



Winning the Race to Educate Our Children

Science, Technology, Engineering, and Mathematics (STEM) Education in the 2012 Budget

“Maintaining our leadership in research and technology is crucial to America’s success. But if we want to win the future – if we want innovation to produce jobs in America and not overseas – then we also have to win the race to educate our kids.”

President Barack Obama
January 2011

In 2009, President Obama set an ambitious goal: to move U.S. students from the middle to the top of the pack in math and science achievement over the next decade. In his most recent State of the Union address, the President called for a new effort to prepare 100,000 science, technology, engineering, and math (STEM) teachers with strong teaching skills and deep content knowledge over the next decade. As a crucial component of achieving this goal, the 2012 Budget proposes an investment of \$100 million through the Department of Education and the National Science Foundation (NSF) to prepare effective STEM teachers for classrooms across America. This proposal also responds to a key recommendation by the President’s Council of Advisors on Science and Technology (PCAST) to prepare and inspire America’s students in science, technology, engineering, and mathematics.

In addition, to drive breakthroughs in technology that will transform education, the 2012 Budget proposes \$90 million for the creation of an Advanced Research Projects Agency – Education (ARPA-ED) with the mission of driving transformational improvement in education technology.

Preparing 100,000 STEM Teachers Over the Next Decade

Students need to master science, technology, engineering, and mathematics (STEM) in order to thrive in the 21st Century economy. Steadily, we have seen other nations gain ground in preparing their children in these critical fields. That is why the President has set the ambitious goal of preparing 100,000 effective STEM teachers over the next decade.

The 2012 Budget proposes \$100 million toward that goal, including \$80 million from the Department of Education dedicated to teacher pathways that successfully prepare effective STEM teachers and \$20 million from the National Science Foundation (NSF) to launch a new teacher-training research program called Teacher Learning for the Future. In cooperation with the Department of Education, NSF’s Teacher Learning for the Future program will fund innovative efforts that design, develop, implement, and test new teacher-training programs.

These programs will be developed in conjunction with a government-wide effort to improve the impact of Federal investments in math and science education by ensuring that all programs supporting K-12 and undergraduate education adhere to consistent standards of effectiveness.

Investing Along the Pipeline

A coordinated approach by the many Federal agencies that contribute to improving STEM education will facilitate achievement of the President's education goals. The 2012 Budget makes key investments along each segment of the STEM pipeline from K-12 to graduate education. Since scientific discovery and engineering design depend on creative approaches and a diversity of viewpoints, these investments will include an emphasis on specific efforts to broaden participation of women and traditionally under-represented minorities.

K-12 STEM Education: The focus of the K-12 STEM investments in the 2012 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:

- \$206 million to improve the teaching and learning of STEM subjects through the Department of Education's proposed Effective Teaching and Learning in STEM program. This new program, with an increase of \$26 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.
- \$60 million (a 28 percent increase compared to 2010 enacted) for NASA's K-12 Education programs, including \$20 million for new multi-week summer enrichment programs with middle school students.
- \$300 million for the Investing in Innovation program, which places a priority on promising models and scaling effective practices to improve STEM education.
- \$185 million for a new Presidential Teaching Fellowship program to fund formula grants to States to support scholarships for talented students to enter teaching, including STEM.

Undergraduate STEM Education: The focus of the 2012 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 and quality of graduates prepared for employment in STEM fields. This includes:

- \$20 million for NSF's new Transforming Broadening Participation through STEM (TBPS) program, a comprehensive S&T workforce program to bring undergraduates from groups historically under-represented in STEM fields, complementing an additional \$91 million for other Broadening Participation programs.
- \$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.

-
- \$20 million for the new Widening Implementation and Demonstration of Evidence-based Reforms (WIDER) program at NSF, with a goal of scaling up improved undergraduate STEM education practices. This program will support research on how to achieve widespread sustainable implementation of improved undergraduate instructional practices and student outcomes at major universities, as well as support demonstration models.

Graduate Fellowships: The focus of the 2012 Budget's graduate STEM investments is on preparing highly skilled scientists and engineers. This includes:

- \$198 million (a \$62 million increase compared to the 2010 enacted level) 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 2012.

ARPA-ED: The President's Plan to Create a "DARPA for Education"

President Obama recognizes that technology can lead to transformational progress in education, including in math and science achievement. Therefore, the President's budget proposes \$90 million at the Department of Education for the creation of an Advanced Research Projects Agency – Education (ARPA-ED) with the goal of transforming education technology just as the Defense Advanced Research Projects Agency (DARPA) has transformed military technology and the Advanced Research Projects Agency – Energy (ARPA-E) is transforming energy technology.

The President's plan for ARPA-ED is a key component of the recently updated *A Strategy for American Innovation*. ARPA-ED will catalyze the development and deployment of new tools and technologies that could significantly improve student learning. ARPA-ED will push the education research, development and demonstration field forward by: sponsoring the synthesis and vetting of public and private R&D efforts; identifying breakthrough development opportunities; shaping the next wave of R&D; investing in the development of new education technologies, learning systems, and digital learning materials; and identifying and transitioning the best and most relevant R&D from other federal agencies.

In addition, the 2012 Budget proposes \$48 million (a 14 percent increase compared to 2010 enacted) for NSF's Cyberlearning Transforming Education program. This multidisciplinary research program will support the Administration's focus on advanced learning technologies, enabling new pathways of STEM workforce development.

Making Hard Choices

The 2012 Budget invests \$3.4 billion in programs across the Federal government on STEM education. This level is below the enacted level for 2010, reflecting the need for disciplined choices that cut back on lower-priority programs to make room for targeted increases. For example, the Budget allows the Department of Education's Science and Mathematics Access to Retain Talent (SMART) Grants to expire and ends the National Science Foundation's Graduate Teaching Fellows in K-12 Education program.

In addition to the funding adjustments presented in the 2012 Budget, the Office of Science and Technology Policy, working with OMB and Federal agencies, will soon launch a government-wide review of STEM education investments to assess their effectiveness and develop strategies for ensuring that future investments are well-coordinated and use the best evidence-based approaches. This effort will be carried out under a new Committee on STEM Education under the National Science and Technology Council.

Building on Success

The 2012 Budget builds on the President's leadership on the issue of STEM education.

- **The President made STEM education a priority as part of the Administration's \$4 billion Race to the Top (RTT) competition, fueling local innovation.** States that applied for RTT were encouraged to develop a comprehensive strategy to improve achievement and provide rigorous curricula in STEM subjects, partner with local institutions, businesses and museums, and broaden participation of women and girls and underrepresented groups. The winning states are taking decisive actions to put STEM at the center of their education reform efforts. For example, Maryland is increasing the number of STEM teachers and developing a new STEM teacher preparation pathway for elementary school teachers to engage younger students; North Carolina is investing in 10 STEM "anchor schools" that will develop an exemplary curriculum connected to regional science and technology assets; Rhode Island is supporting its school turnaround strategies with "STEM distinguished educators."
- **The President's "Educate to Innovate" campaign has resulted in over \$700 million in financial and in-kind support for STEM programs.** The President's "all hands on deck" call to improve STEM education has galvanized industry, universities, foundations, and science and engineering professionals to do more. The private sector is responding not just with financial support, but with commitments that take advantage of their core competencies and the skills and passion of their employees. Over 100 CEOs have come together to launch *Change the Equation*, a historic effort to scale up effective models for improving STEM education. The President has also personally helped raise the visibility of STEM education by holding the first ever White House Science Fair.