



Preparing America's Future

Math-Science Initiative

Susan Sclafani, Assistant Secretary
US Department of Education

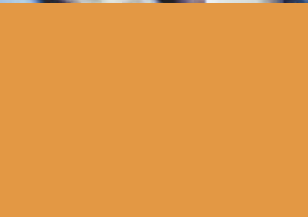




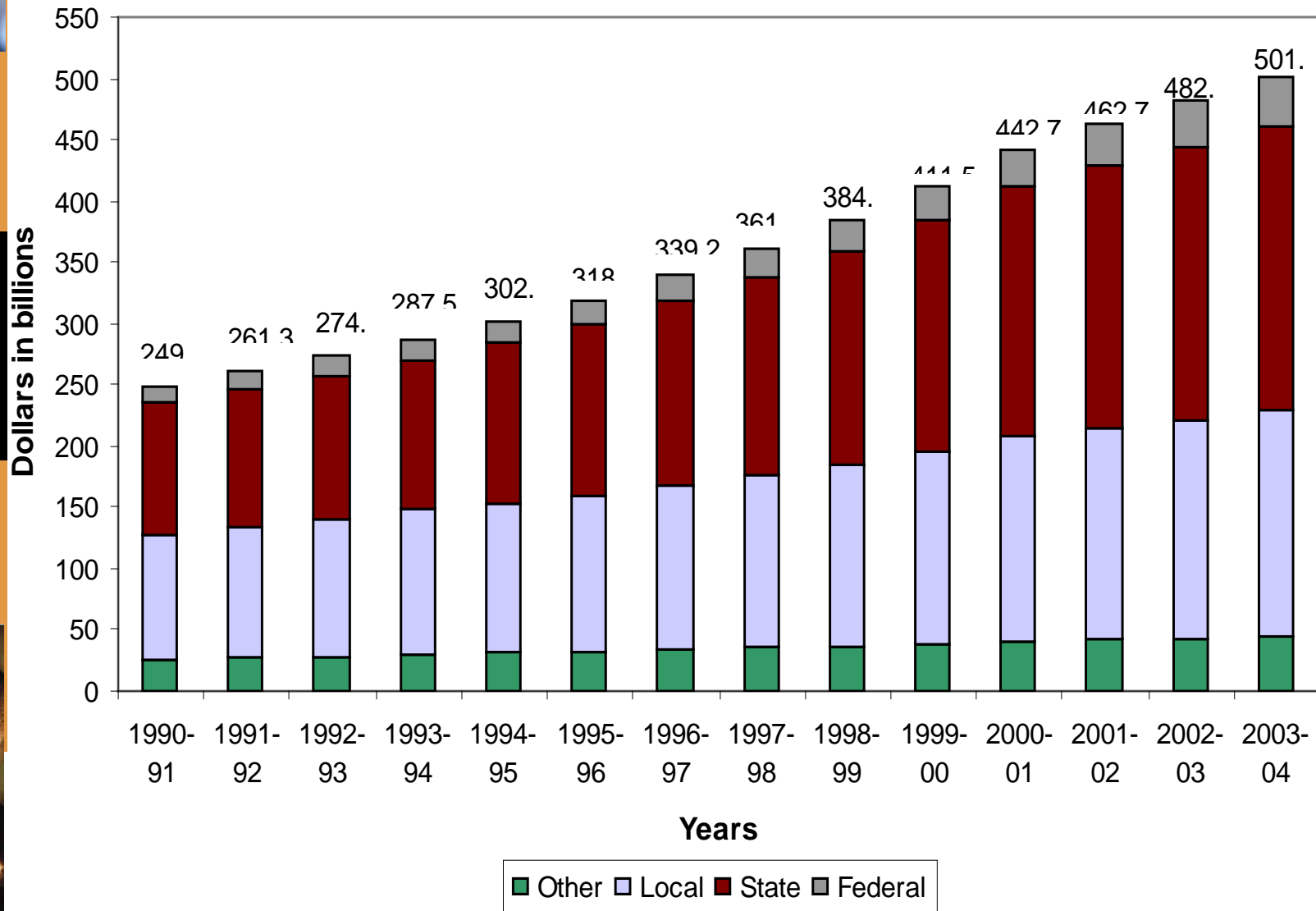
No Child Left Behind

Key Principles

- Increase accountability for student performance
- Focus on what works
- Reduce bureaucracy and increase flexibility
- Choices for students and parents

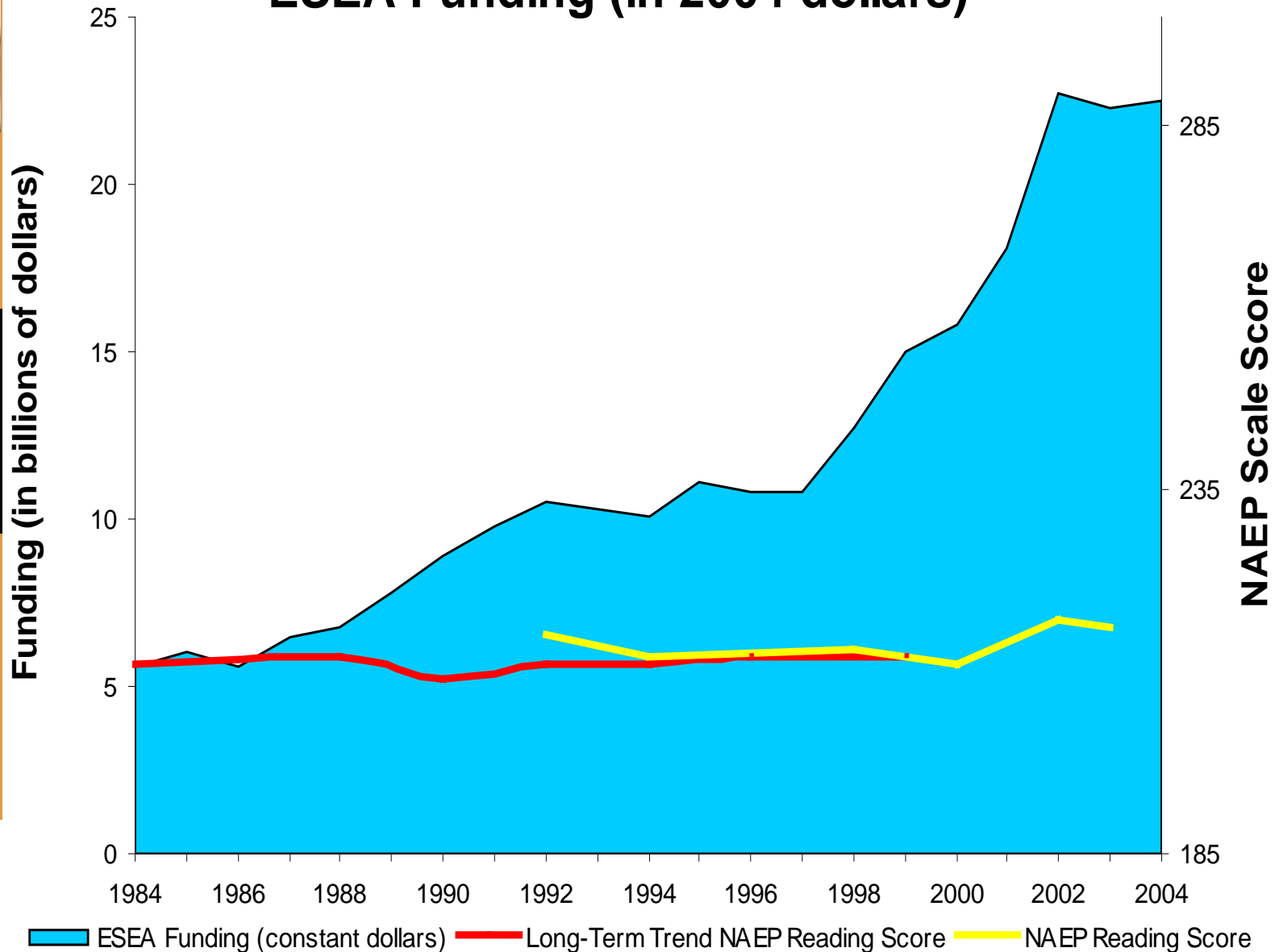


Expenditures for Elementary and Secondary Education





NAEP Reading Scores (Age 9) and ESEA Funding (in 2004 dollars)

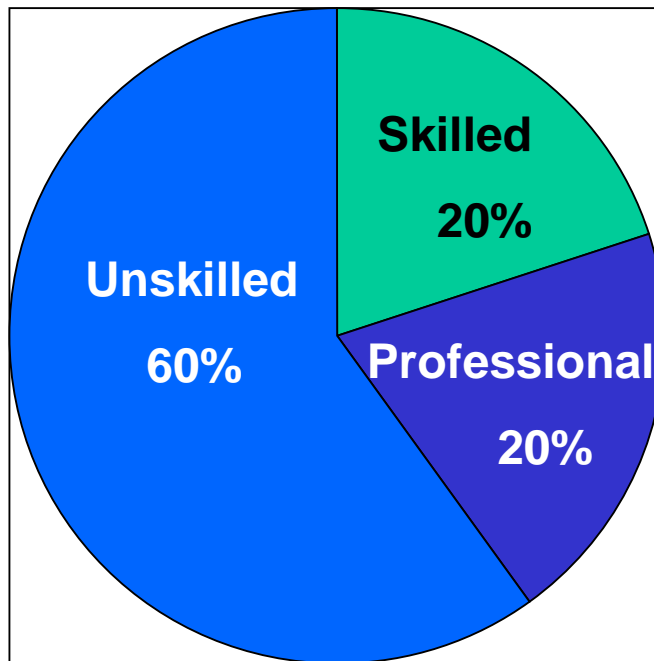




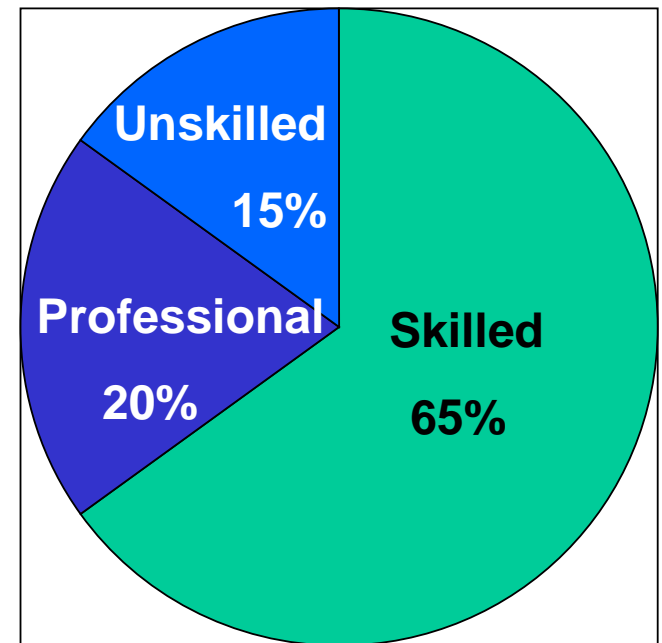
Economic Change

- Changing nature of the workforce.
- Fastest growing jobs require some education beyond high school.
- Employers express concern about the lack of essential skills among students.

Skill Level Changes



1950



1997

National Summit on 21st Century Skills for 21st Century Jobs



Graduation Rates for the United States

All Students	70%
White	72%
African American	51%
Hispanic	52%

Manhattan Institute Data from *Public High School
Graduation and College Readiness Rates in the U.S.*
(September 2003)



Losing Our Edge?

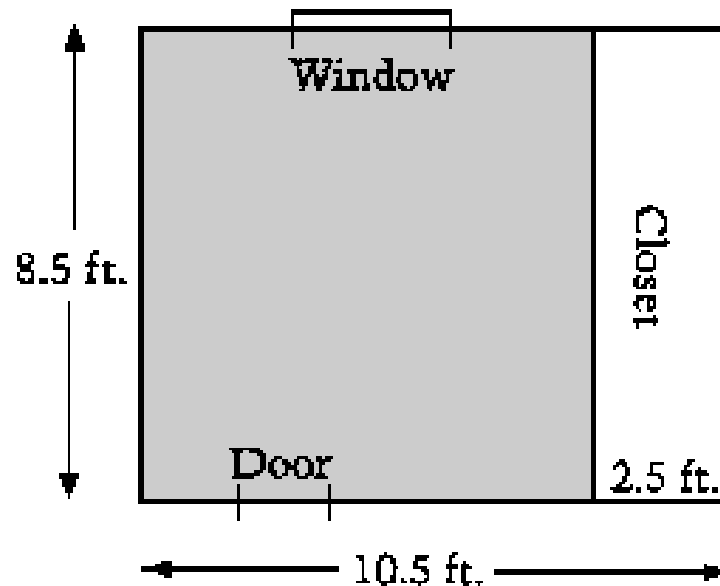
NAEP 2000 Math Assessment 12th Graders Scoring “Below Basic”

- 35 percent of *all* students
- 56 percent of *Hispanic* students
- 69 percent of *African-American* students
- 60 percent of *low-income* students
- 23 percent of students with *college-educated parents*

SOURCE: U.S. Department of Education, Institute of Education
Sciences, National Center for Education Statistics, National
Assessment of Educational Progress (NAEP), 2000

A Question Most “Below Basic” Students Answered Incorrectly

Chris wishes to carpet the rectangular room shown below. To the nearest square yard, how many square yards of carpet are needed to carpet the floor of the room if the closet floor will not be carpeted? (1 square yard = 9 square feet)





Losing Our Edge?

NAEP 2002 Reading Assessment 12th Graders Scoring “Below Basic”

- 26 percent of *all* students
- 39 percent of *Hispanic* students
- 46 percent of *African-American* students
- 40 percent of *low-income* students
- 18 percent of students with *college-educated parents*

SOURCE: U.S. Department of Education, Institute of Education Sciences,
National Center for Education Statistics, National Assessment of Educational
Progress (NAEP), 2002



High Expectations?

In 2003, 66 percent of entering freshmen at 4-year colleges and universities reported that they had studied or done homework for ***less than six hours per week*** during their senior year of high school.

Sax, L.J., et al. The American Freshman: National Norms for Fall 2003



College remediation rates

Entering freshmen, 2000

All	28%
Public 2-year	42%
Public 4-year	20%
Private 4-year	12%

Source: NCES, Remedial Education at Degree-Granting Postsecondary Institutions in Fall 2000,



Community college freshmen placed in remediation, by subject, 2000

Reading, writing, or math	42%
Reading	20%
Writing	23%
Math	35%

Source: NCES, Remedial Education at Degree-Granting Postsecondary Institutions in Fall 2000.



Teacher Impact

Value Added Studies

Children assigned to three effective teachers in a row scored at the 83rd percentile in math at the end of 5th grade, while children assigned to three ineffective teachers in a row scored at the 29th percentile.

William Sanders, University of Tennessee



Subject Matter Knowledge

- ★ High school math and science teachers with a major in their field of instruction have higher achieving students than teachers who are teaching out-of-field.
- ★ These effects become stronger in advanced math and science courses in which the teacher's content knowledge is presumably more critical

(e.g., Brewer & Goldhaber, 2000; Monk, 1994; Monk & King, 1994; Rowan, Chiang, & Miller, 1997; Chiang, 1996).



Impact of Professional Development

When professional development is focused on academic content and curriculum that is aligned with standards-based reform, teaching practice and student achievement are likely to improve.

Wiley and Yoon, 1995; Brown, Smith and Stein, 1986; and Kennedy, 1998.



What's Needed, Pinky Nelson

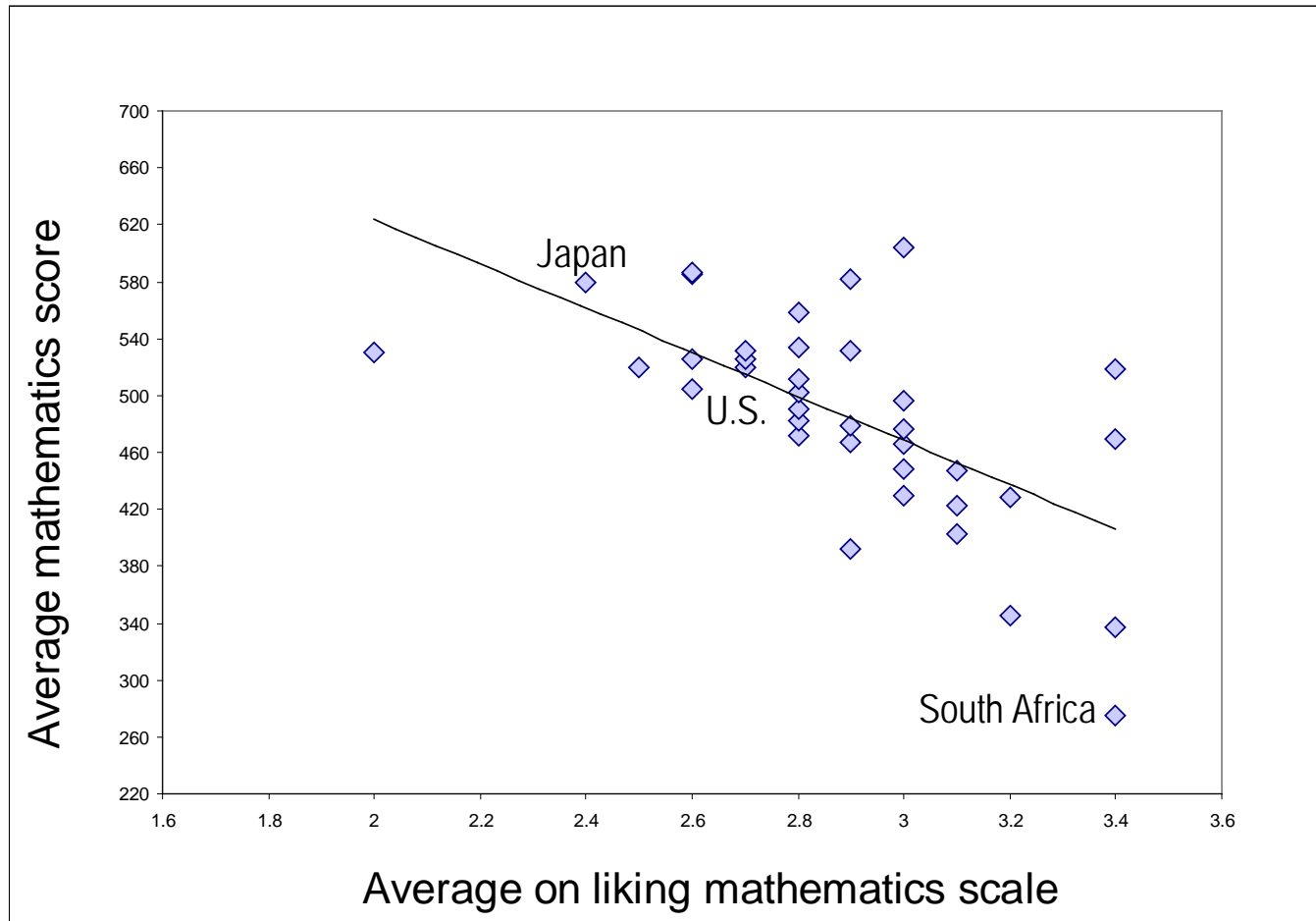
- **Teacher Preparation and Professional Development.**
 - Targets content in benchmarks and standards
 - Incorporates elements of good instruction
 - Works in context of curriculum materials
- **Coherent curriculum K-12**
 - Targets content in benchmarks and standards
 - Incorporates elements of good instruction
 - Tells a story
- **Published research on student learning of specific ideas**



What's Hard to Hear, Pinky Nelson

- **Most science teaching is ineffective in K-14**
- **Most students are not learning much science**
- **Teaching and learning science is hard**
 - **It does not have a mechanical component like math and reading**
- **Most curriculum materials are not research based and do not help teachers teach or students learn**
- **Only about 1000 hours are available to teach science K-12: 50 hrs/yr in K-5, 100 hrs/yr in 6-12**

Relationship Between “Liking Math” and Doing Well





The Math “Wars”

Constructivist Approaches	Skills-based Approaches
Knowledge is constructed	Knowledge is imparted
Children should develop their own understanding	Children should master standard facts & concepts
Authentic problems	Skill-relevant problems
Intrinsically motivated	Extrinsically motivated



Impact Research Results

Classroom-based assessment	+
Structured peer feedback	+
Tracking	-
Understanding	+
Direct instruction	+ - ?
Discovery	+ - ?
Authentic problems	+ - ?
Work and practice	+
Curriculum	?
Implementation	+
System alignment	+

Coherent Curriculum – A+ Countries

Topic	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Whole Number Meaning	j	j	j	j	j			
Whole Number Operations	j	j	j	j	j			
Measurement Units	j	j	j	j	j	j	j	
Common Fractions			j	j	j	j		
Equations & Formulas			j	j	j	j	j	j
Data Representation & Analysis			j	j	j	j		j
2-D Geometry: Basics			j	j	j	j	j	j
Polygons & Circles				j	j	j	j	j
Perimeter, Area & Volume				j	j	j	j	j
Rounding & Significant Figures				j	j			
Estimating Computations				j	j	j		
Properties of Whole Number Operations				j	j			
Estimating Quantity & Size				j	j			
Decimal Fractions				j	j	j		
Relationship of Common & Decimal Fractions				j	j	j		
Properties of Common & Decimal Fractions					j	j		
Percentages					j	j		
Proportionality Concepts					j	j	j	j
Proportionality Problems					j	j	j	j
2-D Coordinate Geometry					j	j	j	j
Geometry: Transformations						j	j	j
Negative Numbers, Integers & Their Properties						j	j	
Number Theory							j	j
Exponents, Roots & Radicals							j	j
Exponents & Orders of Magnitude							j	j
Measurement Estimation & Errors							j	
Constructions w/ Straightedge & Compass							j	j
3-D Geometry							j	j
Congruence & Similarity								j
Rational Numbers & Their Properties								j
Patterns, Relations & Functions								j
Slope & Trigonometry								j



Goals of Mathematics-Science Initiative

- ★ **Increase public awareness of the vital importance of mathematics and science education**
- ★ **Recruit, prepare, and retain teachers with strong mathematics and science backgrounds**
- ★ **Develop a comprehensive research framework on mathematics and science learning and assessment**



Math-Science Initiative Web-based Resources


- ★ www.ed.gov/inits/mathscience
- ★ Math Summit 2/6/03
 - ★ Papers, Webcast, PowerPoints
- ★ Teacher Professional Development Action Plan
- ★ Public Engagement Campaign
- ★ Science Summit 3/16/04
 - ★ [www.vodium.com/goto/doed/scienc
esummit.asp](http://www.vodium.com/goto/doed/scienc
esummit.asp)
 - ★ Papers, Webcast, PowerPoints



Math-Science Partnerships

★ State Competitions

- ★ Partnership of Departments of Math, Science or Engineering and High Need School district
- ★ May include colleges of education, other school districts, CBOs, informal science entities, or corporations
- ★ Research-based evaluations
- ★ Funding based on numbers of students in poverty



Preparing America's Future Key Principles

- High expectations for all
- Innovative learning structures that fully engage students
- High-quality teaching and leadership, and
- Accelerated transitions to work or additional education.



Jobs for the 21st Century

Striving Readers Initiative: \$200 million in grants to 50 to 100 school districts to implement effective reading interventions for middle or high school students.

Math and Science Partnerships: \$120 million in grants for interventions to increase achievement in mathematics for secondary students.

Adjunct Teacher Corps: \$50 million to recruit mid-career professionals to teach math and science in middle and high schools.



Jobs for the 21st Century

Advanced Placement (AP): \$28 million for professional development for AP teachers in high-poverty high schools.

State Scholars Initiative: \$12 million to expand the State Scholars program to all interested states.

Enhanced Pell Grants: \$30 million to enhance Pell Grants to reward low-income students who participate in the State Scholars Program by taking a rigorous high school curriculum. Up to an additional \$1,000 per year to students in the first two years of college.



Smaller Learning Communities

- **High schools larger than 1000**
- **\$.5million-\$1 million per school over five years**
- **Focus on academic achievement for all students**
- **Sustainability grants for first time**
- **Option for adolescent literacy grants**

