The Role of K-12 Mathematics Teacher Leaders in a Common Core World

Cathy Seeley (cseeley@austin.utexas.edu)
Charles A. Dana Center
University of Texas at Austin
April 13, 2011

This afternoon...

- How do we recognize potential?
- How do we nurture ***all*** students' potential?
- Shifting the way(s) we teach
- Putting today's standards in perspective
- Leadership

Recognizing Potential...

Discussion:

What factors contribute to a student's success in mathematics?

Factors to consider

- Student factors
  - Motivation
  - Intelligence
- Instructional factors
  - Nature of the task
  - Opportunities to struggle, think, figure things out
  - Expectations that they will succeed
  - An environment of trust, collaboration, respect, and (eventual) success, where perseverance and constructive feedback of each other are valued
- Other factors?

Joshua Bell

- “Bell is simply dazzling.” Gramophone
- “No one stands in Mr. Bell’s shadow.” The New York Times
- “Pure bliss!” Associated Press
- “Joshua Bell is the greatest American violinist active today.” The Boston Herald
- View YouTube Joshua Bell video

Learning from Joshua's Experiment...

- What lessons might this experiment offer to us as educators?
- How might our smartest students be disguised?
- How can we support teachers in recognizing and nurturing potential?

Intelligence

- Fixed vs. malleable (can also motivate learning)
- Confidence, perseverance
- From brain research:
  The activities a person engages in can change their intelligence.
- Who determines the activities a student engages in?

I suspect that the current popular "scientific" theory that we are merely a genetic roll of our parents' dice, or an amalgam of our brain chemistry, keeps us from truly exploring our human potential. Imagine if we were not so busy diagnosing new mental diseases and convincing people that they have weird and incurable conditions--
we might find out how amazing each child can be.

Anne Dunev,
Nutritionist, health writer

Superstar lawyers and math whizzes and software entrepreneurs appear at first blush to lie outside ordinary experience. But they don't. They are products of history and community, of opportunity and legacy. Their success is not exceptional or mysterious. It is grounded in a web of advantages and inheritances, some deserved, some not, some earned, some just plain lucky—but all critical to making them who they are.

The outlier, in the end, is not an outlier at all.

Malcolm Gladwell

Outliers (2008)

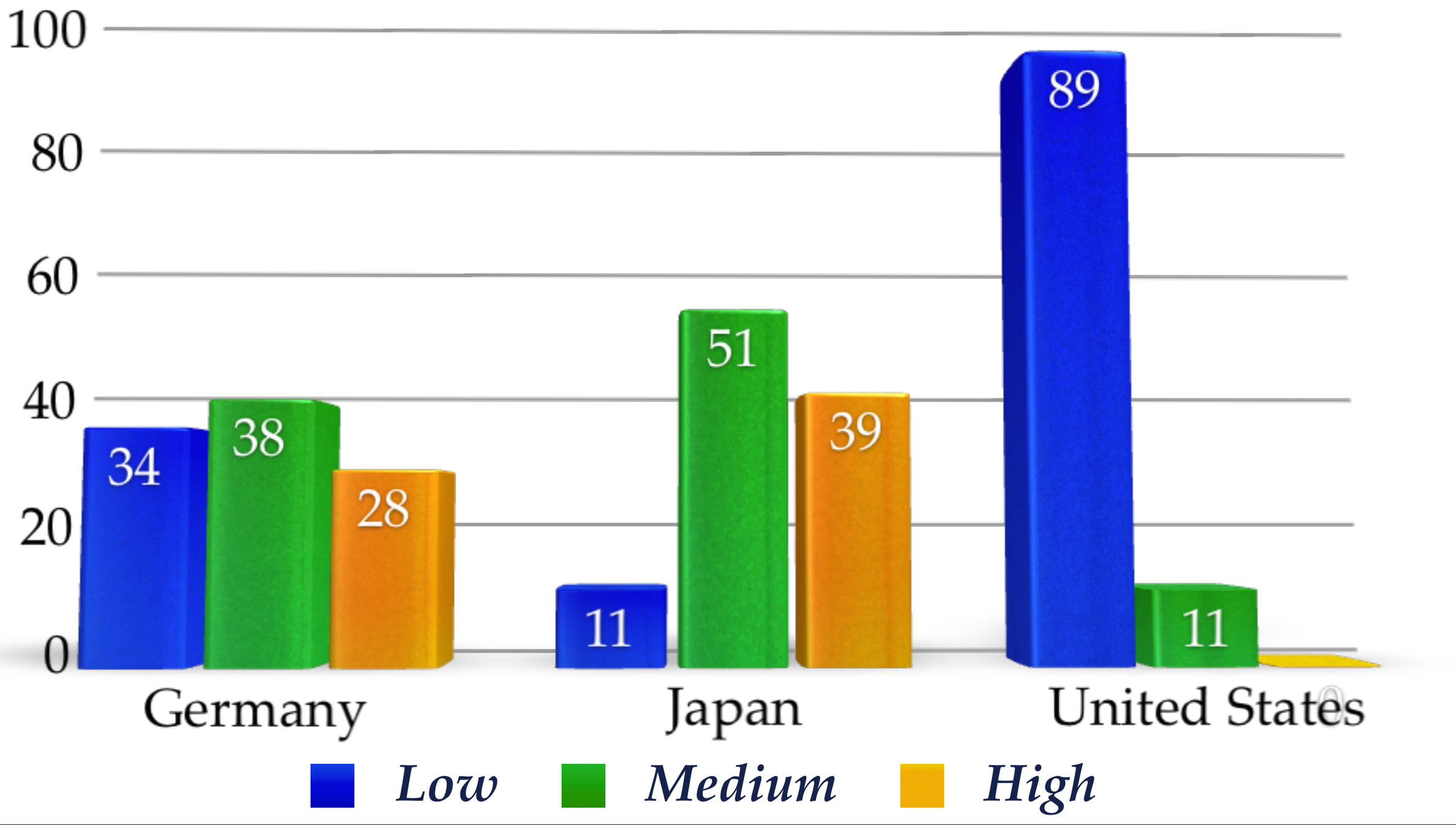
Does teaching matter?

Teaching

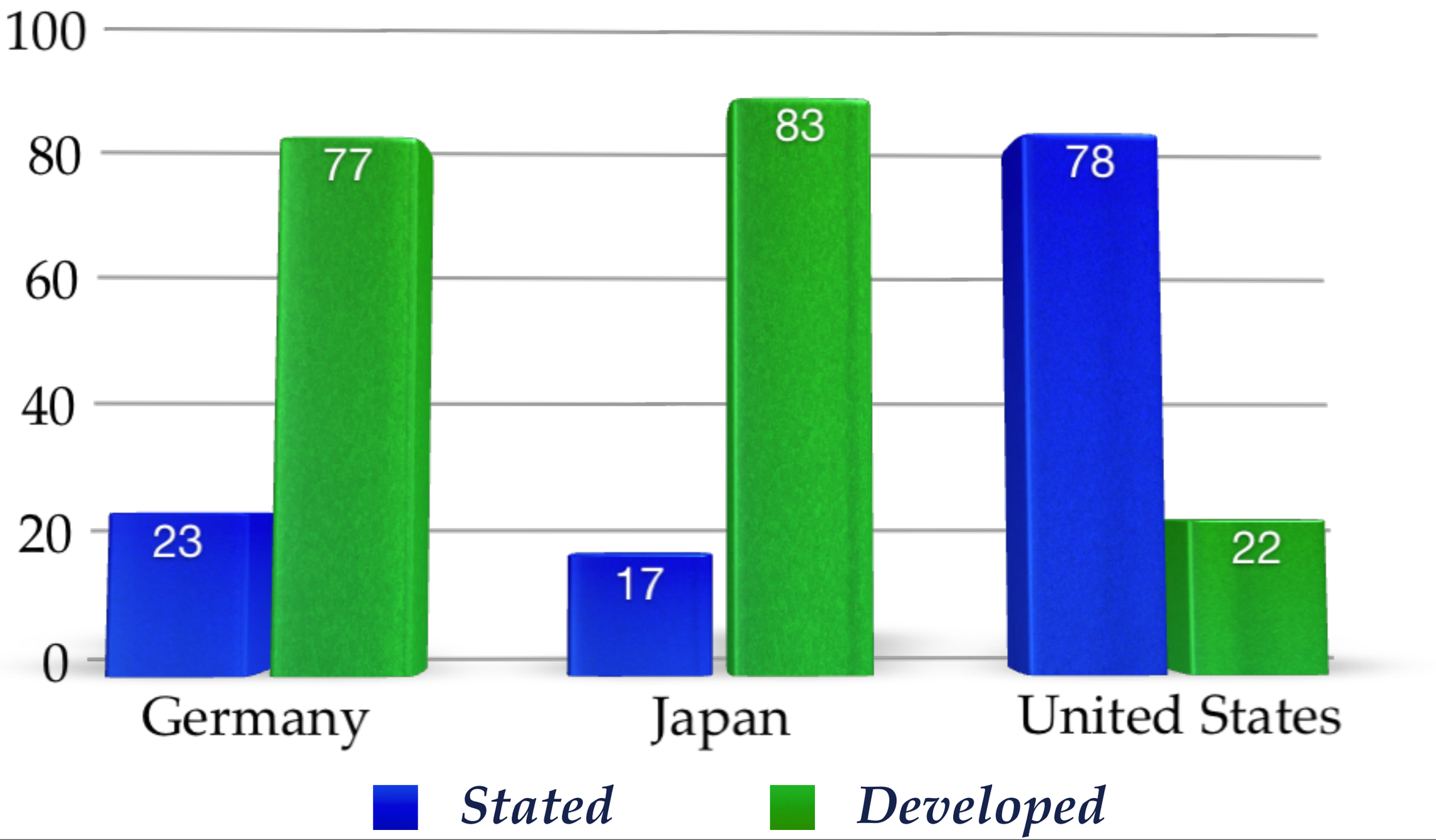
- Adults' views of intelligence matter at least as much as students' view.
- Teachers make dozens (hundreds?) of decisions every day that influence student learning.
- Giving students challenging tasks, expecting them to assume responsibility for their work and their learning, and supporting their perseverance can change their intelligence.

Compelling Comparisons...

Focus on Important Mathematics



Developing New Knowledge



Why allow struggling?

- Sometimes math problems are hard.
- American students give up--don't persevere.
- American teachers are compassionate.

All students need to
constructively struggle--
to get to the good stuff.

Watch out for scaffolding that morphs into spoon-feeding...

“I’m looking for that point right before frustration.”

Vern Williams

Typical flow of a mathematics class

U.S.

- Demonstrates a procedure
- Assigned similar problems to students as exercises
- Homework assignment

Japan

- Presents a problem without first demonstrating how to solve it
- Individual or group problem solving
- Compare and discuss multiple solution methods
- Summary, exercises and homework assignment

Upside-down teaching

- Starting with a rich problem
- Students engaged in dealing with the problem
- Discussion, comparing, interacting
- Teacher helps students connect and notice what they've learned
- Then, exercises and homework

Let's peek at two classrooms...

Two classrooms

- Kindergarten (video not available to share)
  (video clip from the Measure Up program: Maria DaSilva, University Laboratory School, Hannah Slovin, and Linda Venenciano, Univ. of Hawai‘i, Curriculum Research & Development Group)
- 12th-grade (utdanacenter.org/amdm)

While you watch...

- Listen for the questions the teacher asks.
- Listen for the nature of thinking students exhibit.
- Listen for when the teacher tells, answers questions.

Teacher talk I heard on HI videos...

- Can we always do that?
- Try to think if there's a fast way.
- If we turned this into multiplication, what would it look like?
- I like the question you asked. It really got us talking about mathematics.

12th grade math

- Advanced Mathematical Decision Making
- Kelly Flickinger, Bowie High School, Austin ISD
- Numerical Reasoning: Tire lesson; Crowd lesson
- Video from April . . .
- View at: utdanacenter.org/amdm

What teachers say...

- Say what you just said again/Say more about that.
- Then what did you do?
- What does the ‘1’ represent in your solution?
- How did you know to...?/What made you use 7 instead of 10?
- What did you guys do differently?
- What if...? What would happen then?

What didn’t you hear?

- Yes, that’s right.
- Well, that’s almost right...
- I can see where you went wrong.
- Great! This group has the answer.

Discussion:

What are some of your favorite question to push students' thinking?

Some good questions

- How do you know?
- Why do you think so?
- Can you convince your partner?
- What's the same about...?
- What's different about...?

From Frances (middle school teacher)

- The more I listened, the more I learned from my students.
- When I started asking questions, I found out what the student was thinking.
- It doesn't usually work when I show students their mistakes and then show them how to do it correctly.
- Eventually the students start asking the questions of each other.

From Debbie
(1st-gr. teacher)

- I finally figured out that if I shut up long enough, I'll find out what the student really knows.

How can we move closer to the goal?

- Focus less on covering material for the test and on the bits and pieces of the curriculum, standards, test items.
- Focus more on connected chunks and clusters.
- Work together across grades; talk with each other.
- Don’t always show students exactly what to do.
- Look beyond outcomes--to see the understanding.
- Avoid asking one too many questions.
- Avoid answering all of their questions.

The bottom line…

Our students won't learn what they need to learn, if we don't give them opportunities to learn it.

Putting the Common Core State Standards in Perspective

In the beginning, there were NCTM standards…

Curriculum and Evaluation Standards for School Mathematics

NCTM, 1989

Curriculum and Evaluation Standards for School Mathematics (1989)

K-4	5-8	9-12
Problem Solving	Problem Solving	Problem Solving
Communication	Communication	Communication
Reasoning	Reasoning	Reasoning
Mathematical Connections	Mathematical Connections	Mathematical Connections
Estimation	Number/Number Relationships	Algebra
Number Sense/Numeration	Number Sys/Number Theory	Functions
Concepts of Whole No. Ops	Computation and Estimation	Geom: Synthetic Perspective
Whole Number Computation	Patterns and Functions	Geom: Algebraic Perspective
Geometry and Spatial Sense	Algebra	Trigonometry
Measurement	Statistics	Statistics
Statistics and Probability	Probability	Probability
Fractions and Decimals	Geometry	Discrete Mathematics
Patterns and Relationships	Measurement	Conceptual Underpinnings of Calculus
		Mathematical Structure

The message of the NCTM standards...

All students doing meaningful mathematics using appropriate tools

Cathy Seeley, 1990

Principles and Standards for School Mathematics NCTM, 2000

Principles

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

Process Standards

- Problem Solving
- Reasoning
- Communication
- Connections
- Representation

Content Standards

- Number/Operations
- Algebra
- Geometry
- Measurement
- Data/Probability

National Research Council

Adding It Up, 2000: 'Rope' model:

- Adaptive Reasoning
- Strategic Competence
- Conceptual Understanding
- Productive Disposition
- Procedural Fluency

Curriculum Focal Points-- A Quest for Coherence...

NCTM, 2006

Others...

- America Diploma Project, 2004
  Achieve, Education Trust, Fordham Foundation
- College Board, 2008

The New Question

- ***College and Career Readiness***:

Is every student graduating from high school ready for success in college or a well-paying career?

College and Career Ready

- What the recommendations say:
    - All students need challenging, academic high school courses (not remedial)
    - All students need Algebra II or equivalent
    - All students need research and communication skills
    - All students need independent learning skills and critical thinking skills

Common Core State Standards Initiative:

Preparing America's Students for College & Career

STANDARDS FOR MATHEMATICS

JUNE 2010

CCSS slides available at corestandards.org

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments; critique others' reasoning.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision. (read it...)
7. Look for and make use of structure.
8. Look for and make use of regularity in reasoning.

Today's Math Standards

- These standards (and *your* standards) build on a legacy of 20 years of work from the profession.
- Without planning and collaboration, misunderstandings and inappropriate policies and programs are always possible.
- These standards *allow* us to teach *all students* meaningful mathematics as defined by NCTM, the National Research Council, the Minnesota Department of Education, and others.
- But that won't happen without strong leadership to carve out the next legacy...

What does it take from teachers?

... to help students realize their potential in the 21st century?

- A shift in our views about who is smart
- A belief that what teachers do can make a difference in a student's intelligence
- Changes in practice that reflect these shifts: engagement, struggle, skillful facilitation to help students make connections
- A commitment to do what's right as we implement what's required (remembering our priorities)

What does it take from teachers?

...to help students realize their potential in a *Common Core* era?

- A shift in our views about who is smart
- A belief that what teachers do can make a difference in a student's intelligence
- Changes in practice that reflect these shifts: engagement, struggle, skillful facilitation toward connections
- A commitment to do what's right as we implement what's required (remember your priorities)

What does it take from *leaders*?

... to help students realize their potential in the 21st century?

My premise...

In order to develop
students who can think and learn,
we need to empower
teachers to think and learn.

What a teacher leader can do

- Day-to-day PR (grocery store conversation)
- Build relationships with administrators & policy makers
- Write a column for a newspaper or group newsletter
- Keep a blog on current issues (remember that what is posted is public)
- Offer to give a presentation to community organizations (Rotary, Lions, PTA, faith-based groups, etc.)
- Collaborate with others to speak with a collective voice (professional organizations, PTO/PTA, alumni groups)

Your leadership

Leadership

- Communicating a Vision
- Using the Power of People
- Understanding the Change Process

Leadership

- Communicating a Vision
- Using the Power of People
- Understanding the change process
- *and learning from geese...*

Messages from *Faster Isn't Smarter*

1: Math for a Flattening World

 # 2: Untapped Potential

#14: Balance is Basic

#17: Constructive Struggling (I will email)

#26: Beyond Pockets of Wonderfulness

(**bold** are downloadable at

mathsolutions.com/fasterisntsmarter)

E-mail me for a pdf of these slides:

cseeley@austin.utexas.edu

Check out my websites:

http://cathyseeley.com

http://csinburkinafaso.com

http://mathsolutions.com/fasterisntsmarter

Their future is in our hands

...and ours is in theirs