



CONSTRUCTING A RESEARCH AGENDA FOR STEM EDUCATION

STIP STEM Data Summit

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5/20/2012

AGENDA

- Review National STEM Reports/Agencies
- Review Federal STEM legislation
- Successful STEM Education report research recommendations 2011
- Integrated STEM Research Report 2013
Challenges
- LWSD potential

INTRODUCTION

- Science Teacher at RHS for 27 years
- Currently teach A. P. Environmental Science and Environmental Engineering and Sustainable Design
- Einstein Fellow at the National Science Board of the NSF 2010-2011
- Specialize in Federal Stem Policy
- Member of National Academies Integrated STEM I-STEM committee
- Planning Team for new STEM High School to open 9/2012

WHAT IS NSF

- National Science Foundation
- Founded in 1950
- Funds Scientific research in the United States
- \$7 billion annual budget 2010
- \$ 870 million in Education grants
- Broader Impacts

BROADER IMPACTS

- NSF science grants are determined by 2 components Intellectual Merit and Broader Impacts
- Broader Impacts could fund education in many ways

What is the National Science Board?

- The NSB is made up of 25 Members appointed by the President and confirmed by the Senate.
- The Board is advisors to both the President and Congress on national policy issues related to science and engineering research and education



NATIONAL ACADEMIES

- The National Academy of Sciences was established in 1863 to address the government's urgent need for an independent advisor on scientific matters.
- National Research Council in 1916
- National Academy of Engineering in 1964
- Institute of Medicine in 1970

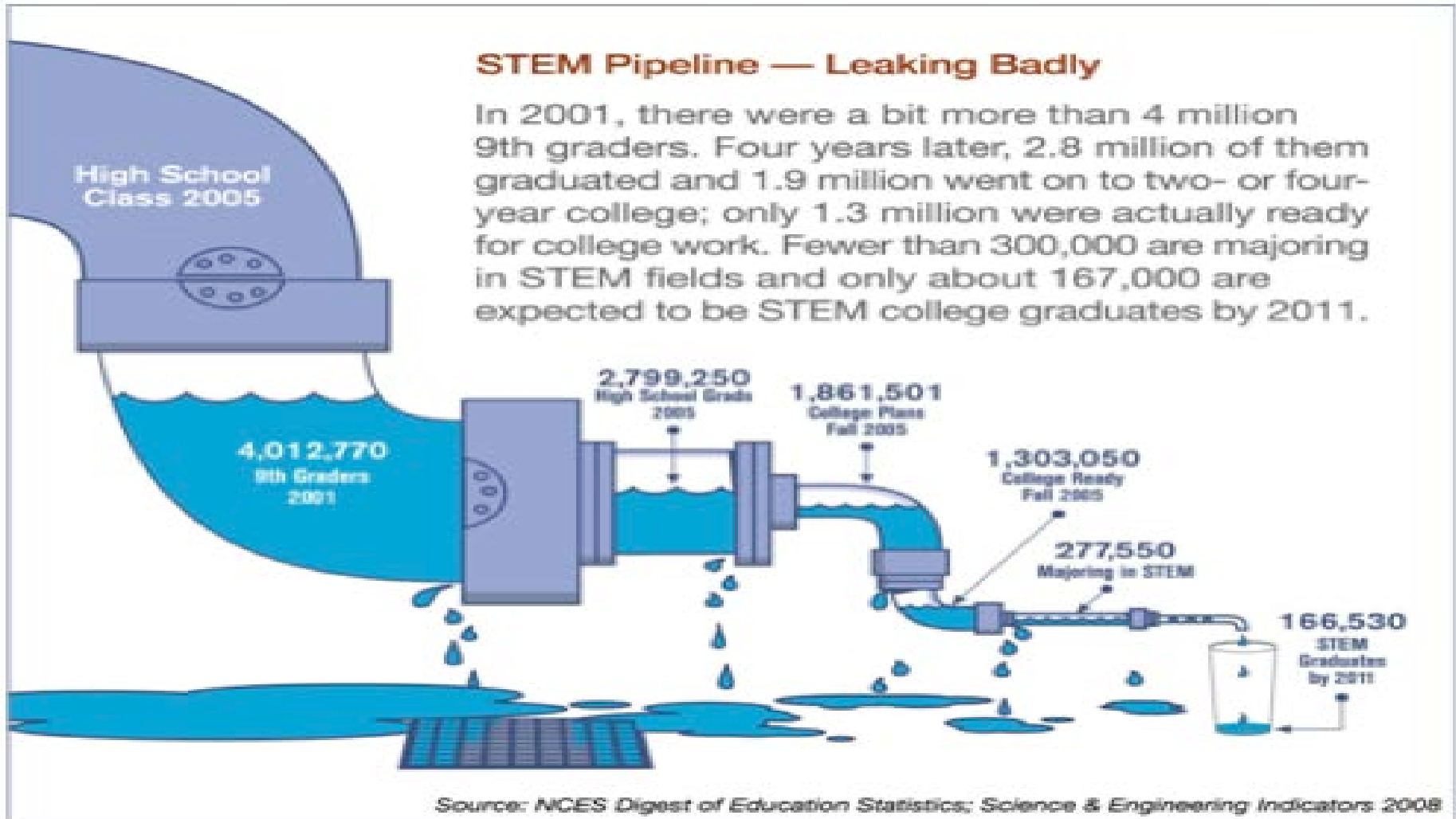
NSA vs NSA

- NSF funds Scientific Research
- NSA is the research arm of Congress

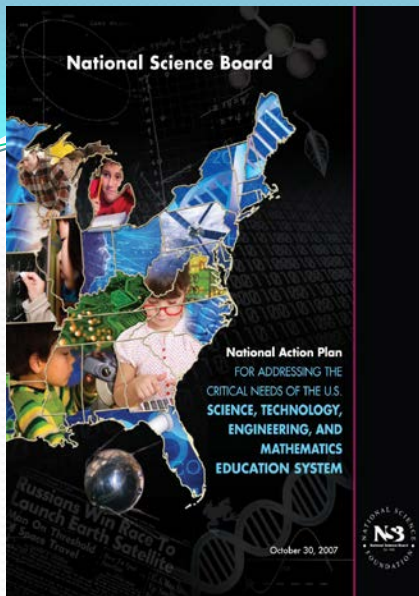
THE LEAKY PIPELINE PROBLEM

STEM Pipeline — Leaking Badly

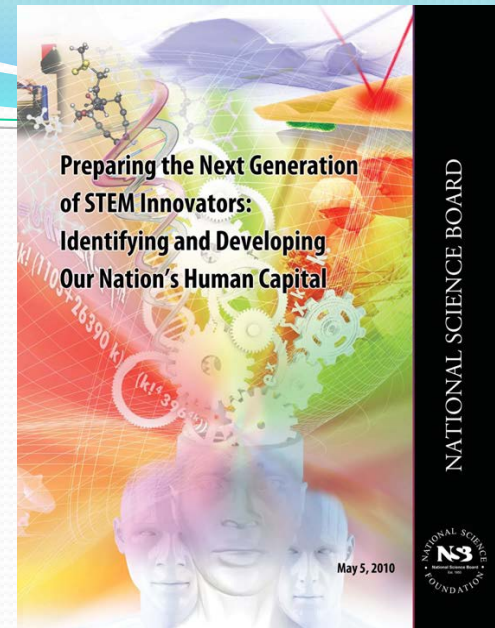
In 2001, there were a bit more than 4 million 9th graders. Four years later, 2.8 million of them graduated and 1.9 million went on to two- or four-year college; only 1.3 million were actually ready for college work. Fewer than 300,000 are majoring in STEM fields and only about 167,000 are expected to be STEM college graduates by 2011.



Source: NCES Digest of Education Statistics; Science & Engineering Indicators 2008



NATIONAL STEM REPORTS



**Prepare and Inspire:
K-12 Education in
Science, Technology,
Engineering, and
Math (STEM)
Education for
America's Future
Executive Report**



**RIISING ABOVE THE
GATHERING STORM,
REVISITED
Rapidly Approaching
Category 5**

PART 1 National STEM Reports

- Stem Action Plan (NSB) 2007
- Raising Above the Gathering Storm (NAS) 2005, Revised 2010
- Preparing the Next Generation of STEM Innovators (NSB) 2010
- Prepare and Inspire (PCAST) 2010

THE MATRIX

<p>A brief summary comparing NATIONAL STEM REPORTS 2005-2010</p> <p>With section numbers from the COMPETES Act which partially addresses recommendations from the reports</p> <p>R = MAJOR RECOMMENDATIONS OR Suggestions for K-12 I = "implied" RECOMMENDATION for K-12 S= Recommendation or suggestions in SUPPORTING MATERIALS/APPENDICES</p>		NSB STEM ACTION PLAN	NAS RISING ABOVE THE GATHERING STORM/ "REVISITED"	NSB STEM INNOVATORS	PCAST PREPARE AND INSPIRE	America COMPETES H.R. 5116
	COUNCILS/COMMITTEES/PARTNERSHIPS					
1	Establish National Interagency Council (e.g., NSTC) for STEM Education	A-1.2 (R)			3-4 (R)	101 (R)
2	Establish the NSF in a leadership role in STEM at the federal level	A-1.4 (R)		S	3-2.2 (R)	101 (R)
3	Establish Assistant Secretary of STEM education or office of STEM in the Dept of Education	A-1.3 (R)			3-1.2 (R)	
4	Coordinate STEM education between NSF and the Department of Education (and related agencies)	A-1.3 (I)			3-3 (R)	101 (R)
5	Establish state STEM councils	A-3.2 (R)	S		3-5 (R)	
6	Establish STEM Commission with the National Governors Association	A-2.4 (R)	S		3-5 (R)	
7	Establish/fund STEM partnership between Secondary schools and universities, and/or industry/businesses (e.g., MSP, STEM non-profit organizations)	A-1.4.2 (R)		I-E (R)	8-2 (R)	513 (I)/ 553 (R)/ 515 (R)



WHAT ARE THE RECCOMENDATIONS?

9 categories

1. COORDINATION

- Federal Government should take a leadership role
 - NSF, Dept of ED, or National Governors Association
- STEM partnerships between schools/universities/private sector (matching funds)
 - Change the Equation –
 - Washington STEM

2. CURRICULUM

- National core standards
 - Reading and math are have been adopted by over 40 states (similar tests)
 - Next Generation Science Standards

3. TEACHERS

- More (100,000) and better STEM teachers (PD)
 - Financial incentives/scholarships
 - STEM master teacher Corps -5% (mentors) 15K
 - Incentives for number of students who pass AP/IB tests

4. PROFESSIONAL DEVELOPMENT

- Better PD –more summer PD
- Mentor teachers (Master Teacher Corps)

5. TECHNOLOGY/RESEARCH

- Increase “on line” courses
- Create a federal Research agency on learning ARPA etc...

6. STUDENTS

- STEM scholarships for students to take AP/IB
- Increase summer and after school enrichment programs and STEM contests
- Increase dual enrollment
- Focus on under served populations

7. Dissemination

- STEM Forum
- National STEM media Campaign
(Obama and sci fairs)
- STEM clearing house for materials

8. OTHER

- Increase informal STEM
- Create new STEM magnetic schools (1000)
- \$10 million/school

9. STEM Innovators “students”

- Multiple and early test for talented students
- Test Spatial and other characteristics

PART 2 STEM LEGISLATION

- AMERICA COMPETES
- ESEA
- OTHER STEM BILLS –stand alone

LEGISLATION –COMPETES ACT

- H.R. 2272: AMERICA COMPETES Act (Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act of 2007)
- Bush administration bill -2007
- Reauthorized in 2010 lame duck
- Funds NSF - 6.9 billion to 10.1 billion in 2015
- NSF education 870 million to 1.28 billion in 2015
- Problem is that it has not be appropriated

LEGISLATION-ESEA

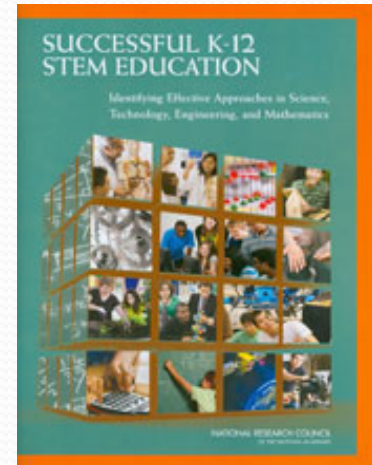
- Elementary and Secondary Education Act
- Replaces Leave No Child Behind
- Could be a whole reauthorization or piece meal approach
- Might contain STEM

POTENTIAL OTHER STEM LEGISLATION

- Separate STEM bill not in COMPETES or ESEA
- STEM Master Teacher Corps (Franken)
- Begich (ESEA STEM grants)

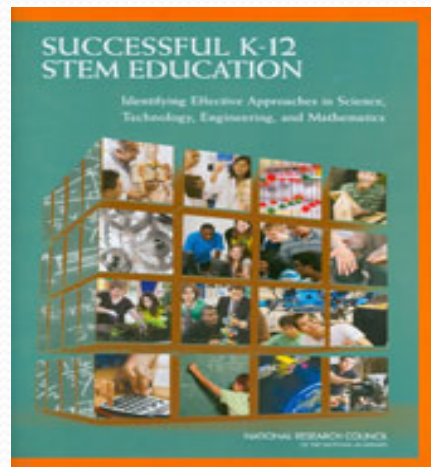
LATEST REPORT

- Successful STEM Education Report 2011
 - Expand the number of students who pursue STEM fields
 - Broaden Participation
 - STEM literacy for all



FUTURE RESEARCH RECOMENDATIONS

- Measure outcomes other than test scores
- Measure organizational practices
- Measure the impact of STEM Schools
- Measure Professional Development



INTEGRATED STEM REPORT (I-STEM)

- National Academies of Engineering
- 5 Workshops
- Spring 2013
- 3 PARTS
 - Taxonomy
 - Review existing research (500)
 - Propose a research Agenda

TAXONOMY CHALLENGES –What is I-STEM

- Separate course with all 4 letters????
- Math in a Science class????
- A unit?
- School wide focus – STEM School?
- Others

CHALLENGES –How is success measured?

- Content test
- Aptitude test
- STEM identity
- STEM pipeline

POTENTIAL LWSD RESEARCH

- NEW STEM School 2012 (LOTTRY)
- Test STEM pipeline
- Cohort study of 3 groups
 - Students accepted into STEM school
 - Students who applied but were rejected in the lottery and go to traditional schools
 - Student not interested in STEM school

OTHER RESEARCH

- Early Identification (method and test)
- STEM Identity



THANK YOU AND QUESTIONS