



Preparing Our Children for the Future *Science, Technology, Engineering and Mathematics (STEM) Education in the 2011 Budget*

"I'm committed to moving our country from the middle to the top of the pack in science and math education over the next decade... This is probably going to make more of a difference in determining how well we do as a country than just about anything else that we do here."

- President Barack Obama
November 3, 2009

The 2011 Budget makes a strong commitment to education in science, technology, engineering, and mathematics (STEM) fields, with an unprecedented set of investments in K-12 STEM education. President Obama believes that it is imperative for our economic competitiveness to increase participation and performance of all students in science, technology, engineering and mathematics, and that America improve its international performance from the middle of the pack to the top of the pack over the next decade. The prosperity of future generations depends on what we do now to educate our students.

The 2011 Budget invests \$3.7 billion in STEM education programs across the federal government (see Table), including a historic \$1 billion commitment to improve math and science achievement among K-12 students, an increase of over 40 percent. The impact of these investments will be magnified by "Educate to Innovate," a campaign launched by the President to motivate and inspire young people to excel in STEM education. This campaign has already mobilized over \$500 million in financial and in-kind support from companies, foundations, philanthropists, universities, non-profit organizations, and grassroots volunteers.

These investments will increase STEM literacy so that students learn deeply and think critically, and strengthen STEM education opportunities for all students, with the understanding that the diversity of our nation is an asset as we invent and design for the diverse global market. It will have a substantial impact on the lives of our students, as their world now and in the future will be defined by scientific discoveries and the new technologies they generate.

Need for Urgent Action: A growing number of jobs require STEM skills, and America needs a world-class STEM workforce both to expand the frontiers of knowledge and discovery and to address the "grand challenges" of the 21st century, such as developing clean sources of energy that reduce our dependence on foreign oil and discovering cures for diseases. We must improve on our current performance.

- Projections from the Department of Labor's Bureau of Labor Statistics (BLS) indicate that over 80 percent of the fastest-growing occupations (such as those in the healthcare- and computer-related fields) are dependent on knowledge of mathematics and science.
- On the 2006 Program for International Student Assessment (PISA) mathematics assessment, the United States ranked 24th out of 30 countries belonging to the Organization for Economic Cooperation and Development (OECD), which represents the world's most advanced countries; and 17th out of 30 on science.

Framework for Action: To achieve measurable and rapid results, the Administration will build on its historic investments in K-12 education under the Recovery Act, support a coordinated continuum of federal programs to develop, validate and scale up effective reforms, and expand the coalition of stakeholders working together to improve STEM education as part of the Educate to Innovate campaign.

- **Building on the Historic Investments in STEM in the Recovery Act:** The Recovery Act included the largest investment in education in history, helping to keep employed more than 300,000 educators. In addition, the President's \$4.35 billion Race to the Top fund provides a competitive advantage to states that commit to a comprehensive strategy to improve STEM education. The 2011 Budget, by providing an additional \$1.35

billion in funding for Race to the Top, builds on these historic investments to create state capacity, focus on student achievement, and help prepare America's students to graduate ready for college and career.

- **Educate to Innovate:** The President is deeply committed to improving STEM education. That's why he has committed to hosting an annual science fair at the White House, and has challenged the 200,000 federal scientists and engineers to get more involved in STEM education. But Federal leadership is not enough. For this reason, the President has challenged governors, philanthropists, scientists, engineers, educators, and the private sector to join with him in a national campaign to dramatically improve achievement in STEM subjects. As part of the "Educate to Innovate" campaign, a new set of public-private partnerships have already mobilized \$500 million in private resources to improve STEM education.
- **Coordinated Effort to Scale What Works:** This Administration is committed to investing in and scaling what works, and to improving the coordination of federal STEM education programs. The Department of Education and the National Science Foundation (NSF) will lead an effort to increase the impact of Federal STEM investments by (1) developing an aligned strategy that emphasizes key agency capacities; (2) clarifying evidence standards used to assess program impact; and (3) identifying the most promising STEM efforts for further validation, testing, and suitability for scale-up.

Investing Strategically: Success on the President's goal will require improving STEM literacy for all students, expanding the pipeline for a strong and innovative STEM workforce, and focusing on opportunities and access for groups such as women and underrepresented minorities. This Administration places a high priority on ensuring opportunities in STEM education to a diverse range of individuals, institutions, and geographic areas, and on investments along each part of the STEM pipeline from K-12 to graduate education.

K-12 Education: The focus of the 2011 Budget's K-12 STEM investments is on increasing expectations for all students, supporting high-quality resources and professional development for STEM teachers, and developing, validating, and scaling up strategies to improve STEM outcomes. This includes:

- \$300 million to improve the teaching and learning of STEM subjects through the Department of Education's (ED) proposed Effective Teaching and Learning in STEM program. This new program, an increase of \$119.5 million over the antecedent programs, would support professional development for STEM teachers; the implementation of high-quality assessments and instructional materials; and improved systems for linking student data on assessments with instructional supports.
- \$150 million in STEM-focused projects funded through ED's Investing in Innovation (i3) program, which under the 2011 request would award a total of \$500 million in competitive awards to provide seed money for fresh ideas, help grow promising programs with a good track record, and scale up programs with proven results to a national level.
- \$63 million for NASA's K-12 Education programs, including \$20 million for a pilot program through which the agency will harness the talent of its scientists and engineers and the discoveries of its missions in multi-week summer enrichment programs for middle school students and teachers.
- \$41 million (a 63 percent increase compared to 2010) for NSF's Cyberlearning Transforming Education (CTE) program. This new multidisciplinary research program, in collaboration with the Department of Education, is intended to capture the transformative potential of advanced learning technologies, enabling new pathways of STEM learning for students and for workforce development.

Undergraduate Education: The focus of the 2011 Budget's undergraduate STEM investments is on identifying and supporting effective approaches that will increase rates of program completion in STEM areas, and increase the number of graduates prepared for employment in STEM fields. This includes:

- \$25 million for a STEM initiative in ED's Fund for the Improvement of Postsecondary Education (FIPSE), which in collaboration with NSF will identify and validate effective and scalable approaches for teaching undergraduate students in STEM fields.

- \$103 million (a 14 percent increase compared to 2010) for a comprehensive program at the NSF's Division of Human Resource Development (HRD) to increase the participation of students from groups traditionally underrepresented in STEM.
- \$19 million in NSF and \$55 million in the Department of Energy (DOE) for the RE-gaining our ENERGY Science and Engineering Edge (RE-ENERGYSE) program, located at the intersection of energy, environment, and human factors. This partnership between DOE and NSF will help the nation retain its leadership position in science and engineering by attracting and educating future scientists in the clean energy field.
- \$64 million for the NSF's Advanced Technological Education (ATE) program, which focuses on educating technicians who have the understanding, knowledge, and abilities to creatively support science and engineering. This program is on a growth trajectory to reach \$100 million by FY 2013.
- In addition, the President's American Graduation Initiative, which has passed the House and awaits approval in the Senate, will invest over \$10 billion over the next ten years to achieve an additional 5 million community college degrees and certificates by 2020 and take new steps to ensure that those credentials will help graduates get ahead in their careers.

Graduate Fellowships: The focus of the 2011 Budget's graduate STEM investments is on preparing the highly skilled scientists and engineers who will tackle the grand challenges of the 21st century. This includes:

- \$158 million (a 16 percent increase compared to 2010 enacted) for the NSF's Graduate Research Fellowship program. This program supports the development of the Nation's future scientists and engineers. This program is on a trajectory to triple awards made each year to 3,000 by FY 2013.
- \$824 million (a 5 percent increase compared to 2010 enacted) for the National Institutes of Health's Ruth L. Kirschstein National Research Service Awards program, which supports basic and applied training in the biomedical and behavioral sciences through institutional awards and fellowships.
- \$15 million (a \$10 million increase compared to 2010 enacted) for the Department of Energy's Office of Science Graduate Fellowship program; \$6 million for Computational Science Graduate Fellowship program; and \$2 million for Applied Mathematics and High Performance Computer Science.
- \$40 million (a 4 percent increase compared to 2010 enacted) for the Department of Defense's National Defense Science and Engineering Graduate (NDSEG) Fellowships, a highly competitive, portable fellowship to support graduate study in one of 15 disciplines.

Evaluation and Research: The focus of the 2011 Budget's research and evaluation investments is on increasing our knowledge of what works in STEM education.

- \$15 million for the Institute of Education Sciences (IES) and the NSF to evaluate approaches to providing professional development to math and science teachers.
- Over \$30 million anticipated for new grants to support the development and evaluation of instructional practices for improving mathematics science and learning achievement, including practices that improve STEM outcomes for students with disabilities.

Table. Federal STEM Education Program Funding

Table. Federal STEM Education Program Funding by Agency

(budget authority in millions)

	FY 2009	FY 2009	FY 2010	FY 2011	Change FY 10-11	
	Enacted	ARRA 1/	Enacted	Budget	Amount	Percent
Corporation for Nat'l & Community Service	7	0	7	8	1	14.3%
Agriculture	47	0	54	59	5	9.3%
Commerce	50	43	57	41	-16	-28.1%
Defense	218	0	98	110	12	12.2%
Education	865	0	904	833	-71	-7.9%
Energy	44	13	53	113	60	113.2%
Health and Human Services	836	33	845	884	40	4.7%
Homeland Security	99	0	99	91	-8	-8.1%
Labor	10	0	0	0	0	--
Interior	24	0	26	26	0	0.0%
Transportation	159	0	173	198	25	14.5%
Environmental Protection Agency	10	0	11	17	6	54.5%
NASA	169	0	184	146	-38	-20.7%
National Science Foundation	1,054	250	1,151	1,177	26	2.3%
Nuclear Regulatory Commission	20	0	20	10	-10	-50.0%
Total STEM Education	3,613	339	3,681	3,713	32	0.9%

1/ Allocations of Recovery Act (P.L. 111-5) appropriations.

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STEM - Science, technology, engineering and mathematics