Overview of Federal interagency activities to improve the health of the STEM enterprise

A presentation for the National Academies Joint Committee Meeting
Committee on Underrepresented Groups and the Expansion of the Science and Engineering Pipeline
Committee on Capitalizing the Diversity of the Science and Engineering Industrial workforce.
June 11, 2008

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Office of Science and Technology Policy
Executive Office of the President
www.ostp.gov
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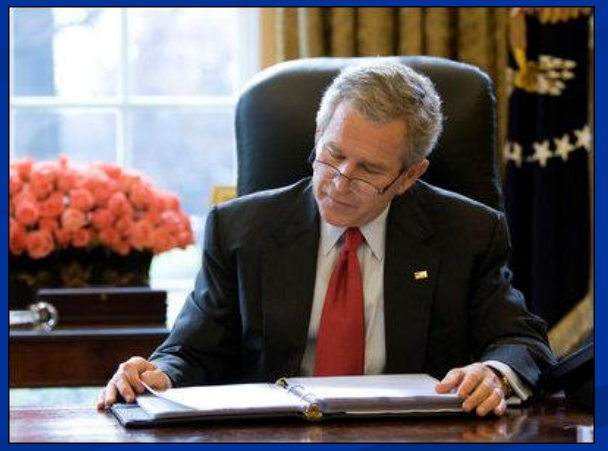
The Office of Science and Technology Policy

www.ostp.gov

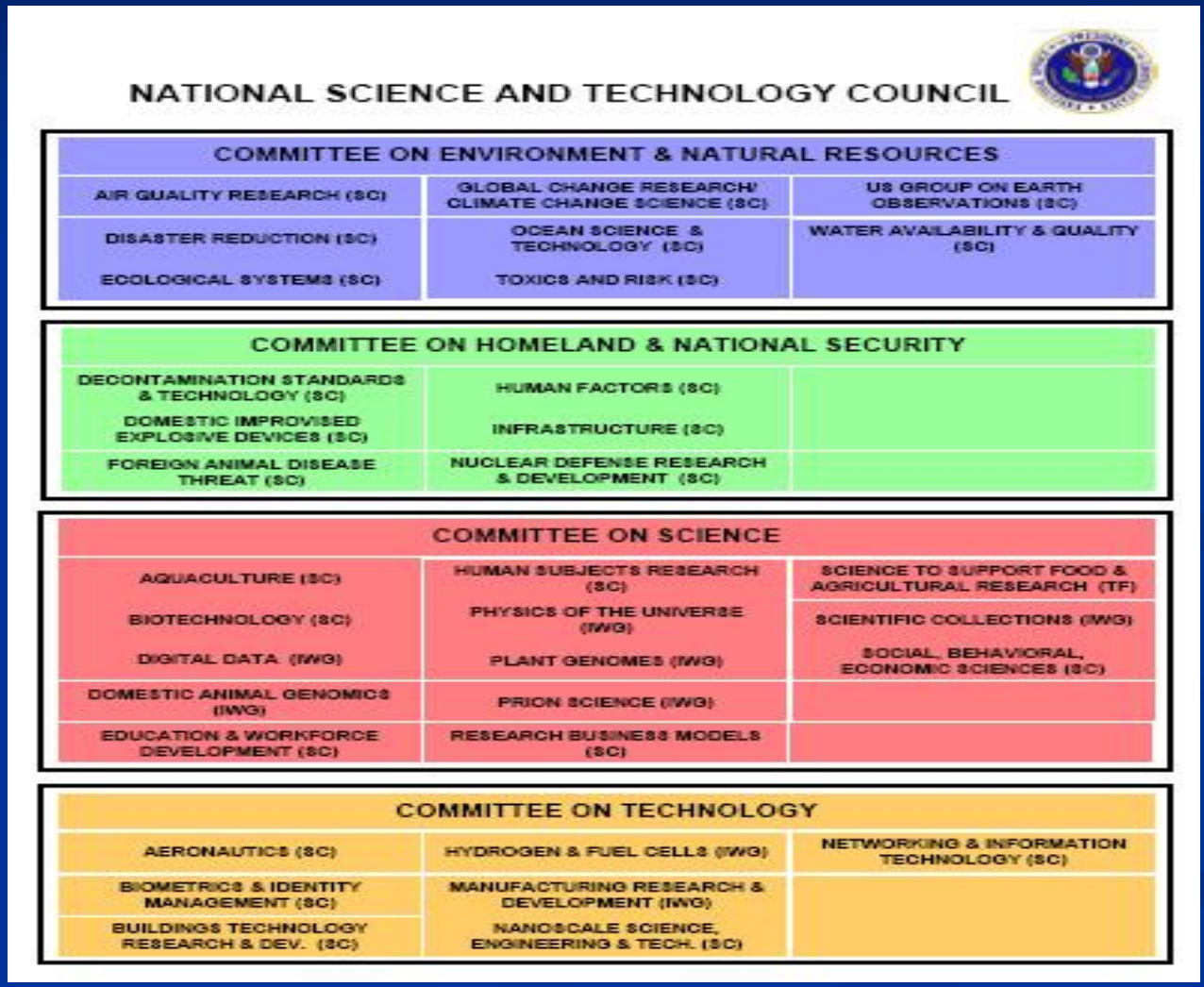
- Advises the President and others within the Executive Office of the President on the impact of science and technology on domestic and international affairs.

- Promotes Federal coordination by leading the National Science and Technology Council, an interagency effort to develop and implement sound science and technology policies and budgets.



- Works with the private sector to ensure Federal investments in science and technology contribute to economic prosperity, environmental quality, and national security.

Federal agencies coordinate S&T investments through the NSTC

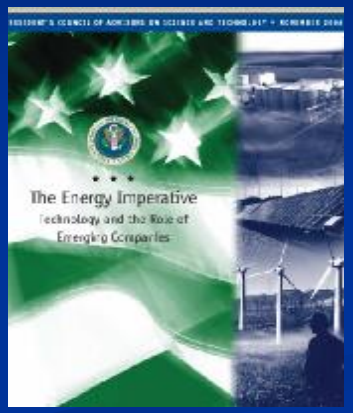


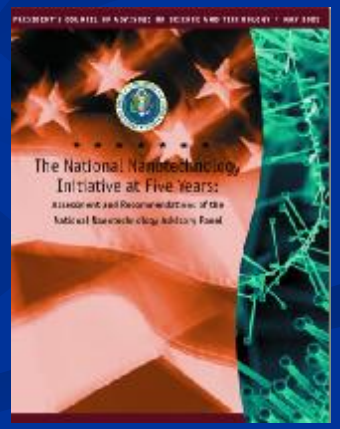
STEM training and workforce issues transcend subcommittees and working groups

The President's Council of Advisors on Science and Technology

http://www.ostp.gov/PCAST/pcast.html

- Established by Executive Order
- Membership from industry, education, research and other nongovernmental organizations
- Advises the President on matters involving science and technology
- Assists NSTC on securing private sector input
- Director, OSTP, serves as co-chair

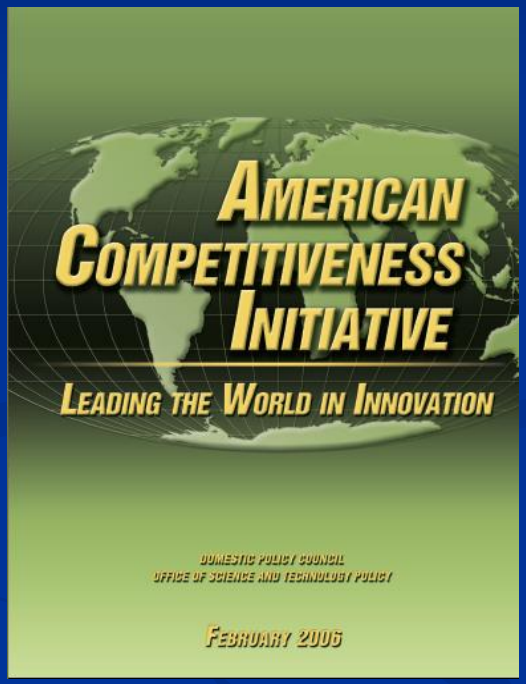




The ACI

http://www.whitehouse.gov/stateoftheunion/2006/aci/aci06-booklet.pdf

- Recognizes innovation as one of the great engines of our growing economy.
- Articulates the need for investments in R&D, especially in the physical sciences and engineering
- Places front and center the idea that the bedrock of competitiveness is a well-educated and well-trained workforce
  - Proposed specific educational programs
  - Advocated for evidence-based programs



The Academic Competitiveness Council

http://www.ed.gov/about/inits/ed/competitiveness/acc-mathscience/report.pdf

Created under the Deficit Reduction Act of 2005. Charge was to:

- Identify all Federal programs with a mathematics or science focus
- Identify the target populations
- Determine program effectiveness
- Identify areas of overlap or duplication
- Recommend ways to integrate and coordinate

ACC Recommendations

- Living inventory of STEM education programs
- Shared knowledge of effective practices
- Improved coordination between Federal, state and local systems on K-12
- Adjust programs to incorporate measurable results, consistent with program goals
- Funding linked to evaluation
- Continuing coordination of federal activities through the NSTC

NSTC Education Subcommittee

Advises and assists the COS and the NSTC on:

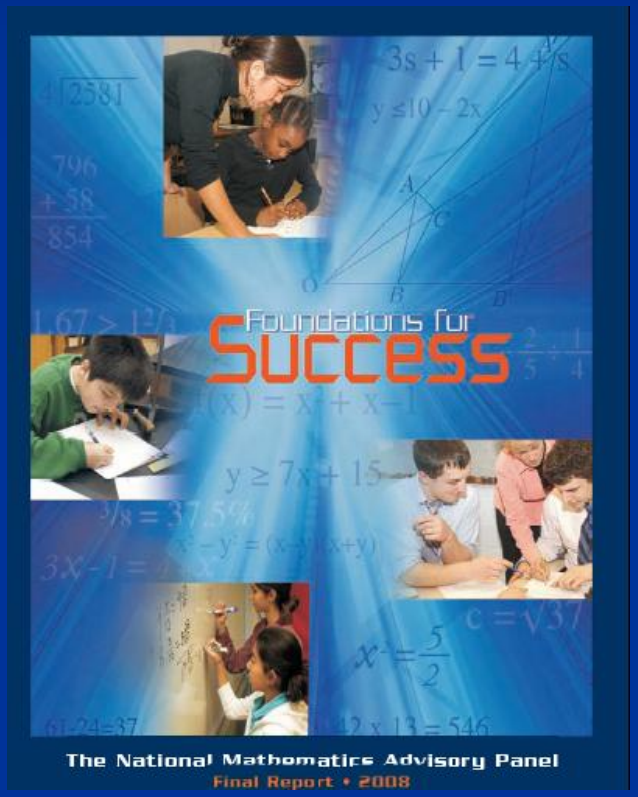
- **Education policies, procedures and programs relating to STEM education and workforce development;**
- **The scientific research base and methodological approaches for evaluating and improving STEM education programs; and**
- **Current, new and evolving strategies in public and private sectors for improving the teaching and learning of STEM education.**

Focus on STEM education issues at the Pre-K-12, undergraduate, graduate, postdoctoral and lifelong learning levels, as well as current and projected STEM workforce needs, trends and issues.

Key first task is responding to ACC recommendations

- **Implementing rigorous evaluation for high leverage programs**
- **Improving the rigor of the overall STEM portfolio.**

Foundations for Success: Report of the National Mathematics Advisory Panel



The National Mathematics Advisory Panel

Established under Executive Order to advise the President and the Secretary of Education on the best use of scientifically based research to advance the teaching and learning of mathematics, with a special focus on preparation for and success in algebra.

http://www.ed.gov/about/bdscomm/list/mathpanel/index.html

NMP Recommendations

- Pre-K-8 mathematics curriculum should be streamlined and focus on critical foundations of algebra
  - Proficiency with whole numbers, fractions and particular aspects of geometry.
- Use what is known from rigorous studies about how children learn
  - Learning begins early. *
  - There are mutually reinforcing benefits of conceptual understanding, procedural fluency and automatic recall.
  - Children's beliefs about learning are related to their mathematics performance.
    - Beliefs about the relative importance of effort and ability can be changed.

NMP Recommendations (continued)

- Mathematically knowledgeable classroom teachers play a central role; encourage rigorously evaluated initiatives for attracting, preparing, evaluating, and retaining effective teachers .

- Instructional practices should be informed by evidence and professional judgment of accomplished teachers.
  - One size doesn't fit all.

Selected NMP findings and recommendations

Children from families with low incomes, low levels of parental education, and single parents often have less mathematical knowledge when they begin school than do children from more advantaged backgrounds. This tends to hinder their learning for years to come.

There are promising interventions to improve the mathematical knowledge of these young children before they enter kindergarten.

Research on students who are low achievers, have difficulties in mathematics, or have learning disabilities related to mathematics tells us that the effective practice includes

- Explicit methods of instruction on a regular basis;
- Clear problem solving models;
- Carefully orchestrated examples / sequences of examples;
- Concrete objects to understand abstract representations and notation; and
- Participatory thinking aloud by students and teachers.

NMP recommendations

- NAEP and state tests should be improved in quality and carry increased emphasis on critical foundations of algebra

- The nation must continue to build capacity for rigorous research on education so that it can inform policy and practice.

National Science and Technology Summit

Oak Ridge National Laboratory, Oak Ridge, TN

August 18-19, 2008

http://www.ornl.gov/natlscitechsummit/index.shtml

- **America COMPETES Act calls for the President to convene a summit to examine the health and direction of the US STEM enterprise**
  - **Strengthen S&T investments in public and private research and development**
  - **Strengthen STEM education**
- **Report to Congress on**
  - **Assessment of health and direction of S&T enterprise**
  - **Identify challenges to achieving competitiveness goal**
  - **Recommend specific actions to achieve consensus goals, increase competitiveness**
  - **Prioritize recommendations.**

Evolving Demands in Graduate Education, Training and Career Development for future STEM professionals

Roundtable discussion hosted by OSTP, November 5-6, 2007

Key themes:

- **Pathways and perspectives from recent graduates**
- **Trends in the system of STEM graduate education and workforce development**
- **"Fit" between current models, national needs, and students**

Summary and presentations posted on Research Business models Website:
http://rbm.nih.gov/stem/index.htm

Next steps:

- **Meeting summary and materials**
- **Listening sessions**
- **Collaboration within the NSTC on solutions**

Presidential Awards for Excellence in Mathematics and Science Teaching

Opportunities and Partnerships

- Dialogue with the federal agencies and the private sector (NSTC agencies and PCAST).
  - Define specific needs (people, qualifications)
  - Be aware of new and ongoing funding activities
- Support good science about the effectiveness of teaching and learning.
  - Considerable work has been done to synthesize the evidence (NMP and other efforts)
  - Echo the call for evidence based practices.
- Engage early and often.
  - With the research community.
  - With the schools.