



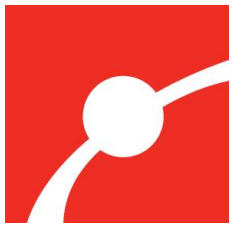
**National Center for
Technological Literacy®**

Museum of Science, Boston

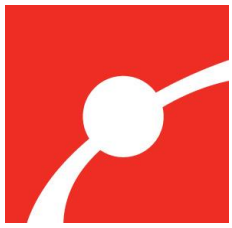
Update on STEM Education Policy

Patti Curtis

National Center for Technological Literacy
Museum of Science, Boston



The Year for K-12 Engineering



Contents

ADMINISTRATION

- Race to the Top
- Invest in Innovation
- FY11 Budget
- Educate to Innovate
- NAGB

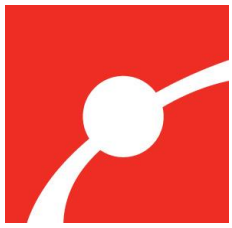
STATES

- Common Core Standards

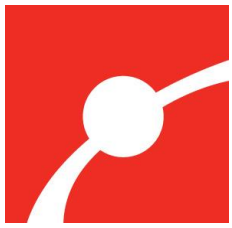
CONGRESS

- America COMPETES
- ESEA
- Engineering Education for Innovation (E²)

NGOs

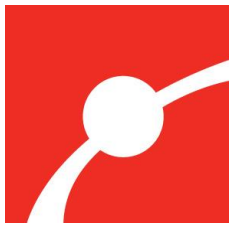


ADMINISTRATION



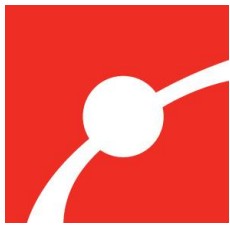
Race to the Top - \$4B

- rigorous & common **standards** and high-quality assessments, college and career readiness
- attracting, preparing & keeping great **teachers** & leaders
- using **data** to inform decisions & improve instruction
- **turn-around** struggling schools
- sustaining education reform, by promoting **collaborations** among business leaders, educators, & other stakeholders



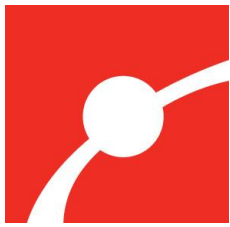
STEM Priority

1. offer a rigorous course of study in mathematics, the sciences, technology, and engineering;
2. cooperate with industry experts, museums, universities, research centers, or other partners to prepare & assist teachers in integrating STEM content across grades and disciplines, offer applied learning opportunities for students; and
3. prepare more students for advanced study and careers in the STEM, address the needs of underrepresented groups, women and girls

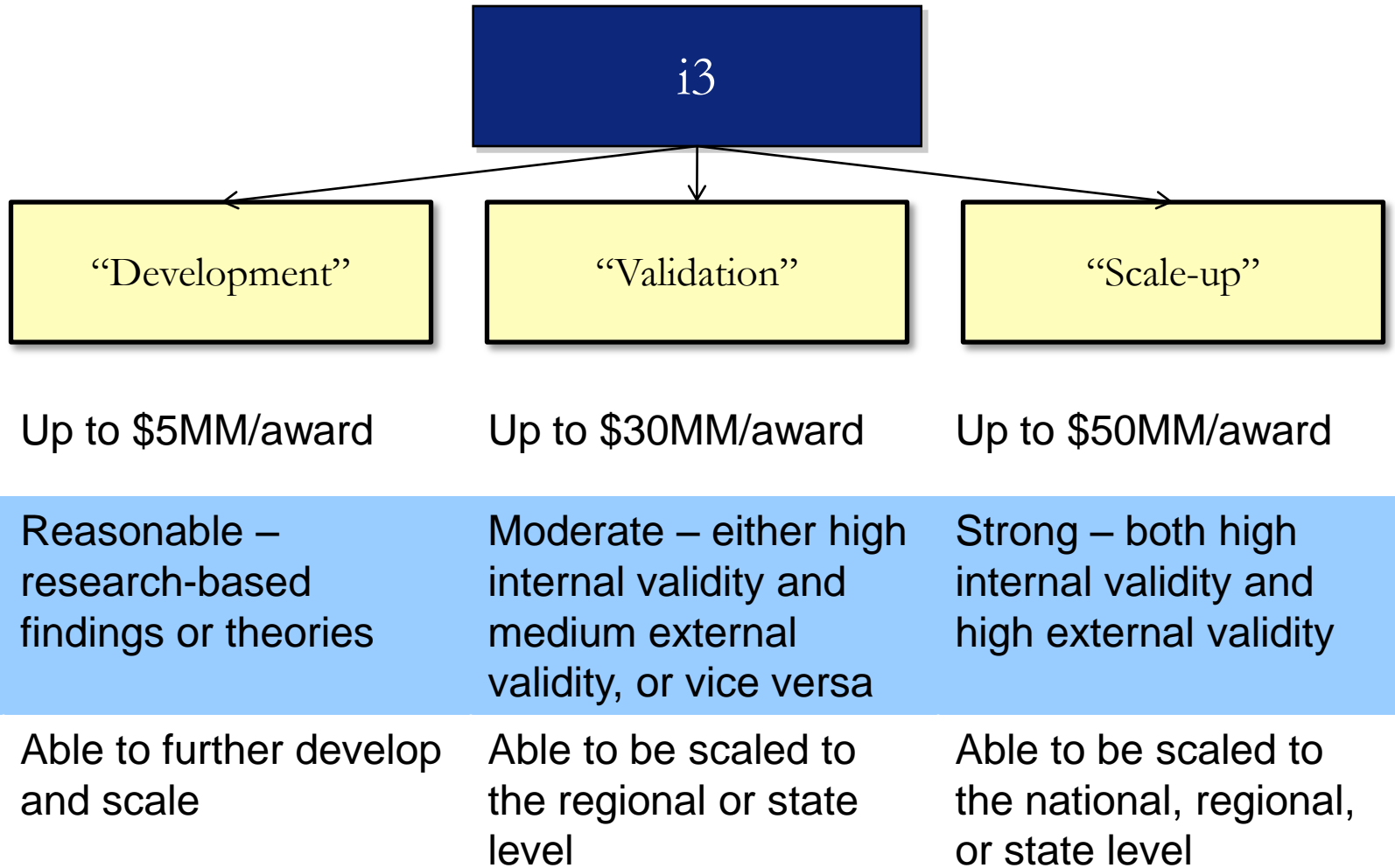


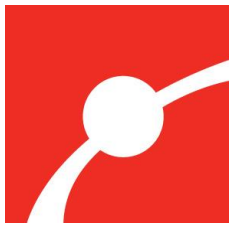
Invest in Innovation (i³)

- The Investing in Innovation Fund, established under the American Recovery and Reinvestment Act of 2009 (ARRA), provides \$650M to support LEAs, and **nonprofit organizations in partnership with one or more LEAs** or a consortium of schools.
- to expand innovative practices that improve student achievement or student growth for high-need students, as well as to promote school readiness, close achievement gaps, **decrease dropout rates**, increase high school graduation rates, and improve teacher and school leader effectiveness.
- to expand and develop models of best practices that can be shared and taken to scale based on demonstrated success.



Types of Awards Available Under i3

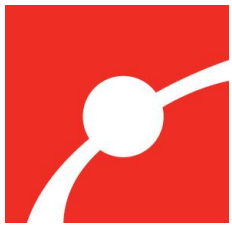




FY11 ED Budget Items

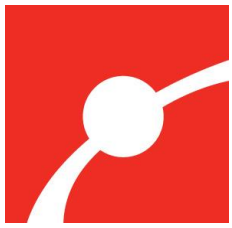
The 2011 Budget invests \$3.7 billion in STEM education programs across the federal government, including a historic **\$1 billion** commitment to improve **math and science achievement** among K-12 students, an increase of over 40 percent. This includes:

- **\$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.



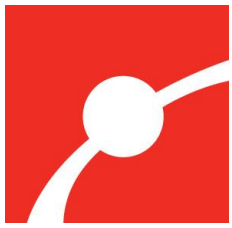
FY11 ED Budget cont.

- 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.



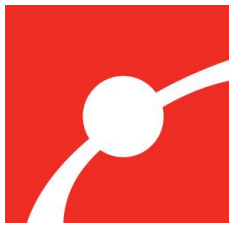
Educate to Innovate

- Educate to Innovate: The President is deeply committed to improving STEM education. 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.



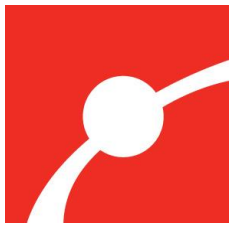
National Lab Day

- The MacArthur Foundation and other donors are supporting National Lab Day — an effort to promote and celebrate learning in science labs and other learning environments, and to build communities of support for STEM teachers across the country through the Web site www.nationallabday.org
- National Lab Day will include a year-long effort to expand hands-on learning methods throughout the country.

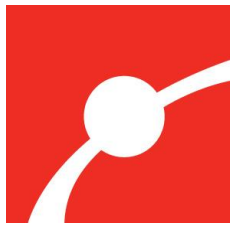


National Assessment Governing Board

- Science 2009
 - includes technological design items
- Technological Literacy 2012
 - ed tech, systems & design, tech & society
 - voting on a new title and a new date
(**Technology & Engineering Literacy, 2014**)

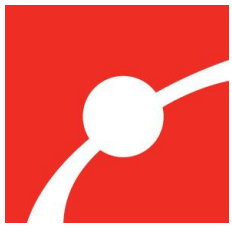


STATES

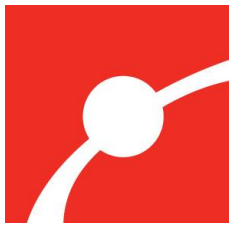


Common Core Standards

- NGA, Achieve, CCSSO
- Reading & Math out for comment
- Science next...
- NAS, BOSE has stated that Engineering will be a component or skill set within their recommendations for the common core Science standards

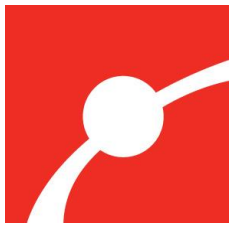


CONGRESS



America COMPETES

- America COMPETES is the landmark legislation, signed into law in 2007, based on recommendations from the National Academies Gathering Storm Report.
- It aims to strengthen our national economic competitiveness through investments in science, technology, engineering and math (STEM) education; it sets our science research agencies on a doubling path (NIST, NSF, and DOE Office of Science);
- and it addresses the need for innovation in the energy sector by creating an Advanced Research projects Agency for Energy (ARPA-E) to pursue high-risk, high-reward energy technology development.



ESEA:

Carrying Forward the Four RTTT Assurances

**Rigorous
Standards &
Meaningful
Assessments**

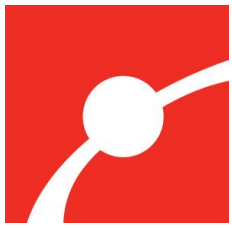
**Great Teachers
& Leaders**

**Transform
Persistently
Low-
performing
Schools**

**Effective Use
of Data**

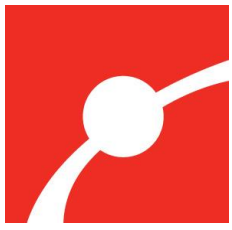


ESEA

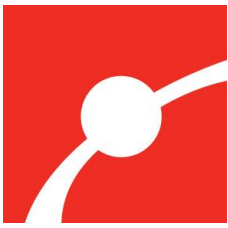


ESEA Assessments

- The Secretary of Education has set aside up to \$350 million of Race to the Top funds for the potential purpose of supporting States in the development of a next generation of assessments



Engineering Education (E²) for Innovation Act

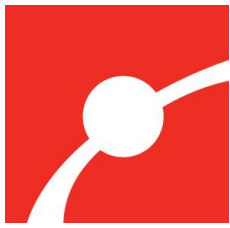


Engineering in K-12 Education

NAE Report, September 2009

Potential Benefits :

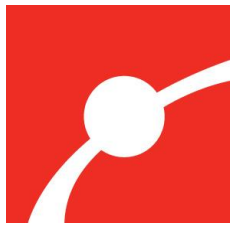
- improved learning and achievement in science and mathematics;
- increased awareness of engineering and the work of engineers;
- understanding of and the ability to engage in engineering design;
- interest in pursuing engineering as a career; and,
- increased technological literacy.



NAE Recommendations

RECOMMENDATION 1. Foundations and federal agencies with an interest in K–12 engineering education should support long-term **RESEARCH** to confirm and refine the findings of earlier studies of the **impacts of engineering education on student learning** in STEM subjects, student engagement and retention, understanding of engineering, career aspirations, and technological literacy.

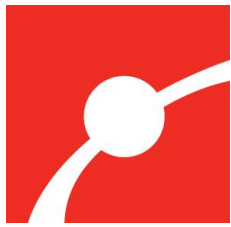
RECOMMENDATION 2. Funders of new efforts to develop and implement curricula for K–12 engineering education should include a **RESEARCH** component that will provide a basis for analyzing how design ideas and practices develop in students over time and determining the classroom conditions necessary to support this development. After a solid analytic foundation has been established, a rigorous evaluation should be undertaken to determine **what works and why.**



NAE Recommendations, cont.

RECOMMENDATION 3. The National Science Foundation and/or U.S. Department of Education should fund **RESEARCH** to determine **how science inquiry and mathematical reasoning can be connected to engineering design in K–12 curricula and teacher professional development.**

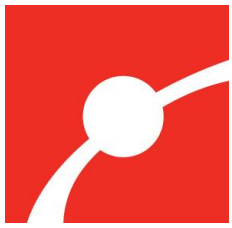
RECOMMENDATION 4. The American Society for Engineering Education (ASEE), through its Division of K–12 and Pre-College Education, should begin a national dialogue on **preparing K–12 engineering teachers** to address the very different needs and circumstances of elementary and secondary teachers and the pros and cons of establishing a formal credentialing process.



NAE Recommendations, cont.

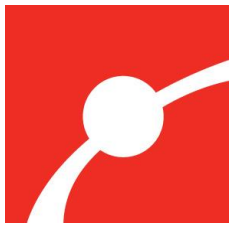
RECOMMENDATION 5. Given the demographic trends in the United States and the challenges of **attracting girls, African Americans, Hispanics, and some Asian subpopulations to engineering studies**, K–12 engineering curricula should be developed with special attention to features which appeal to students from these underrepresented groups.

RECOMMENDATION 6. Philanthropic foundations or federal agencies with an interest in STEM education and school reform should fund **RESEARCH** to identify models of implementation for K–12 engineering education that embody **the principles of coherence** and can guide decision making that will work for widely variable American school systems. The research should explicitly address school populations that do not currently have access to engineering studies.



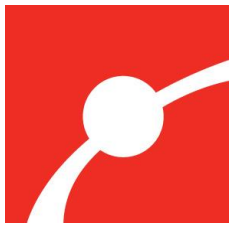
NAE Recommendations, cont.

RECOMMENDATION 7. The National Science Foundation and the U.S. Department of Education should support **RESEARCH** to characterize, or **define, “STEM literacy.”** Researchers should consider not only core knowledge and skills in science, technology, engineering, and mathematics, but also the “big ideas” that link the four subject areas.



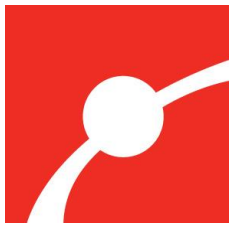
E² Purpose

The Act would authorize the Secretary of Education to competitively award planning and implementing grants for educational agencies to invest in programs and activities to integrate engineering education into K–12 instruction and curriculum and to fund research and evaluation programs of such efforts.



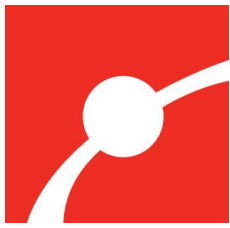
Planning Grants

- Planning grants to be awarded to state educational agencies (SEAs) for a period not more than two years in an amount not to exceed **\$1,000,000**.
- State **partnerships** should include governor, chief school officers, education and engineering faculty, administrators, teachers, businesses, professional societies, informal science education centers, and others.
- Grantees must review pertinent resources and programs currently in existence and develop implementation plans to achieve the objective of **integrating engineering** education in K–12 instruction.



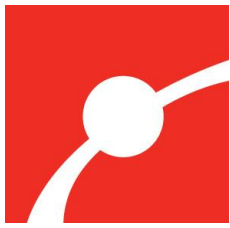
Implementation Grants

- Implementation grants to be awarded to SEAs for a period not more than four years in an amount not less than **\$10,000,000** for the entire period of the grant.
- Priority for awards would go to SEAs that (1) demonstrate satisfaction of the required activities under the planning grant, (2) serve significant percentages of **underrepresented** minorities, and (3) have partners that agree to pay a portion of the non-federal share of program costs.
- Grantees must provide non-federal **matching funds** from non-federal sources of not less than 50 percent of program costs.



Activities

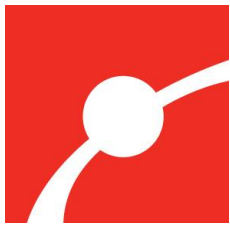
- 1) Implementing challenging academic content **standards**, achievement standards, and curricula frameworks that include engineering.
- 2) Developing new or obtaining effective **curricula** in engineering education.
- 3) Designing and implementing engineering education **assessment** items and tools.
- 4) Developing or improving elementary and secondary teacher pre-service, induction, and **professional development** engineering and technology education programs, including those that lead to a certificate or other credential in engineering or technology education.
- 5) Recruiting qualified teachers to provide engineering education for high-need local educational agencies and high-need schools.
- 6) Establishing distance learning modules for teachers or students in engineering education.
- 7) Creating **online** engineering education tools that are widely accessible.
- 8) Investing in **after school** engineering education programs.



Evaluation Grants

The Act charges the Institute of Education Sciences with conducting RESEARCH and evaluation on the grantees activities to assess:

- 1) the effectiveness of the programs and activities;
- 2) how these programs and activities can be replicated;
- 3) how these programs and activities lead to students developing engineering design ideas, practices and habits of mind over time, and the types of conditions necessary to support these developments;
- 4) how science inquiry and mathematical reasoning can be connected to engineering design in K–12 curricula and teacher professional development;
- 5) the numbers and diversity of students with science, technology, engineering, and mathematics career aspirations; and
- 6) other information or assessments the Secretary of Education may require.



House Bill

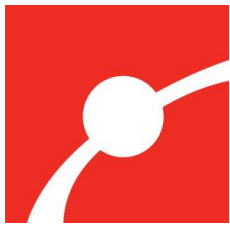
H.R.4709

Title: To award planning grants and implementation grants to State educational agencies to enable the State educational agencies to complete comprehensive planning to carry out activities designed to integrate engineering education into K-12 instruction and curriculum and to provide evaluation grants to measure efficacy of K-12 engineering education.

Sponsor: [Rep Tonko, Paul D.](#) [NY-21] (introduced 2/25/2010) [Cosponsors](#) (5)

Latest Major Action: 2/25/2010 Referred to House committee.
Status: Referred to the House Committee on Education and Labor.

COSPONSORS(5), ALPHABETICAL [Rep Foster, Bill](#) [IL-14] - 3/4/2010 [Rep Hare, Phil](#) [IL-17] - 2/25/2010 [Rep Honda, Michael M.](#) [CA-15] - 2/25/2010 [Rep Norton, Eleanor Holmes](#) [DC] - 2/25/2010 [Rep Sires, Albio](#) [NJ-13] - 2/25/2010



Senate Bill

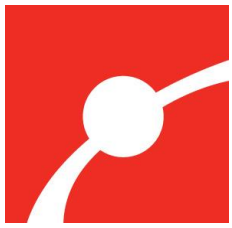
- **S.3043**

Title: A bill to award planning grants and implementation grants to State educational agencies to enable the State educational agencies to complete comprehensive planning to carry out activities designed to integrate engineering education into K-12 instruction and curriculum and to provide evaluation grants to measure efficacy of K-12 engineering education.

Sponsor: [Sen Gillibrand, Kirsten E.](#) [NY] (introduced 2/25/2010) [Cosponsors](#) (8)

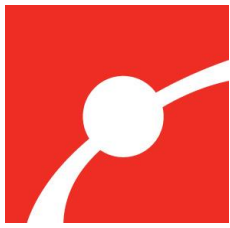
Latest Major Action: 2/25/2010 Referred to Senate committee.
Status: Read twice and referred to the Committee on Health, Education, Labor, and Pensions.

- **COSPONSORS(5), ALPHABETICAL** [Sen Brown, Sherrod](#) [OH] - 3/1/2010 [Sen Burris, Roland](#) [IL] - 3/1/2010 [Sen Cantwell, Maria](#) [WA] - 2/25/2010 [Sen Kaufman, Edward E.](#) [DE] - 2/25/2010 [Sen Klobuchar, Amy](#) [MN] - 2/25/2010 [Sen Murray, Patty](#) [WA] - 2/25/2010 [Sen Schumer, Charles E.](#) [NY] - 3/1/2010 [Sen Snowe, Olympia J.](#) [ME] - 2/25/2010



NGOs

- International Technology Education Association, developed the Standards for Technological Literacy, renamed ITEEA
- IEEE-Fly-In focus on E2 bill
- ...and many more.



Next Steps

- CONTACT your Senators & Representative
 - www.house.gov
 - www.senate.gov
- CALL & ASK that they co-sponsor the E² Act
 - H.R. 4709 & S. 3042
- Follow-up with MAIL
- Provide staff contacts:
 - Sen Gillibrand, Arundhati 202.224.4451
 - Sen Kaufman, Rachel 202.224.5042
 - Rep Tonko, Becky, 202.225.5076
- THANK them for cosponsoring!