agency model, using a common evidence framework, will be expanded to include other STEM programs and agencies in the future as part of the Federal STEM-education strategic plan.
 - **Improving undergraduate math and science instruction.** The Administration proposes \$20 million for the second year of an NSF teacher-training R&D program for undergraduate teachers. This program, Widening Implementation and Demonstration of Evidence-based Reforms (WIDER), will transform the way science, engineering, and math are taught to undergraduate students. Competitive proposals will target the teaching of all undergraduate courses and the teaching practices of faculty members in a department for relevant departments at an institution. This program will support research on how to achieve widespread sustainable implementation of improved STEM undergraduate teaching practices and student outcomes at major universities, particularly for future K-12 STEM teachers.
 - **Supporting individuals from groups traditionally underrepresented in STEM.** The 2013 Budget includes \$100 million for ED's Developing Hispanic Serving Institutions STEM and Articulation program, which is designed to increase the number of Hispanic and other low-income students attaining degrees in STEM fields. In addition, the Administration proposes \$46 million for NSF's Louis Stokes Alliance for Minority Participation (LSAMP) Program and \$30 million for NASA's Minority University Research and Education Program (MUREP).
 - **Improving STEM education at community colleges.** The Administration proposes \$64 million for NSF's Advanced Technological Education (ATE) program, which focuses on educating technicians who have the knowledge and abilities to creatively support science and engineering.

Graduate Fellowships

The focus of the 2013 Budget's graduate STEM-education investments is on producing more highly skilled U.S. scientists and engineers. This includes:

- \$243 million for NSF's Graduate Research Fellowship (GRF) program. This program supports the development of the Nation's future scientists, with funding for 2,000 new GRF awards in 2013.
- \$775 million for NIH's Ruth L. Kirschstein National Research Service Awards, which provide funding to prepare individuals for careers in the biomedical, behavioral, and social sciences. NIH

will provide an increase of 2 percent in the average stipend level to sustain the development of a highly qualified biomedical-research workforce.

Preparing Effective Teachers

- **Training an additional 100,000 effective STEM teachers over the next 10 years.** The 2013 Budget proposes \$80 million in the Department of Education to expand promising and effective models of STEM-teacher preparation in the Effective Teachers and Leaders State Grants program, which will help prepare an additional 100,000 effective STEM teachers over the next decade. This investment would allow the expansion of promising models—for example, those that provide students with early and intensive field experiences and enable students to simultaneously earn a STEM degree and a teaching certificate.
- **Encouraging STEM experts to become teachers.** The 2013 Budget proposes \$55 million for NSF’s Robert Noyce Scholarship Program to encourage talented science, technology, engineering, and mathematics majors and professionals to become K-12 mathematics and science teachers.

STEM Education for Students and Adults

K-12 STEM Education: The focus of the K-12 STEM investments in the 2013 Budget is on increasing expectations for all students, supporting high-quality resources and professional development for STEM teachers, and scaling up strategies to improve STEM outcomes. This includes:

- **Improving STEM instruction and learning.** The Administration proposes to align the programmatic goals of the Department of Education’s \$150 million reauthorized Math and Science Partnership program (to be renamed Effective Teaching and Learning: STEM) and the NSF’s \$57 million Math and Science Partnership program to ensure that STEM instruction reflects what works. The Department of Education’s program would support research on and scaling of evidence-based models of professional development for STEM teachers.
- **Identifying and scaling evidence-based STEM-education practices.** The Administration proposes \$114 million to support NSF’s Discovery Research K-12, which supports research on teaching and learning STEM, and creating research-based resources and practices which can be replicated on a larger scale.

Informal STEM Education:

- **Building models of effective STEM education in informal environments.** The Administration proposes \$48 million for NSF’s Advancing Informal Science Learning program (formerly Informal Science Education), focusing on a research and model-building program targeted at identifying the most effective means and the most innovative models for engaging today’s young people and adults in science outside of school settings.

Making Hard Choices

The 2013 Budget invests \$3.0 billion in programs across the Federal government on STEM education, a 2.6 percent increase over the 2012 enacted funding level. (All comparisons are in current, not-adjusted-for-inflation dollars.) The 2013 Budget makes disciplined choices guided by drafts of the Federal STEM education strategic plan, cutting back on lower-priority programs to make room for targeted increases and

reducing duplication and overlap. The Budget proposes the elimination or consolidation of programs to reduce the total number of federal STEM-education programs to 209 from 235 in FY 2012.

In addition to the funding adjustments presented in the 2013 Budget, the Office of Science and Technology Policy, working with OMB and Federal agencies, will soon release a government-wide STEM-education strategic plan to assess the effectiveness of Federal STEM-education investments and develop strategies for ensuring that future investments are well-coordinated and use the best evidence-based approaches. This effort has been carried out by the Committee on STEM Education under the National Science and Technology Council.

Table. Federal STEM Education Program Funding

Table. Federal STEM Education Program Funding by Agency

(budget authority in millions)

	FY 2011 Enacted	FY 2012 Enacted	FY 2013 Budget	Change FY 12-13	
				Amount	Percent
Agriculture	91	88	91	3	3.5%
Commerce	58	55	44	-11	-19.5%
Defense	153	164	153	-11	-6.5%
Education	561	517	628	111	21.5%
Energy	49	48	37	-11	-23.1%
Health and Human Services	560	560	554	-7	-1.2%
Homeland Security	2	2	6	4	200.0%
Interior	1	1	1	0	0.0%
Transportation	100	98	101	2	2.4%
Environmental Protection Agency	20	26	20	-6	-21.6%
NASA	157	149	117	-32	-21.3%
National Science Foundation	1,148	1,154	1,193	40	3.4%
Nuclear Regulatory Commission	10	16	5	-10	-65.6%
Total STEM Education	2,910	2,877	2,951	74	2.6%

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STEM - Science, technology, engineering and mathematics