

Issues in Teaching & Learning Mathematics

Things we should all think about!

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Forces of Change

- Logical (Content - Mathematics)
- Psychological (Learning)
- Social (Parents, Society, Policy)

Ralph Tyler, 1934



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Where have we been...



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Recommended Actions

- The mathematics curriculum should be organized around **problem solving**.
- Mathematics teachers should create classroom environments in which **problem solving** can flourish.

An Agenda for Action. (Reston, VA: NCTM, **1980**, p. 2-5).



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Curriculum and Evaluation Standards

- Major Impact on K-12 Curriculum
- Influenced State Standards; 49 of 50 states now have state standards
- Update: 30* states have revised their standards since 2003.
- Influenced Local School System Standards; most school districts now have their own standards.
- Grade Band Alignment – Grades K-4; 5-8; and 9-12 Standards
- **Note:** Prior to the Standards, the textbook was the defacto curriculum. It is far less likely that this is the case now – in the United States.



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NCTM, 1989



Principles and Standards

Principles

- Equity
- Curriculum
- Teaching
- Learning
- Assessment
- Technology



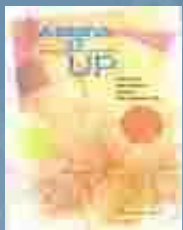
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Content and Process Standards

- Number & Operations
- Algebra
- Geometry
- Measurement
- Data Analysis & Probability

- Problem Solving
- Reasoning & Proof
- Communication
- Connections
- Representation



Mathematical Proficiency

- **conceptual understanding** - comprehension of mathematical concepts, operations, and relations.
- **procedural fluency** - skill in carrying out procedures flexibly, accurately, efficiently, and appropriately.
- **strategic competence** - ability to formulate, represent, and solve problems.
- **adaptive reasoning** - capacity for logical thought, reflection, explanation, and justification.
- **productive disposition*** - inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.



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↖ The Happiness Factor!?

Adding it Up, 2001

Oh my...

- “My wife who is completing her MS degree in Mathematics (a former HS Math teacher in the public schools), and I both agree, you are either born with a math gene or you're not (like many other god given abilities like performing arts, athletics, etc) and no amount of "confidence" or "fun" will convert most students into mathematicians, scientists, or engineers.
- The sooner we only focus on say the top 16-25% of students in math, the less frustrating math teachers will become.”



Some Mathematics



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Mathematical Discussions

- Procedural tasks for which students are expected to have well-developed algorithmic approaches are usually **not** good candidates for discussion. Interesting problems that “go somewhere” mathematically can often be catalysts for rich conversation.

Messy Problems are Good!

Imagine you are at your favorite amusement park, ready to ride the roller coaster. The ride lasts 2 minutes 15 seconds. The wait for the coaster each weekend is about 45 minutes, which is double the weekday wait.

- Could you ride the coaster three times in an hour?



- Although in school, students are often presented with clearly specified problems to solve, outside of school they encounter situations in which part of the difficulty is to figure out exactly what the problem is. They then need to formulate the problem so that they can use mathematics to solve it.

Wiest, 2000.

Numbers, Numbers, Numbers

How many 1-digit numbers are there? 2-digit numbers? 3-digit numbers?

Elementary School Mathematics, Addison-Wesley, **1968**



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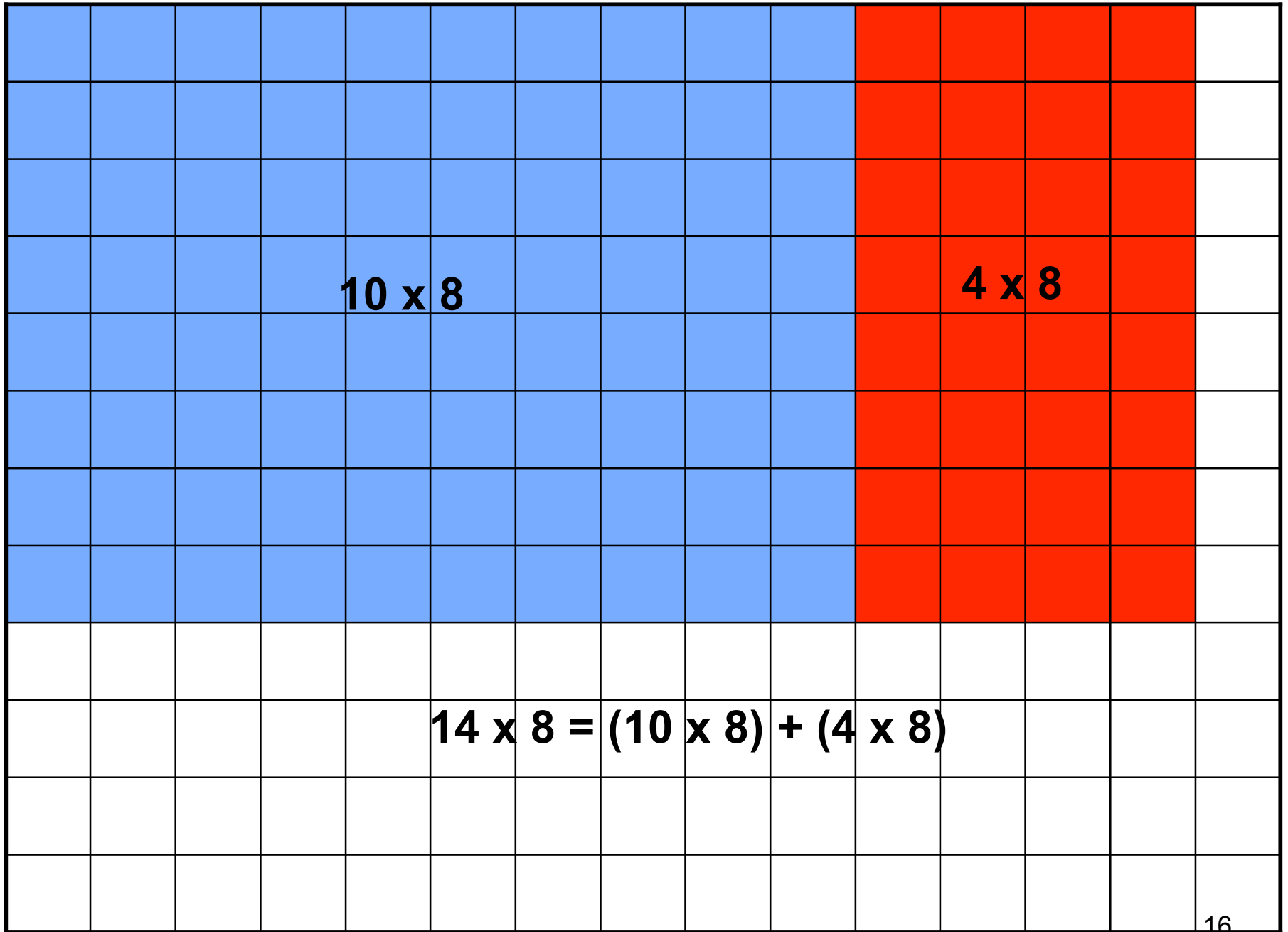
How would you solve

$$14 \times 8$$

mentally?



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Facts!!



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- Finding and using patterns and other thinking strategies greatly simplifies the task of learning multiplication tables.

Thornton, 1978

- Children need to identify individual products rapidly. **Little is known about how children acquire this fluency or what experiences might be of most help.**

Adding it Up (NRC, 2001)



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Think about...

- Teachers - In many cases, students should know their facts before they come to you.
OK, they don't - get over it!!
- But, facts are important linchpins for upper level computation work.
- **How many times in your instructional life do you think you have dealt with this issue?**

Fractions

- A Mess! Children don't do well and never have.
- Links to number theory - GCF and LCM are not consistent across curricula.
- Social contexts for their use are diminishing, as we become a decimal culture.
- Links to decimals, ratio, percent, proportion.
- Elementary schools should begin the process and the **middle school should extend it.**

Comparing Fractions

- Which is the greatest fraction? Tell how you know.

$$\frac{4}{6}$$

$$\frac{4}{7}$$

$$\frac{4}{8}$$

$$\frac{4}{9}$$

$$\frac{2}{8}$$

$$\frac{4}{8}$$

$$\frac{1}{8}$$

$$\frac{3}{8}$$



What's an improper fraction?

What did it do?



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Algebra

- Understand patterns, relations, and functions.
- Represent and analyze mathematical situations and structures using algebraic symbols.
- Use mathematical models to represent and understand quantitative relationships.
- Analyze change in various contexts.

Algebra: think abouts...

- The issue of algebra has become political.
- It's a gatekeeper
- It's very important for the serious study of collegiate mathematics
- Has become more of a K-12 issue.
- Issues:
 - **When?**
 - **Who?**
 - **Who's teaching?**
 - **Curriculum**

Developing Algebraic Thinking

- The basic ideas of algebra as generalized arithmetic should be anticipated by activities in the early elementary grades and learned by the end of middle school.
- Teachers and researchers should investigate the effectiveness of instructional strategies in grades preK-8 that would help students move from arithmetic to algebraic ways of thinking.



What algebra?



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Are you sure?

Actual problem presented at a mathematics conference.

A dog traveled 15 meters per second.
How far would the dog go in: a minute, a half-hour, an hour, a day?

Speeds of some animals

Cheetah	70 mph
Lion	50 mph
Zebra	40 mph
Rabbit	35 mph
Reindeer	32 mph
Elephant	25 mph
Chicken	8 mph
“Super Dog”	32+ mph

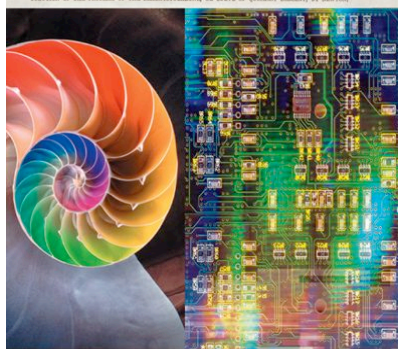
The Mathematics

- Too many objectives, standards, etc.
- Every objective is not equally important across a grade or grade band.
- Ways to integrate and involve (daily!) the process standards.
- What are the big ideas or **focal points** of instruction?
- How can we get teachers to understand what is really important?
- How can we get teachers to teach, and teach well, topics in which they are not as familiar?



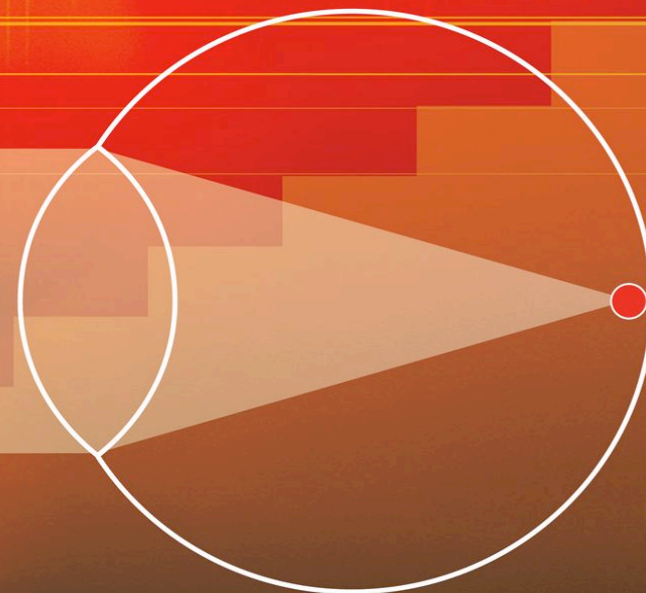


Problema I
Dato un arco di cerchio AB e un punto P su di esso, si costruisce un rettangolo $ABCD$ tale che P sia il punto medio di AC .
Soluzioni.
Dato il punto A tracciare una retta $APCZ$ passante per P e C . Tracciare una retta BD perpendicolare a $APCZ$ in P . I punti B e D sono i punti cercati. Si dimostra che $ABCD$ è un rettangolo e che P è il punto medio di AC .



Curriculum Focal Points

for Prekindergarten through Grade 8 Mathematics



A Quest for Coherence



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Why Identify Focal Points?

- Address long lists of state learning expectations
- Address “mile wide, inch deep” math curriculum
- Identify the mathematics that should be the focus of instruction and student learning, preK-8
- Begin the discussion of appropriate curricular expectations
- Identify key mathematical ideas all others build on



Number of 4th-Grade Learning Expectations per State by Content Strand

	Number & Operation	Geometry	Measurement	Algebra	Data Analysis, Probability & Statistics	Total Number of Learning Expectations
California	16	11	4	7	5	43
Texas	15	7	3	4	3	32
New York	27	8	10	5	6	56
Florida	31	11	17	10	20	89
Ohio	15	8	6	6	13	48
Michigan	37	5	11	0	3	56
New Jersey	21	10	8	6	11	56
North Carolina	14	3	2	3	4	26
Georgia	23	10	5	3	4	45
Virginia	17	8	11	2	3	41

Reys, et al., 2006

What Are Curriculum Focal Points?

- The most important mathematical topics for each grade level, preK-8
- Cohesive clusters of related ideas, concepts, skills, and procedures that form the foundation for higher-level mathematics
- More than a single objective, standard, expectation, or indicator
- Not discrete topics for teachers to present and check off as mastered by students



Curriculum Focal Points and Connections for Grade 4

The set of three curriculum focal points and related connections for mathematics in grade 4 follow. These topics are the recommended content emphases for this grade level. It is essential that these focal points be addressed in contexts that promote problem solving, reasoning, communication, making connections, and designing and analyzing representations.

Grade 4 Curriculum Focal Points	Connections to the Focal Points
<p>Number and Operations and Algebra: Developing quick recall of multiplication facts and related division facts and fluency with whole number multiplication</p> <p>Students use understandings of multiplication to develop quick recall of the basic multiplication facts and related division facts. They apply their understanding of models for multiplication (i.e., equal-sized groups, arrays, area models, equal intervals on the number line), place value, and properties of operations (in particular, the distributive property) as they develop, discuss, and use efficient, accurate, and generalizable methods to multiply multidigit whole numbers. They select appropriate methods and apply them accurately to estimate products or calculate them mentally, depending on the context and numbers involved. They develop fluency with efficient procedures, including the standard algorithm, for multiplying whole numbers, understand why the procedures work (on the basis of place value and properties of operations), and use them to solve problems.</p>	<p>Algebra: Students continue identifying, describing, and extending numeric patterns involving all operations and nonnumeric growing or repeating patterns. Through these experiences, they develop an understanding of the use of a rule to describe a sequence of numbers or objects.</p> <p>Geometry: Students extend their understanding of properties of two-dimensional shapes as they find the areas of polygons. They build on their earlier work with symmetry and congruence in grade 3 to encompass transformations, including those that produce line and rotational symmetry. By using transformations to design and analyze simple tilings and tessellations, students deepen their understanding of two-dimensional space.</p>
<p>Number and Operations: Developing an understanding of decimals, including the connections between fractions and decimals</p> <p>Students understand decimal notation as an extension of the base-ten system of writing whole numbers that is useful for representing more numbers, including numbers between 0 and 1, between 1 and 2, and so on. Students relate their understanding of fractions to reading and writing decimals that are greater than or less than 1, identifying equivalent decimals, comparing and ordering decimals, and estimating decimal or fractional amounts in problem solving. They connect equivalent fractions and decimals by comparing models to symbols and locating equivalent symbols on the number line.</p>	<p>Measurement: As part of understanding two-dimensional shapes, students measure and classify angles.</p> <p>Data Analysis: Students continue to use tools from grade 3, solving problems by making frequency tables, bar graphs, picture graphs, and line plots. They apply their understanding of place value to develop and use stem-and-leaf plots.</p>
<p>Measurement: Developing an understanding of area and determining the areas of two-dimensional shapes</p> <p>Students recognize area as an attribute of two-dimensional regions. They learn that they can quantify area by finding the total number of same-sized units of area that cover the shape without gaps or overlaps. They understand that a square that is 1 unit on a side is the standard unit for measuring area. They select appropriate units, strategies (e.g., decomposing shapes), and tools for solving problems that involve estimating or measuring area. Students connect area measure to the area model that they have used to represent multiplication, and they use this connection to justify the formula for the area of a rectangle.</p>	<p>Number and Operations: Building on their work in grade 3, students extend their understanding of place value and ways of representing numbers to 100,000 in various contexts. They use estimation in determining the relative sizes of amounts or distances. Students develop understandings of strategies for multidigit division by using models that represent division as the inverse of multiplication, as partitioning, or as successive subtraction. By working with decimals, students extend their ability to recognize equivalent fractions. Students' earlier work in grade 3 with models of fractions and multiplication and division facts supports their understanding of techniques for generating equivalent fractions and simplifying fractions.</p>

How to Use Curriculum Focal Points

- Framework for development of mathematics curriculum
- Grade-level targets for curriculum developers
- An example for next generation of curricula and related assessments

Then What?



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September 12, 2006

Arithmetic Problem

New Report Urges Return to Basics in Teaching Math

By JOHN HECHINGER

Critics of 'Fuzzy' Methods Cheer Educators' Findings; Drills Without Calculators

The nation's math teachers, on the front lines of a 17-year Curriculum war, are getting some new marching orders: Make sure students learn the basics.

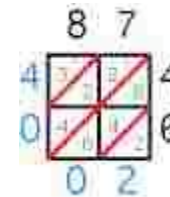


September 21, 2006

Latest 'new math' idea gets back to the basics

By Stephanie Banchero

1202!!!



For nearly two decades, a battle has raged over the best ways to teach elementary and high school math.

On one side sit fundamentalists, who prefer old-fashioned drilling and a focus on the basics. On the other side are the so-called 'new math' proponents, who care more about understanding the concepts than performing the calculations.

April 13, 2000

Math Teachers Back Return Of Education in Basic Skills

By ANEMONA HARTOCOLLIS

In an important about-face, the nation's most influential group of mathematics teachers announced yesterday that it was recommending, in essence, that the arithmetic be put back into mathematics, urging teachers to emphasize the fundamentals of computation rather than focus on concepts and reasoning.

- Children should master the basic facts of arithmetic that are essential components of fluency with paper-pencil and mental computation and with estimation.
- It is important for children to learn the sequence of steps – and the reason for them – in the paper-and-pencil algorithms used widely in our culture.



PreK-4 – Curriculum and Evaluation Standards, NCTM, 1989, p.47



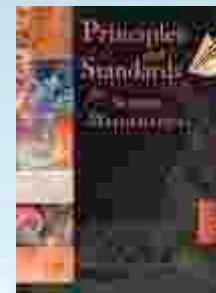
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- Knowing basic number combinations – the single digit addition and multiplication pairs and their counterparts for subtraction and division – is essential.
- Equally essential is computational fluency – having and using efficient and accurate methods for computing. Fluency may be manifested in using a combination of mental strategies and jottings on paper or using an algorithm with paper and pencil, particularly when the numbers are large, to produce accurate results quickly. Regardless of the particular algorithm used, students should be able to explain their method, understand that many methods exist, and see the usefulness of methods that are efficient, accurate, and general.

Number & Operations, Principles and Standards for School Mathematics, NCTM, 2000, p. 32



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CLAIM:

Most importantly, they should not be expected to use an algorithm before it is understood.

Me!

RESPONSE:

As far as I can tell, the norm in mathematics (and in life) is the exact opposite; they will not understand any algorithm until they have used it – lots and lots of times.

The point that we should be able to agree on is that, for this process of getting to know things from the inside to be effective (whether a student just arrived in a new city, or a child in a new house, or a kid with a new computer game, or a kid learning violin via the Suzuki method, or a singer trying to learn a new song, or conductor coming to grips with a new score, or...yes, or even a mathematician trying to read an important paper) there has to be reflection along the way to avoid things fossilizing in a blindly, uncomprehending mechanical form.

Tony Gardiner

- What can you say about:

24

49

57

- How can we write:

23 ... $20 + 3$; $30 - 7$; $25 - 2$; etc

109... $100 + 9$; $110 - 1$; $100 + 5 + 4$

Fennell, 1999, 2001

And...



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- States who have met* or will meet to consider using the Curriculum Focal Points to assist in revising their state standards:

- Florida
- Oregon
- Maine
- North Carolina
- South Carolina
- Minnesota
- New York
- Ohio
- Pennsylvania
- Mississippi
- Tennessee
- Utah
- Maryland
- District of Columbia
- Kentucky

More now



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Other Audiences

- National Math Panel Presentation
- Capitol – Senate and House Aides
- AMS, MAA – October and January
- Major Publishers
- CBMS Presentation - December
- Department of Education – MSP Meetings
- National Title I meeting – January
- Brookings Institution Meeting*
- AMTE – January
- Curriculum Center Meeting – February
- Lieutenant Governor's Retreat – Hunt Institute - March
- Others...



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The Students and Learning



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Gaps begin before children
arrive at the schoolhouse door.

But, rather than organizing our
educational system to ameliorate
this problem, we organize it to
exacerbate the problem.



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Education Trust, 2006 48

Choices are made about
what to expect of whom...



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Education Trust, 2006

Adults Say:

- They're poor;
- Their parents don't care;
- They come to schools without breakfast;
- Not enough books
- Not enough parents . . .

OUR challenge!!!!

Time

- “Substantial time should be devoted to mathematics instruction each school day, with enough time devoted to each topic to develop understanding of the concepts and procedures involved. Time should be apportioned so that all strands of mathematical proficiency together receive adequate attention.”

Adding it Up, NRC, 2001, p. 422



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Student Achievement Considerations

- Access to a challenging curriculum.
- Expectations to and from students.
- Access to quality teaching.
- Inequitable distribution of resources.

Education Trust, 2001



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Think about...

- How is it that we have so many students in programs that deny opportunities?
- Challenge is good!
- Kids do better when placed in more rigorous courses.

Mathematics is the gateway to good jobs!



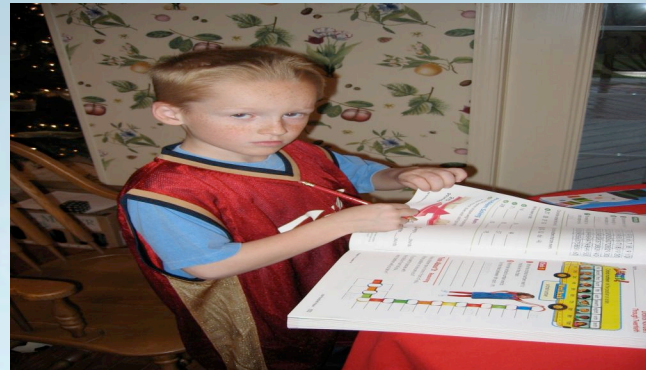
But it's not just
Algebra II



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We share a responsibility

This must be a concerted team effort,
it's about every child every day.



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They are all yours!

- There are 26 sheep and 10 goats on a ship. How old is the captain?
- What do you think middle grade students did with the problem above?
- More than three out of four students responded with a numeric answer, the most common one being that the captain's age is 36!
- One child explained: "Well, you need to add or subtract or multiply in problems like this, and this one seemed to work best if I add" (Bradford and Stein, 1993).



Finally, with regard to students and learning

There is nothing more unequal
than equal treatment of
unequal children.



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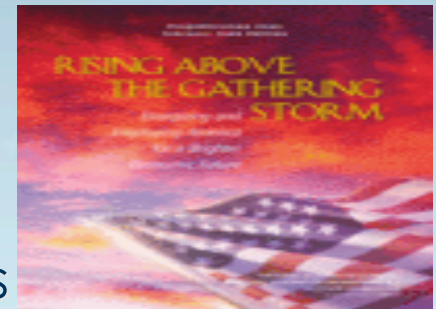
Policy/Community/Societal Issues



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- 86% of U.S. voters believe that the U.S. must increase the number of workers with a background in science and mathematics or America's ability to compete in the global economy will be diminished.

- The Tom Friedman – effect!
- Competitiveness – an advantage for new ideas

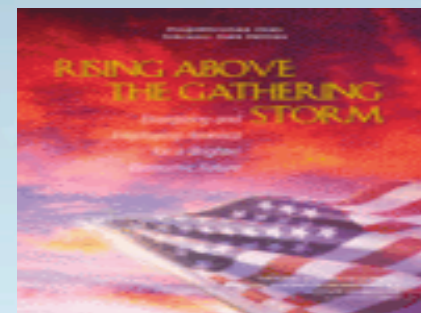


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Rising Above the Gathering Storm, NAS, 2005 59



- House Bill 362
 - 10,000 Teachers, 10,000,000 minds!
- This bill (passed April 24th) creates several new programs and expands programs at NSF. Areas of focus:
 - Teacher education
 - Professional development
 - Training for AP courses.



The RAGS effect



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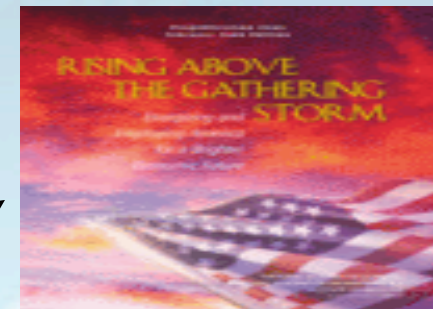
• Senate Bill 761: America Competes Act

- Passed April 25th
- Preserving America's Competitive Edge
- Authorizes Math Now for elementary and middle school math
- Increases research \$
- Strengthens educational opportunities from elementary level through graduate school.
- Focus on intervention.
- Robert Noyce Teacher Scholarship



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RAGS Effect II

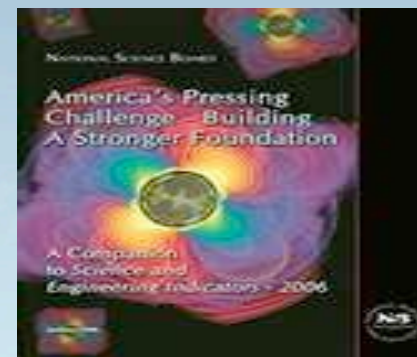


What is the compromise bill?



America's Pressing Challenge: Building A Stronger Foundation

- Our nation must devote the necessary resources now to revitalize our precollege STEM education system. We cannot wait for a new **Sputnik** episode to energize our population to rise to this challenge – we must recognize the existing crisis and take the necessary actions.



NSF, 2006



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- ACT study notes gap between U.S. high school curriculum and college expectations.
 - Colleges generally want all incoming students to attain an in-depth understanding of a selected number of fundamental skills and concepts in their high school courses, while high schools tend to provide less in-depth instruction of a broader range of skills and topics.

April, 2007



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- “America’s high schools are obsolete. By obsolete, I don’t just mean our schools are broken, flawed, and under-funded. By obsolete, I mean that our high schools cannot teach our kids what they need to know today...This isn’t an accident or a flaw in the system, it is the system!”
- “Each year more than 1 million students drop out of high school. That’s one child every 29 seconds. We all must demand that candidates and our leaders share their opinions and policies on how our country will offer all young people Strong American Schools.”



Bill Gates, 2005, 2007



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- ...math and science are the keys to innovation and power in today's world, and American parents had better understand that the people who are eating their kids' lunch in math are not resting on their laurels.



Tom Friedman, 2005



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The world keeps getting flatter...

The education ministries of Singapore and the UAE recently signed a “memorandum of understanding.”



By 2010, if current trends continue, more than 90% of all scientists and engineers in the world will be living in Asia.



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Business Roundtable, 2005

Workforce Issues

- High school graduation rates peaked at 77% in 1969 and fell back to 70% in 1995 and have stayed at this level. The graduation rate for disadvantaged minority students is thought to be close to 50%
- A recent report by the Organization for Economic Cooperation and Development (OECD) indicates that the US ranked 16th out of 21 OECD countries with respect to high school graduation rates.



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More and better mathematics for all students

This is an imperative for America's
competitiveness.



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Do the kids care that Singapore is #1?

Mixed Messages

- Nationwide (NAEP) Math Scores Improve for Grades 4 and 8!
- U.S. 15-year olds ranked 24th of 40 on the 2003 PISA examination – assessing the ability to solve real-world problems.
- Is NAEP really the Nation's Report Card?
- NMP and NAEP



Mixed Messages II

- In academic 2005-2006, there were more students taking calculus at the high school level than taking calculus I in all 2- and 4-year colleges and universities in this country.



David Bressoud
Macalester
College
May, 2007



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The downward push issue!

Sound bites...



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We go where the smart people are.
Now our business operations are
two-thirds in the U.S. and one-third
overseas. That ratio will flip over the
next 10 years.



Intel spokesman Howard High



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If we don't step up to the challenge of finding and supporting the best teachers we'll undermine everything else we are trying to do to improve our schools.



Louis Gerstner, former Chair, IBM



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Mathematics for all.
We ALL use mathematics every day!!



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No Child Left Behind Challenges

- Meeting AYP
- Highly Qualified Teachers
- Math for All
 - special Education challenges
 - the continuing use of the word “subgroups”
- Overemphasis on high stakes assessments.



These challenges are diverting teachers from teaching, and driving them from the profession!

And, from my sister...*

Madaline Fennell, the Nebraska teacher of the year: Teachers are asking for,

- fully funding education and assessment programs that are federally mandated;
- language that addresses the special needs of students with disabilities, such as implementing state assessment systems that track the academic growth of individual students;
- replacing penalties against failing schools with methods to enhance achievement;
- multiple methods of assessment that evaluate a student's progress over the entire year, instead of just through standardized tests.

Ms. Fennell said that while there are positive aspects to the law, it is also "fraught with numerous deficiencies." The expertise of teachers who have been chosen as the best of the best in their states, she said, can help lawmakers craft a better version of the No Child Left Behind Act. "Teachers need to be included in this reauthorization," she said. "Please, leave no teacher behind."

Technology and Instruction

We are digital immigrants and
our students are digital natives!



ACR National Policy Forum, 2005



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The iPod effect

- By 2008, distance learning, via the internet, e-mail, or other technologies will become the main method used in 30% of training programs. By 2014, it will be the main method used in 30% of university courses.



Halal, 2004

And of course, our need to
support teachers...

Do you remember?



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When did you really become a teacher?

You were not prepared for your
first class!



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When I got everything done, I just sat down in the middle of my room and cried.

“I didn’t call myself anything. I was more than a teacher. And less. In the high school classroom you are a drill sergeant, a rabbi, a shoulder to cry on, a disciplinarian, a singer, a scholar, a clerk, a referee, a clown, a counselor, a dress-code enforcer, a conductor, an apologist, a philosopher, a collaborator, a tap dancer, a politician, a therapist, a fool, a traffic cop, a priest, a mother-father-sister-brother-aunt-uncle, a bookkeeper, a critic, a psychologist, the last straw.”

“Teacher Man” Frank McCourt (p.19, 2005)

The fact is, parents and schools and cultures do shape people. The most important influence in my life, outside of my family, was my high school journalism teacher, Hattie M. Steinberg. She pounded the fundamentals of journalism into her students – not simply how to write a lead or accurately transcribe a quote but, more important, how to comport yourself in a professional way. She was nearing 60 at the time I had her as my teacher and high school newspaper advisor in the late 1960s. She was the polar opposite of “cool,” but we hung around her classroom like it was the malt shop and she was Wolfman Jack. None of us could have articulated it then, but it was because we enjoyed being harangued by her, disciplined by her, and taught by her. She was a woman of clarity and principles in an age of uncertainty. I sit up straight just thinking about her! Our children will increasingly be competing head-to-head with Chinese, Indian, and Asian kids, whose parents have a lot more of Hattie’s character-building approach than their American parents. I am not suggesting that we militarize education, but I am suggesting that we do more to push our young people beyond their comfort zones, to do things right, and to be ready to suffer some short-run pain for longer gain.

Thomas L. Friedman, *The World is Flat*, p. 305

Thinking about teaching

- Teachers need expertise in both mathematics and in the teaching of mathematics.
- **Teachers are learners and the same principles of learning and transfer for student learners apply to teachers.**
- Teachers need opportunities to learn about children's cognitive development in order to know how teaching practices build on learners' prior knowledge.

They never told me about:

- Getting along with others
- Finding stuff
- Faculty Lounge fallout
- Custodian
- Secretarial support
- Day-to-day victories and losses

SCHOOL CULTURE



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Teaching is a hard job,
which gets harder every
day!

Departure – 50% in five years; 30% in 3
years!



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Some facts

- Teachers college course taking in mathematics is associated with student gains in high school.
- Teacher's mathematical knowledge as measured by tests is also linked to student achievement.
- **Prior on-the-job performance of teachers is by far the strongest predictor of their future on-the-job performance.**



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Greenwald, Hedges, and Laine, 1996⁸⁹

- The magnitude of the salary differential between the private sector and the teaching profession is large.
- Math/science teachers are more likely to leave their jobs due to dissatisfaction than other teachers.
- The most common reason for leaving?
\$\$\$

Ingersoll, 2000



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Why do they leave?

- Too little planning time,
- Too much paperwork
- Unreliable assistance
- **A general lack of support, including limited pay!**



- And then: “There is a trust there (at my school). They look at me as a professional, and it really makes or breaks whether you stay.”

What must we do for and with teachers? This must be a shared responsibility!

We must grow new leaders, starting right now and we must find ways to keep them!!!!!!



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And the next generation of teachers:

- Expects to be paid well for the important work they do.
- Expects variety in what they do with differentiated roles and opportunities to advance.
- Want the opportunity to collaborate with colleagues and to work in organizations that support them.

Moore Johnson, et al, 2004



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Parents/Community/Societal/Policy Issues



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Quiz

- Math is hard...
- Barbie!
- Math Sucks
- Jimmy Buffett
- You know I could never do math either...
- Every parent – seemingly!!!

NCTM Initiatives

- Curriculum
 - Curriculum Focal Points
 - High School Mathematics Project (Oct. 2008)
- Research
 - Linking research and practice
 - Research into practice grant
 - Research Access initiative
- Professional Growth and Leadership Development
 - Professional Development Continuum
- Advocacy and Outreach
- Membership – The next us!
 - Teacher Advisory Group



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Need and Opportunity

- Curricular Coherence
- Opportunities
 - National Mathematics Panel – feel free to ask about this effort!
 - Math Now
 - Dodd/Ehlers
 - Kennedy
 - Clinton



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Finally

- Your curriculum is too long, too much. We need to focus on important topics at each grade level and monitor progress carefully.
- Your job is hard and gets harder each day. And you more than occasionally wonder who cares!!!



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BUT...

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Questions?



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