

*Challenges:
Competitiveness
Math for all students every day*

Mathematics for ALL:
Quad County Conference
May 22, 2007



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Landscape Issues

Domestic Factors

- ◆ Interest in STEM fields
 - ◆ STEM curricula
 - ◆ NCLB Issues
- ◆ National Math Panel
 - ◆ Quality of life
- ◆ R&D investment/
tax credits



U.S. Competitiveness

Who will be at the
strategy table?

What will it take to not
only get a seat at
table, but be heard?



Global Factors

- ◆ U.S. trade deficit
- ◆ Emergence of BRIC
economics
(*Brazil, Russia, India,
China*)
- ◆ Emerging centers of
education
- ◆ Interest & performance
in STEM fields



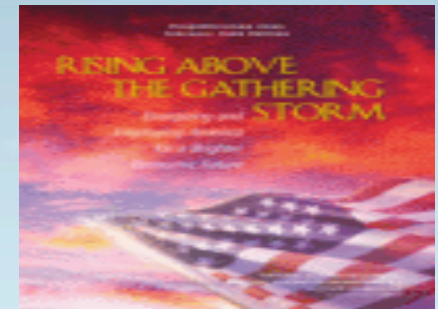
The Competitiveness Thing



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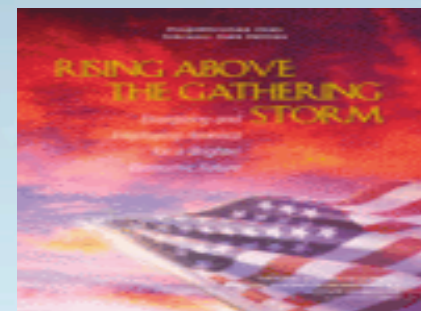
- 86% of U.S. voters believe that the U.S. must increase the number of workers with a background in science and mathematics or America's ability to compete in the global economy will be diminished.

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





- 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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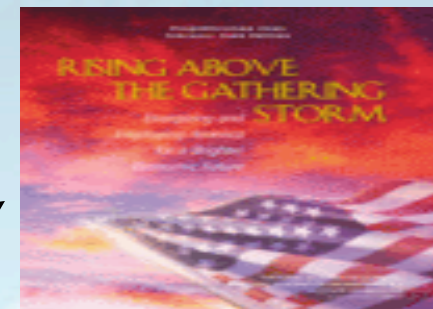
• Senate Bill 761: America Competes Act

- 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



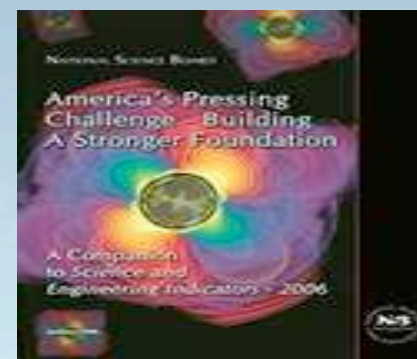
What is the compromise bill?



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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 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



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NCTM (2005), PISA (2005)

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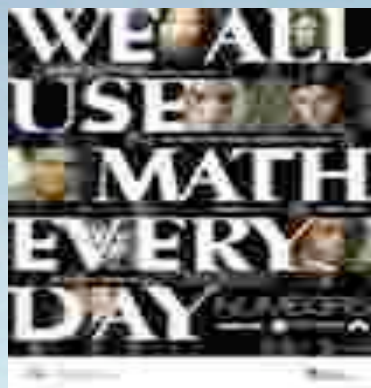
If we don't step up to the challenge of finding and supporting the best teachers we'll undermine everything else we are trying to do to improve our schools.



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Louis Gerstner, former Chair, IBM

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!



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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."



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* NOT

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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Assessment is Much More than Testing!



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“Our number one goal in this school district is to raise test scores.”

Sound Familiar?

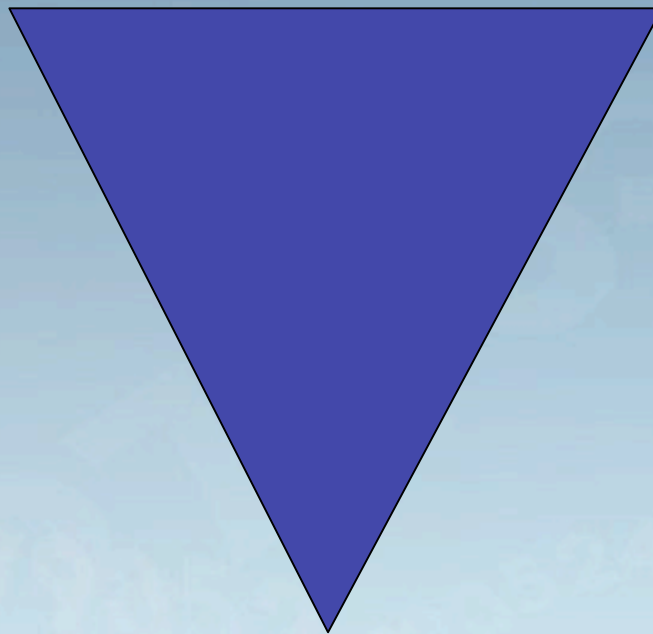


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Assessment Triangle

Observation

Interpretation



Cognition

- Assessment should not merely be done to students; rather, it should also be done for students, to guide and enhance their learning.

Assessment Today

- Assessment outcomes not only define what will be taught but also provide gates to educational programs and schools. They are used to determine how much federal money schools get. They put teachers on the line for job security and promotion. They are even used to evaluate schools and districts. They are a high stakes game. And make no mistake, they drive instruction.

Fostnot and Dolk, 2002, p. 127



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Classroom Assessment

These very important
assessments need to inform
teaching - daily.



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- Consider assessments (all assessments) as snapshots within a much larger album or record of learning.

Continuum of Assessment Distance

- **Immediate** – informal observation or artifacts from a lesson.
- **Close** – embedded assessments and semi-formal quizzes following several activities.
- **Proximal** – formal classroom exams following a particular curriculum.
- **Distal** – criterion-referenced achievement tests such as those required by NCLB.
- **Remote** – Broad outcomes measured over time – norm referenced tests.



Informal Assessments

- Observations
- Anecdotal Reports
- We know it is **more** informative to observe a student during a mathematical activity than to grade his papers. (Freudenthal, 1973)

- Grade 5 - Mia seemed anxious to me. After a while she asked me for some help. I sat down with her and talked her through the problem. I asked her questions about the problem and gave her a little clue, then she got that spark! **Oh, I know now**, she said. She seemed to understand completely (3 instances).



Assessment Recommendations

- Observation, discussion, and interviews serve better than paper-pencil tests in evaluating a pupil's ability to understand the principles he/she uses (Sueltz, Boynton, and Sauble, **1946**, p. 145).
- Information is best collected through informal observation as students participate in class discussions, attempt to solve problems, and work on various assignments individually or in groups (NCTM, **1989**, p. 233).
- Observation of the pupil's oral and written work is a very important assessment procedure and should be encouraged. Closely associated with the use of observations is the interview with the pupil regarding his/her daily work or his solution or attempted solutions of items of a test (Spitzer, **1951**, p. 191).

Write a word problem that
can be solved by either
addition or subtraction

Part Four: Problem Solving

Directions: Solve the following problems. Record your work in the space after each problem. You may use pictures, numbers and words.

1. Write a word problem that is solved by using addition OR subtraction.

ten
x ten

one hundred

twenty
- four

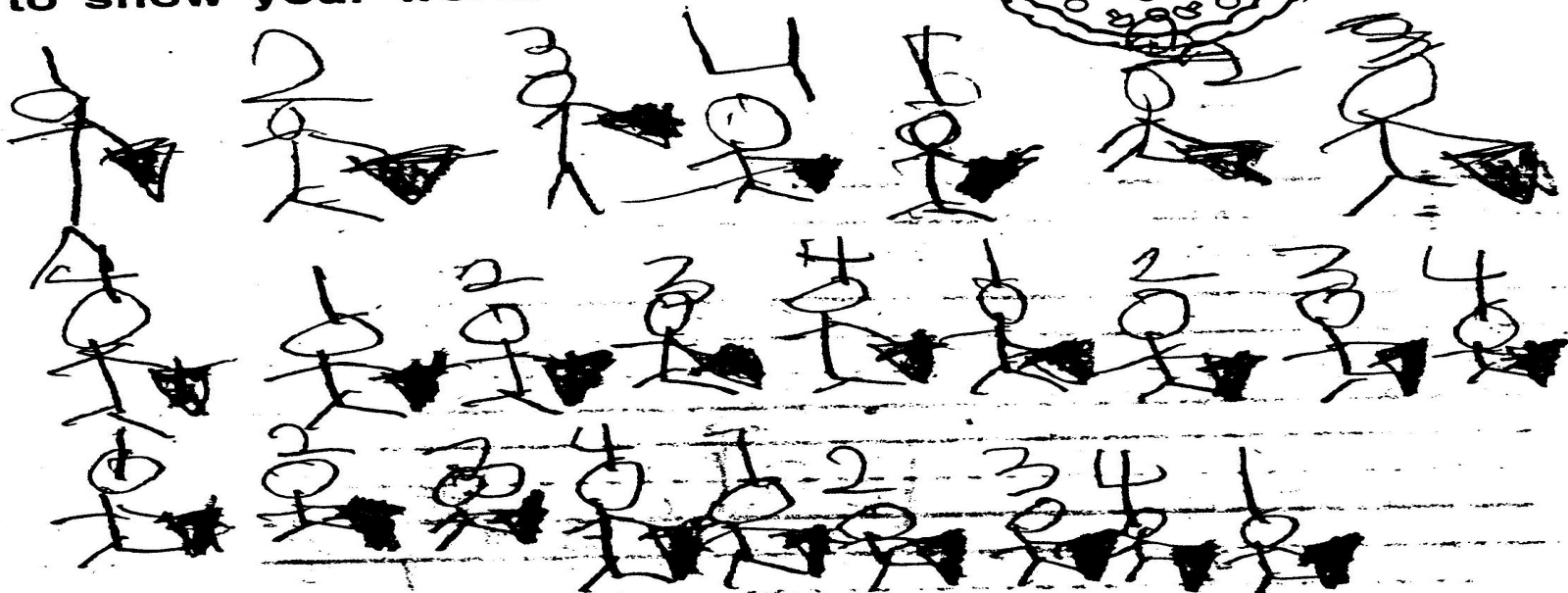
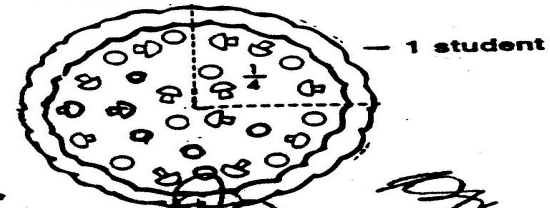
sixteen

Jimmy

③

Task 1

There are 25 students in our class. Each student will get $\frac{1}{4}$ of a pizza. Your job is to decide how many pizzas we should order? Be sure to show your work.



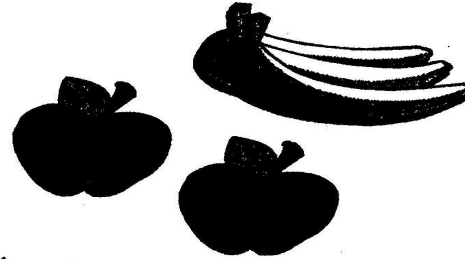
How many pizzas should we order? 7

Name: Jordan

Write a Problem

Write a question that can be answered by using the data in this story. Then find the answer.

Tommy went to the store and bought
13 apples and 5 bananas.



This is how I will help you.

You can use manipulatives. You can

use addition. You can use lego

blocks. You can use a number line.

What is the answer.

The answer is

- Interviewer: Melanie these two circles represent pies that were each cut into eight pieces for a party. This pie on the left had seven pieces eaten from it. How much pie is left there?
- **Melanie:** *One-eighth, writes $1/8$.*
- Interviewer: The pie on the right had three pieces eaten from it. How much is left of that pie?
- **Melanie:** *Five-eighths, writes $5/8$.*
- Interviewer: If you put those two together, how much of a pie is left?
- **Melanie:** *Six-eighths, writes $6/8$.*
- Interviewer: Could you write a number sentence to show what you just did?
- **Melanie:** *Writes $1/8 + 5/8 = 6/16$.*
- Interviewer: That's not the same as you told me before. Is that OK?
- **Melanie:** *Yes, this is the answer you get when you add fractions.*

Fennell and Rowan, 2001

Subtle, but important changes



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Language Issues

- There are 34 railroad cars on a train. Eleven railroad cars are carrying oranges. How many railroad cars are not carrying oranges? Show or explain how you found your answer.
- Raul has 12 cars. Raul and Joey together have 26 toy cars. How many cars does Joey have? Explain your answer. Use words, pictures or numbers.

NOTE THE DIFFERENCES



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Wilson, L. TCM, Oct. 2004

Visualization Issues

- Jerry is packing 250 math books in boxes. If 30 books fit in each box, how many boxes will he need? Show your work and explain your answer.
- 460 students are going on a trip. They are going on buses. 60 students can go on one bus. How many buses do the students need? Use pictures, words or numbers to explain your answer.

NOTE THE DIFFERENCES



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Wilson, L. TCM, Oct. 2004₃

Assessing Disposition



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Group Work Checklist

	Seldom	Occasionally	Often
Cooperates			
Discusses			
Uses Effective Strategies			
Proceeds to the solution			
Shares thinking			

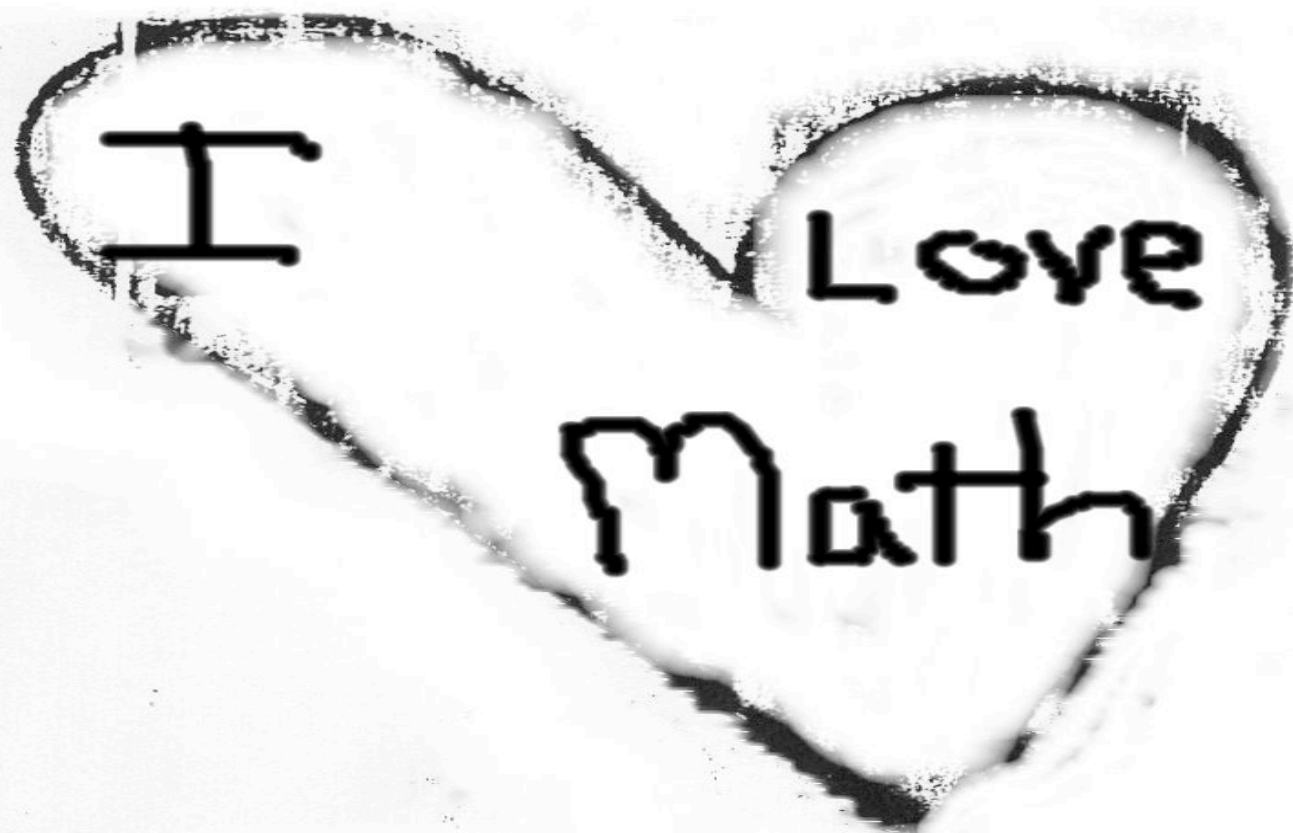
What I know	What I need to know	Think space

Multiplication

I think multiplication is fast
adding. ~~Multiplication is important~~
because sometimes you can't just
stand there counting. Some people
use multiplication at sales or at
shops or stores or even at home.
I didn't think multiplication was
important, but now I know, But I
still don't like it.

THE END

$$1\frac{1}{2} + 1\frac{1}{2} = 2\frac{2}{2}$$



- Aside from teacher-made classroom tests, the integration of assessment and learning as an interacting system has been too little explored.

Glaser and Silver, 1994



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Your first three performances were a sellout. 175 people attended each performance. What is the approximate number of people attending all three performances? 415

Explain your answer.

well, I multiplied 3 times 175 but because
It was supposed to be approximate I
screwed up on purpose.

High stakes are for tomatoes!

Susan Ohanian



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Finally!

- Tests are thermometers, not cures. At best, they sample where we are and hazard a guess as to what a rise or fall might mean.



Continuing...



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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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What do we do about the paradoxes here?

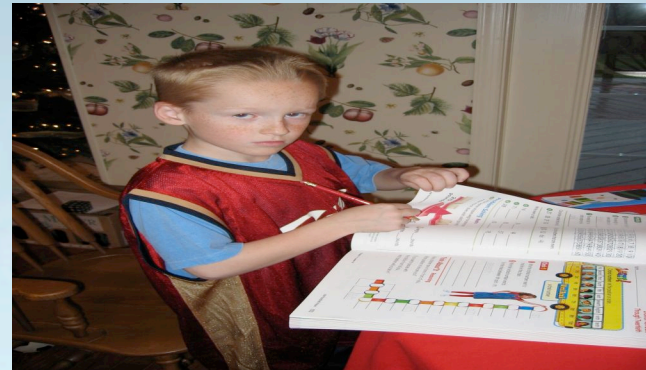
What are we (NCTM included) going to do about this?



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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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What we must be about

- Curriculum
 - Curriculum Focal Points
 - “Lenses” on High School Mathematics...
- Research
 - Linking research and practice
 - Research initiatives to frame our vision
 - Research Access initiative
- Professional Growth and Leadership Development
 - Professional Development Continuum
- Advocacy and Outreach
 - Washington Partners LLC
 - Much more...
- Membership – The next us!
 - Teacher Advisory Group

NCTM Strategic Priorities



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Curriculum Focal Points

- Oh my, what a year it has been!
- 750,000+ downloads
- Over 20+ states
- From the National Title I Conference to the Lt. Governor's to AERA...



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Recent and forthcoming!

Need and Opportunity

- Curricular Coherence
- Opportunities
 - National Mathematics Panel
 - Math Now
 - Dodd/Ehlers
 - Kennedy
 - Clinton



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



“Find what you love and do it. You are on your own in the classroom. The classroom is a place of high drama. You’ll never know what you’ve done to, or for, the hundreds coming and going. After a few years you develop antennae. You can tell when you have reached them or alienated them. So there’s the bell. See you later. Find out what you love and do it.”

“Teacher Man” Frank McCourt (p.255, 2005)



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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

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

Departure – 50% in five years; 32% in 3
years!




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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.

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



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We must

- Compete and become engaged in the national dialogue surrounding mathematics teaching and learning, balancing the challenges of competing with the need to meet the needs of every student in every classroom every day.
- Think of mathematics as the gateway, the portal for good jobs and quality of life for all citizens.
- Think of the shared responsibilities of our work – with and for teachers every day.



Changing the focus...

Entitlement + Empowerment = Expertise



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Questions?



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