NCSM Fall 2010: Connecting to The Common Core State Standards

The critical first steps will be to help educators interpret and understand the CCSS and to support the development and implementation of comprehensive, coherent instruction and assessment systems… we plan to work with our local, state, and national affiliates to feature the CCSS in our professional development opportunities, including annual and regional conferences, academies, and seminars…

NCSM Joint Position Statement with NCTM, AMTE and ASSM - 2010

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Welcome to the CCSS Seminar!

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PHASES OF TEACHING

ATTITUDES TOWARD TEACHING

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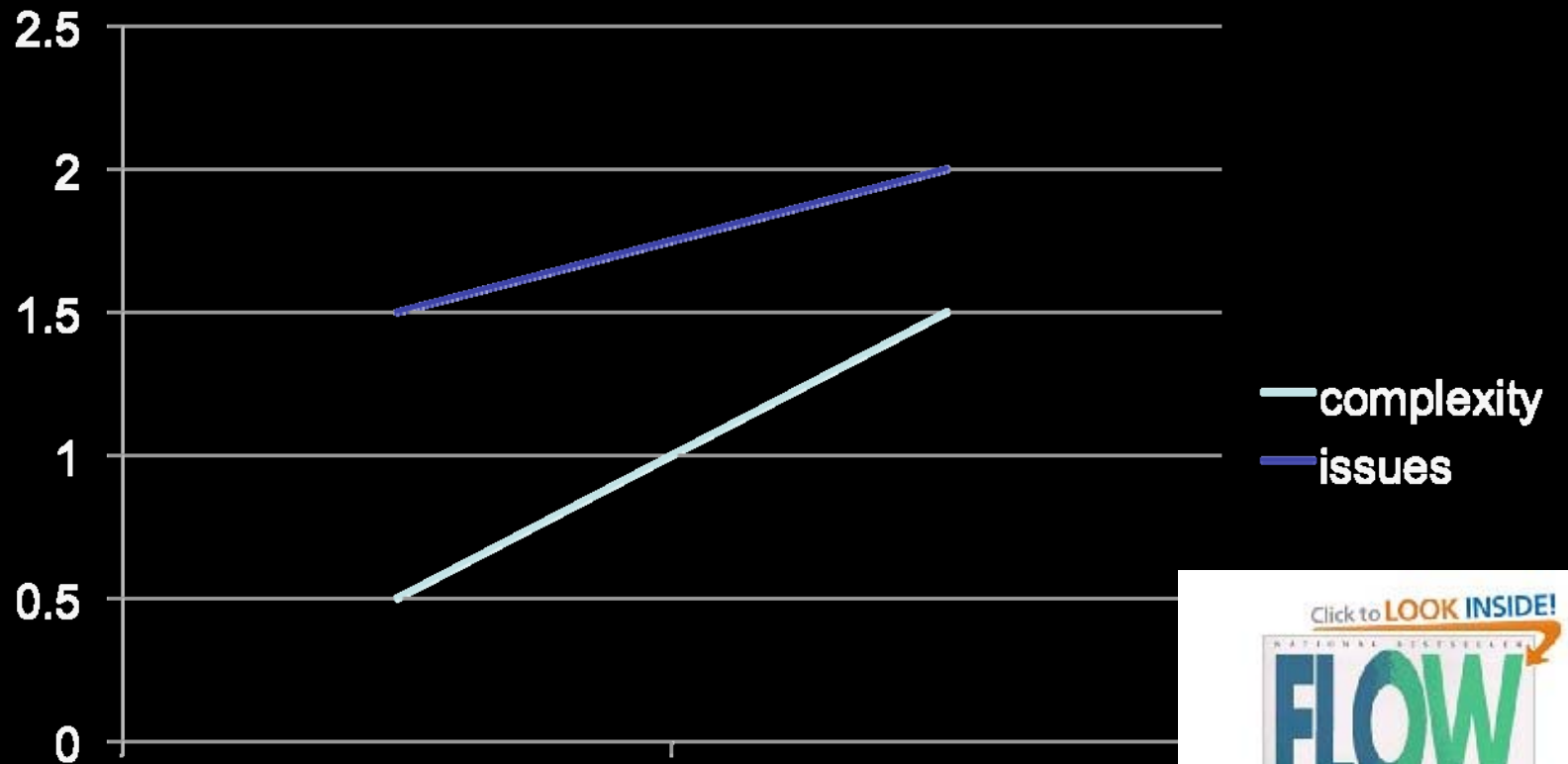
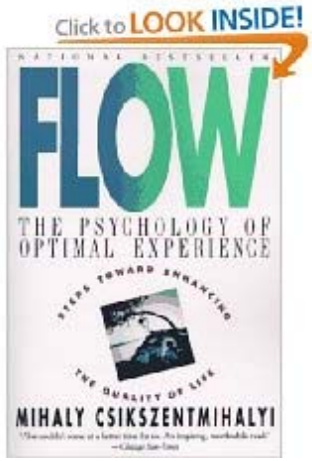
The energy flow of your life…Mihaly Szikszentmihalyi





What is Your Leadership Story?

- There are 4 possible “Storyboards” to Your School/District Mathematics program…

A) A good past has led to a good present

B) A good past has led to a bad present

C) A bad past has led to a good present

D) A bad past has led to a bad present

Which is your school mathematics program story?

A) 43%, B) 15%, C) 22% D) 20%

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The PRIME Leadership Framework and the CCSS

- Provides a vision of what "ought to be" in school leadership PreK-12 (p.1)
- Asks mathematics education leaders PreK-12 to **ensure** every adult focus his/her energy and efforts on the "right set of things" or Vital Teacher Behaviors
- The CCSS provide a "National" perspective about those right things – especially the *Standards for Mathematical Practices*…

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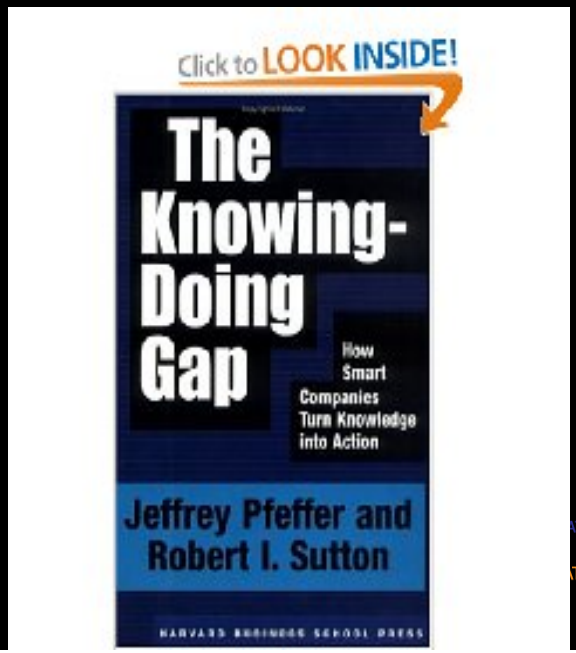
The PRIME and CCSS Leader…

"It is the PRIME leader who will close the 'knowing-doing' gap between our knowledge about how to enhance student achievement and the commitment to actions we must take as a result of that knowledge."

PRIME, p. 56



A Major Challenge

Common Core State Standards

- College and career readiness
- Stress conceptual understanding of key ideas as well as skills
- Organized around mathematical principles
- Focus and coherence

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History

- NCTM
  - *Curriculum and Evaluation Standards for School Mathematics* (1989)
  - *Professional Standards for Teaching Mathematics* (1991)
  - *Assessment Standards for School Mathematics* (1995)
  - *Principles and Standards for School Mathematics* (2000)
  - *Curriculum Focal Points* (2006)
  - *High School Reasoning and Sense Making (2009)*

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History

- New Standards Project
- Achieve
- College Board
- ACT

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Common Core State Standards

- National Governors Association (NGA)
- Council of Chief State School Officers (CCSSO)
- Standards for College and Career Readiness for Mathematics and English/LA
  - Achieve
  - College Board
  - ACT

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Common Core State Standards

- Mathematics Standards
  - Lead writers: Phil Daro, Bill McCallum, Jason Zimba,
  - Writing teams
  - Review teams
- Two rounds of public review and feedback
- States have option to adopt
  - Verbatim
  - 85% of State Standards must be CCSS

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Common Core State Standards

- Introduction
- Application of CCSS for ELLs
- Application to Students with Special Needs
- Mathematics Standards
  - Standards for Mathematical Practice
  - Grade level/strand introductions
  - Domains, Clusters and Standards
- Appendix A: Model Pathways for High School Courses

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The most important ideas in CCSS that will be overlooked

1. Properties of operations: their role in arithmetic and algebra
2. Units and unitizng
3. Quantities-variables-functions-modeling
4. Number-expression-equation-function
5. Modeling
6. Practices

Phil Daro, 2010

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Implementing CCSS

- Challenge:
  - CCSS assessments not available for several years (2014 deadline)
- Where to start?
  - Practices
  - Learning trajectories
  - Conceptual understanding
  - Research-Informed C-T-L Actions

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http://www.corestandards.org/

What are the current and widest Knowing - Doing Gaps you face?

Take a few moments to have a “café conversation” as you post responses to the question on your poster paper:

What are the most essential teacher classroom practices or “Vital teacher Behaviors” you expect? (and briefly explain why)

Identify which of these “Vital Actions” have the widest “Gap” toward authentic implementation at this time?

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The CCSS Standards for Mathematical Practice…

1. Make sense of problems and persevere in solving them.

3. Construct viable arguments and critique the reasoning of others.

Are these ***student expectations for mathematical practice*** met by your vital teacher behavior list?

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The Expectations-Acceptance Gap of the Leader…

One way to re-frame the Knowing-doing Gap question – which is about someone else – is to think of it as the leaders'

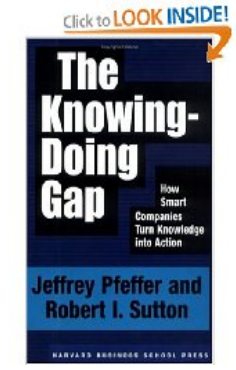
"Aspirations-Tolerance Gap"

We EXPECT every teacher to participate in

Professional development and to prepare/teach/assess using best practice knowledge… yet, we ACCEPT much le

Is it possible we contribute to the

"Knowing – Doing" Gap of our teachers?



PRIME Leadership Principles and Indicators p.5

1. Equity Leadership
2. Teaching and Learning Leadership
3. Curriculum Leadership
4. Assessment Leadership

Take a moment to scan the 12 Indicators on page 5. Identify key words and patterns in each statement…

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Stage 1:Leadership of Self

The leader is respected for his or her own teaching and learning skills (know and model).

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Stage 2: Leadership of Others

Leadership of all students and teachers within the mathematics program. The leader is respected for his or her interpersonal skills and commitment for leading change (collaborate and implement).

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A *highly reliable* School District or mathematics program…Equity

…Understands the PRIME response that the "smallest unit of change" must become the teacher team…*The Art of "Defined Autonomy"*

Defined by What?

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The Common Core Standards: Understanding the Mathematical *Practices* Standards

These Standards are not intended to be new names for old ways of doing business. They are a call to take the next step. It is time for states to work together to build on lessons learned from two decades of standards based reforms. It is time to recognize that standards are not just promises to our children, but promises we intend to keep.

— CCSS (2010, p.5)

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The Standards for [Student] Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students…

These practices rest on important “processes and proficiencies” for mathematics education.

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The Standards for [Student] Mathematical Practice

The first of these are the NCTM (2000) process standards of problem solving, reasoning and proof, communication, representation, and connections spelled out in PSSM…

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The Standards for [Student] Mathematical Practice

The second are the strands of mathematical proficiency specified in the National Research Council's report (2001) *Adding It Up*:

Adaptive reasoning; Strategic competence; Conceptual understanding (comprehension of mathematical concepts, operations and relations); Procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately); and Productive disposition.

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The Standards for [Student] Mathematical Practice

Take a moment to examine the first three words of each of the 8 mathematical practices… what do you notice?

Mathematically Proficient Students…

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The Standards for [Student] Mathematical Practice

Lesson Planning from the "*Student's Point of View*": Deepening the student learning Experience…

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The Standards for [Student] Mathematical Practice

Count off at your tables…

What are the *verbs* that illustrate the student actions for your assigned mathematical practice?

Circle, highlight or underline them for your assigned practice…

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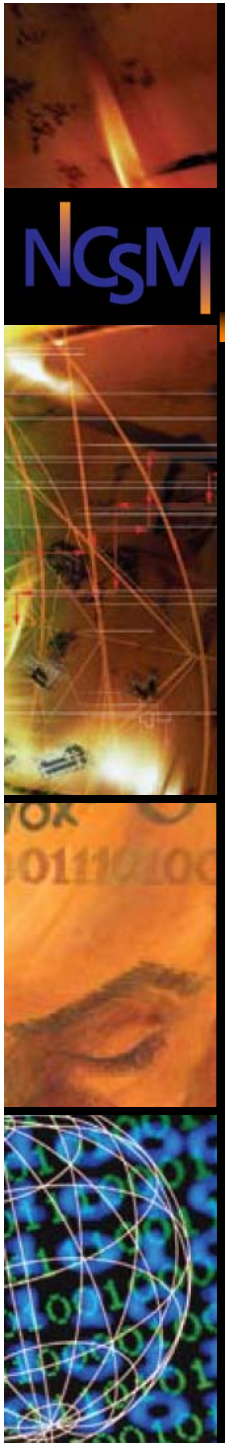

The Standards for [Student] Mathematical Practice

SMP1: *Explain and Make Conjectures…*

SMP2: *Make Sense of…*

SMP3: *Understand and Use…*

SMP4: *Apply and Interpret…*

SMP5: *Consider and Detect…*

SMP6: *Communicate precisely to Others…*

SMP7: *Discern and Recognize…*

SMP8: *Notice and Pay Attention to…*

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The Standards for [Student] Mathematical Practice

Use a Café Conversation *in your teams and the poster paper to write down primary methods you currently use in class to facilitate student demonstration of one of these eight "Mathematical Practices" Standards…*

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The Standards for [Student] Mathematical Practice

The 8 Standards for Mathematical Practice – place an emphasis on student demonstrations of learning…

"What we as teachers do, doesn't matter nearly as much as how our students ***experience*** *what we do"*

Daily, we know what it is we do… how do we know how the students *experience it?*

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The Standards for [Student] Mathematical Practice

The 8 Standards for Mathematical Practice – place an emphasis on student demonstrations of learning…

Equity begins with an understanding of how the selection of tasks, the assessment of tasks, the student learning environment creates great inequity in our schools…

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We begin the PRIME and CCSS journey through our role in Equity Leadership…

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It's about knowing your leadership "voice"

Can you explain how your vital teacher behavior is an equity issue in your school or district?

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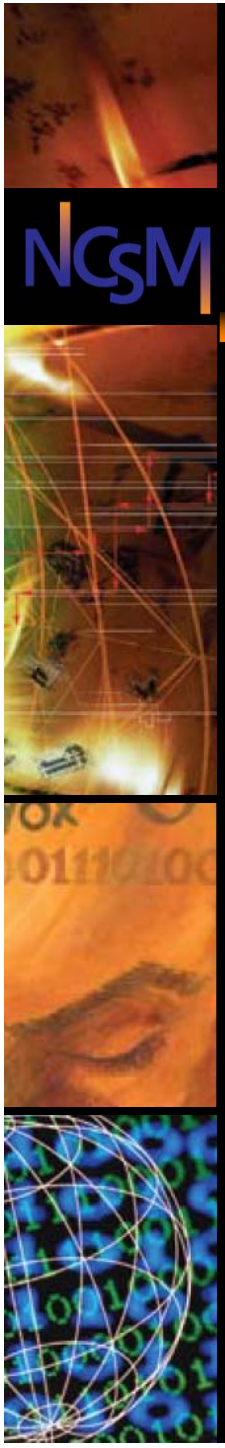

PRIME Equity Principle:

Ensure high expectations and access to meaningful mathematics learning for every student.

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PRIME Equity Indicators

Equity Indicators (*PRIME,* page 9)

1. Every teacher addresses gaps in mathematics achievement expectations for all students.
2. Every teacher provides each student access to relevant and meaningful mathematics experiences.
3. Every teacher works interdependently in a collaborative learning community to erase inequities in student learning.

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Leadership for Equity
Indicator 3 p.18

The leader ensures that:

Every teacher works interdependently in a collaborative learning community to erase inequities in student learning.

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Leadership for Equity
Indicator 3

Traffic Signal

- *Red light - 1 thing you will stop doing that limits teachers collaborating . . .*
- *Yellow light - 1 thing you will continue to do . . .*
- *Green light - 1 thing you will begin to do . . .*

Feet, Greet, Meet

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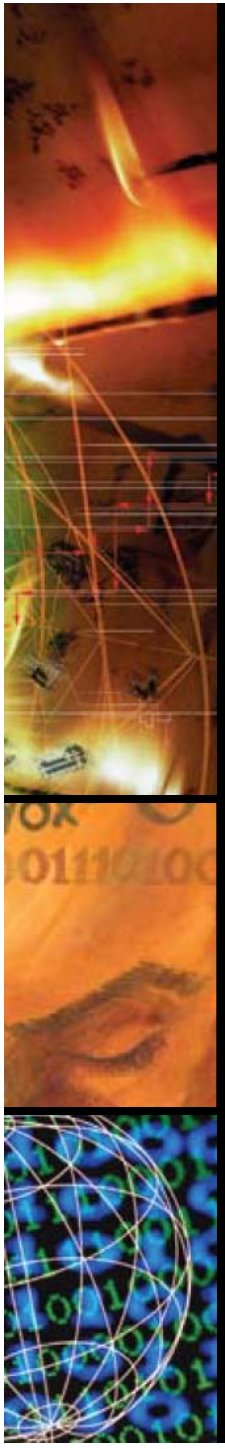

Research-Informed Practices to Support Implementation of the Common Core State Standards

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Teaching and Learning Leadership

Indicator 2

Every teacher implements research-informed best practices and uses effective instructional planning and teaching strategies.

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Research-Informed Actions

Instructional practice should be informed by high-quality research, when available, and by the best professional judgment and experience of accomplished classroom teachers.

National Math Panel, 2008

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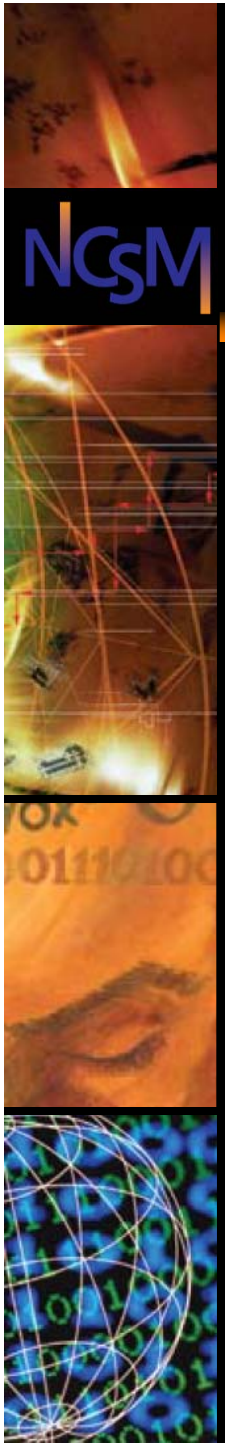

"Wisdom of practice" can/should inform research, but it is not a substitute for research.

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Realistic Expectations

- Research is most useful when it provides an understanding of why a particular strategy, intervention, approach or program works (Hiebert 2003).
- Research on general learning principles can provide a basis for effective instructional practices.

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Research Results

- *How People Learn*, NRC, 1999, 2005
- *Adding It Up: Helping Children Learn Mathematics*, NRC, 2001
- *Knowing What Students Know: The Science and Design of Educational Assessment,* NRC, 2001
- Mathematics Learning in Early Childhood, NRC, 2009
- *Foundations for Success*, National Mathematics Advisory Panel, 2008
- *Educational Researcher*, Response to NMAP Report, December 2008
- Department of Education IES Practice Guides
- QUASAR project
- TIMSS, 1999

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Research-Informed Practices

- On-going cumulative distributed practice increases learning and retention.
- Accessing prior knowledge and addressing students' misconceptions increases learning.

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Build Upon Informal Knowledge

1. Mike has 8 pennies. Sam has 3 pennies. How many altogether?
2. Mike has 8 pennies. Sam gives him 3 more. How many does Mike have now?
3. Mike has 8 pennies. He loses 3. How many does he have now?
4. Mike has 8 pennies. Sam gives him some more. Now he has 11. How many did he get from Sam?
5. Mike has 11 pennies. He loses some. How he has 8 pennies. How many did he lose?
6. Mike has some pennies. He gets 3 more. Now he has 11. How many did he have at the beginning?
7. Mike has some pennies. He loses 3. Now he has 8. How many did he have at the beginning.

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Extending to Algebra

U.S. Shirts charges $12 per shirt plus $10 set-up charge for custom printing.

1. What is the total cost of an order for 3 shirts?
2. What is the total cost of an order for 10 shirts?
3. What is the total cost of an order for 100 shirts?
4. A customer spends $70 on T-shirts. How many shirts did the customer buy?

$y = 12x + 10$

1. Solve for y when x = 3, 10, 100.
2. Solve $70 = 12x + 10$

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Connect New Learning with Prior Knowledge

- Cue students about knowledge to access
  - Preview
  - Openers
  - Homework
- Build upon informal knowledge
- Directly assess prior knowledge

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Learners should

- Engage with challenging tasks that involve active meaning-making.
- Acquire conceptual knowledge as well as skills to enable them to organize their knowledge, transfer knowledge to new situations, and acquire new knowledge.

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What Are Mathematical Tasks?

Mathematical tasks are a set of problems or a single complex problem the purpose of which is to focus students' attention on a particular mathematical idea.

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Why Focus on Mathematical Tasks?

- Tasks form the basis for students' opportunities to learn what mathematics is and how one does it;
- Tasks influence learners by directing their attention to particular aspects of content and by specifying ways to process information;
- The level and kind of thinking required by mathematical instructional tasks influences what students learn; and
- Differences in the level and kind of thinking of tasks used by different teachers, schools, and districts, is a major source of inequity in students' opportunities to learn mathematics.

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The QUASAR Project

- Assisted schools in economically disadvantaged communities to develop instructional programs that emphasize thinking, reasoning and problem solving in mathematics.
- Worked with lowest achieving middle schools in six urban sites.
- Studied the impact of high quality curricula and professional development upon student achievement.

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Comparing Two Mathematical Tasks

Martha was re-carpeting her bedroom which was 15 feet long and 10 feet wide. How many square feet of carpeting will she need to purchase?

Stein, Smith, Henningsen, & Silver, 2000, p. 1

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Comparing Two Mathematical Tasks

Ms. Brown's class will raise rabbits for their spring science fair. They have 24 feet of fencing with which to build a rectangular rabbit pen in which to keep the rabbits.

1. **If Ms. Brown's students want their rabbits to have as much room as possible, how long would each of the sides of the pen be?**
2. **How long would each of the sides of the pen be if they had only 16 feet of fencing?**
3. **How would you go about determining the pen with the most room for any amount of fencing? Organize your work so that someone else who reads it will understand it.**

Stein, Smith, Henningsen, & Silver, 2000, p. 2

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Compare the Two Tasks

- Work each task.
- Share solution strategies with the people at your table.
- Discuss:
  How are Martha's Carpeting Task and the Fencing Task the same and how are they different?

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Lower-Level Tasks

- Memorization
  - What are the decimal equivalents for the fractions ½ and ¼?
- Procedures without connections
  - Convert the fraction 3/8 to a decimal.

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Higher-Level Tasks

- Procedures with connections
  - Using a 10 x 10 grid, identify the decimal and percent equivalents of 3/5.
- Doing mathematics
  - Shade 6 small squares in a 4 x 10 rectangle. Using the rectangle, explain how to determine:
    a) The decimal part of area that is shaded;
    b) The fractional part of area that is shaded.

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Opportunities for *all* students to engage in high-level tasks?

- Examine tasks in your instructional materials:
  - Higher level?
  - Lower level?
- Where are the higher-level tasks?
- Do *all* students have the opportunity to do higher-level tasks?
- Examine the tasks in your assessments:
  - Higher level?
  - Lower level?

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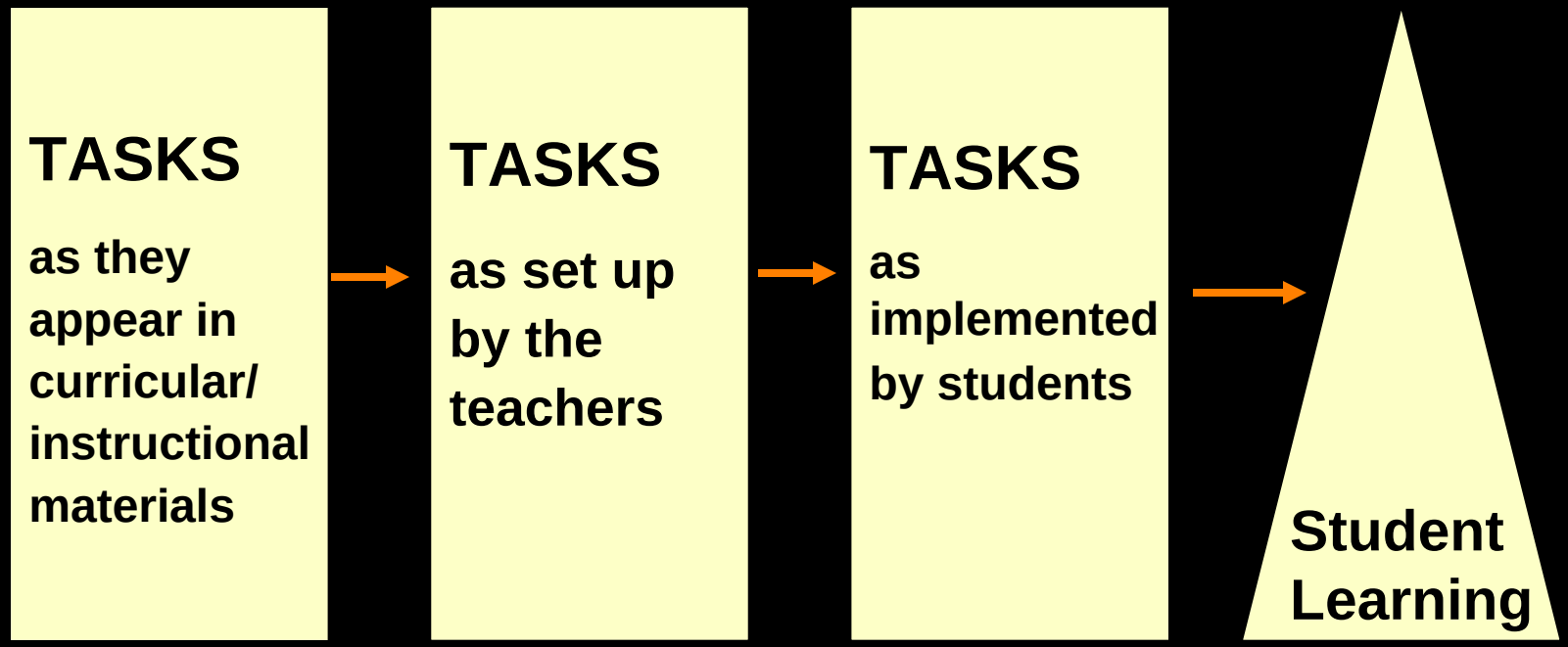
The Mathematical Tasks Framework



Stein, Smith, Henningsen, & Silver, 2000, p. 4

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LSC Evaluation Study

While teachers were using the materials more extensively in their classrooms, there was a wide variation in how well they were implementing these materials. Teachers were often content to omit rich activities, skip over steps and jump to higher level concepts, or leave little time for students to ‘make sense’ of the lessons.

Weiss, et al, 2006

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LSC Evaluation Study

In fact, classroom observations indicated that the lessons taught as the developers intended were more likely to provide students with learning opportunities than those that were “adapted.”

Weiss, et al, 2006

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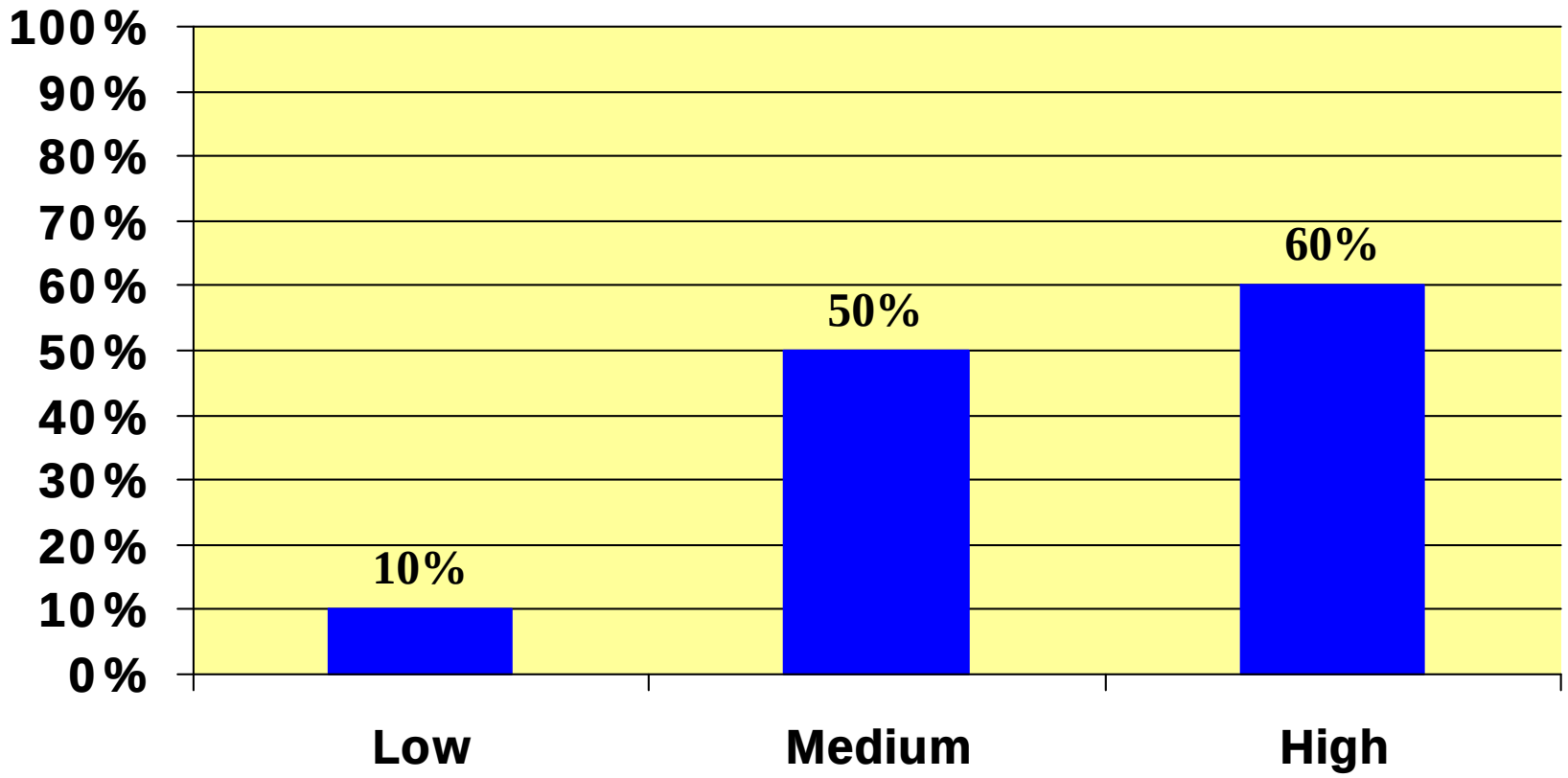
Highly-Rated Lessons by Adherence to Standards-Based Materials



Weiss et al., 2002

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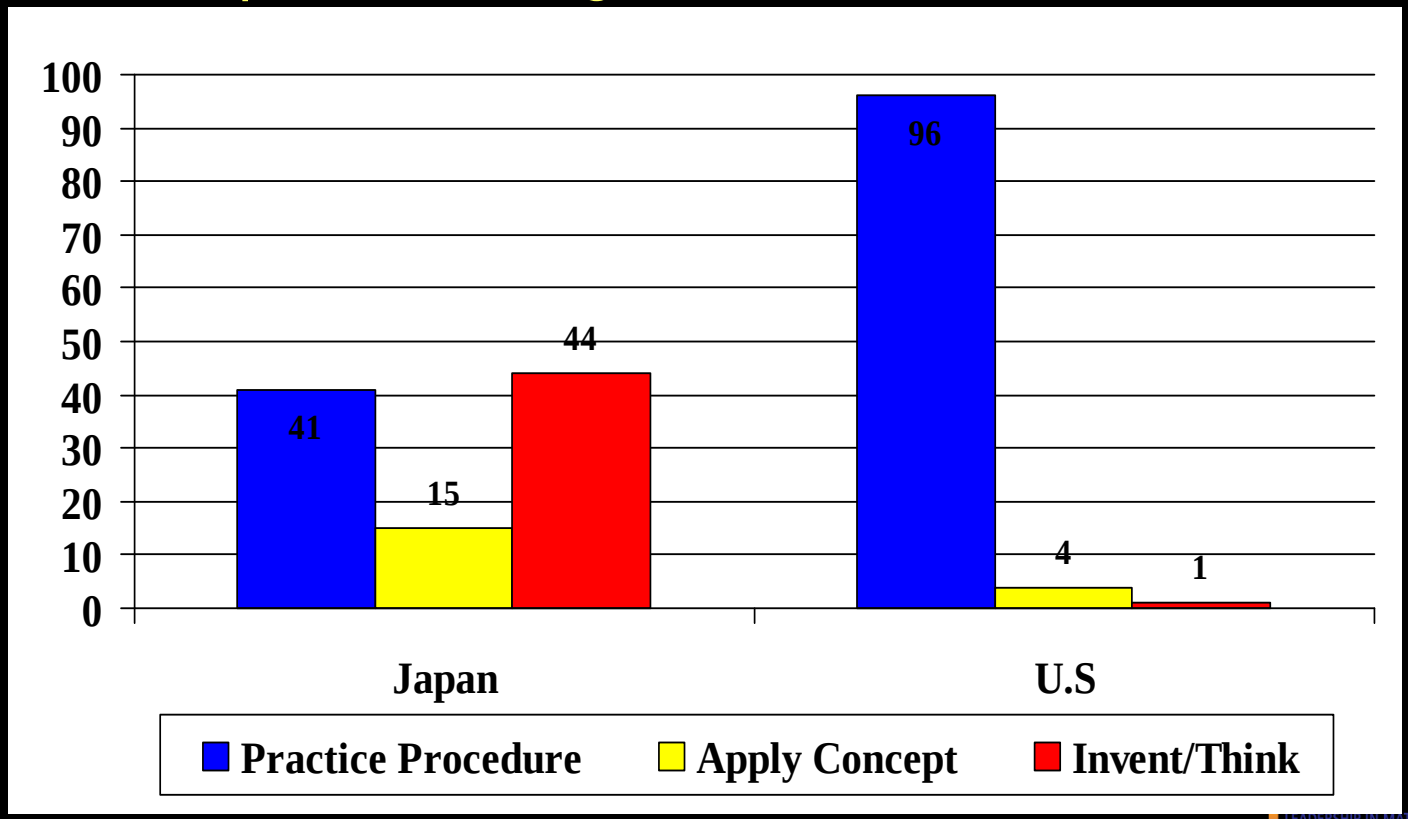
TIMSS Video Studies

Average Percentage of Seatwork Time in Each Country Spent Working on Three Kinds of Tasks



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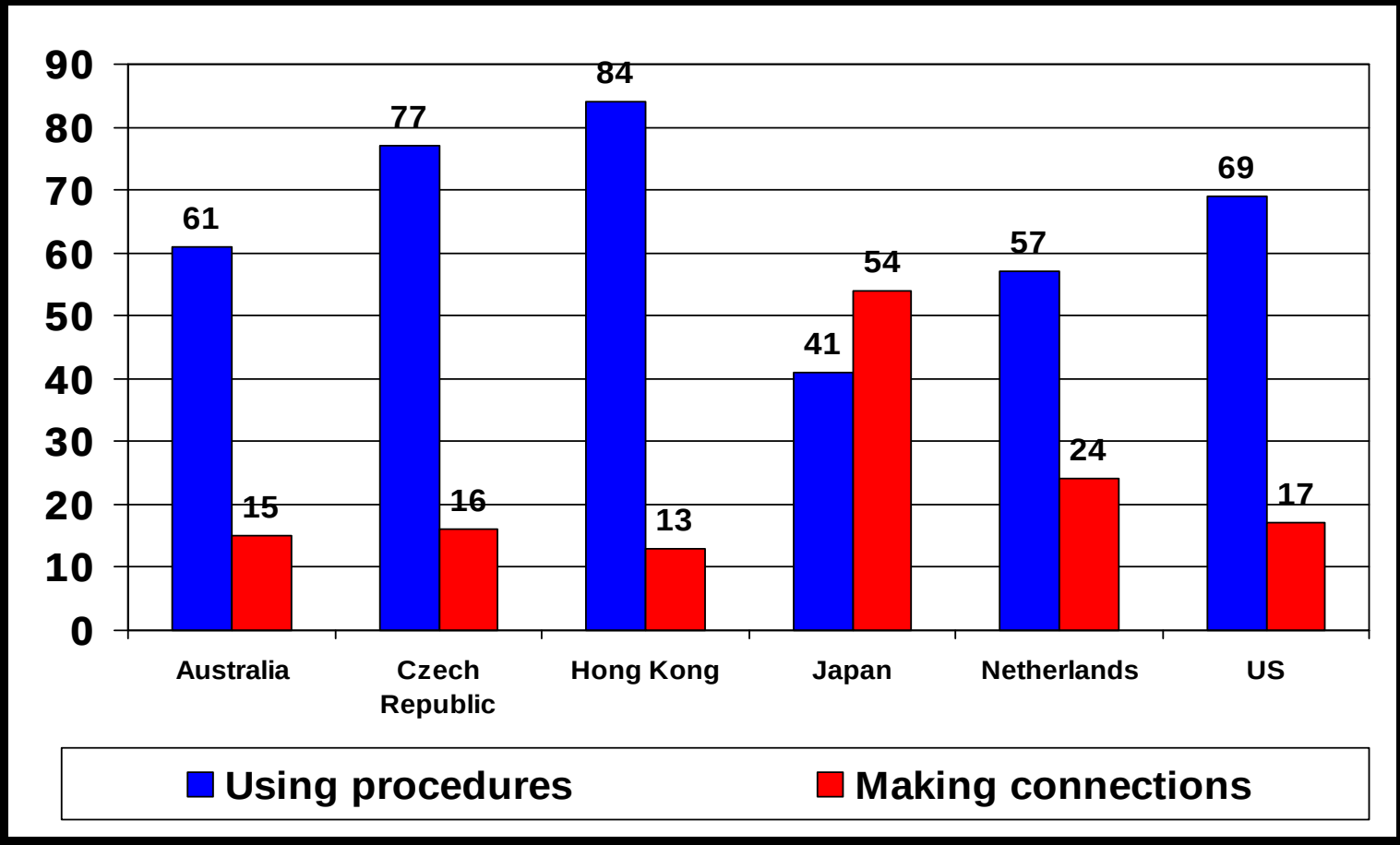
Types of Math Problems Presented
1999 TIMSS Video Study



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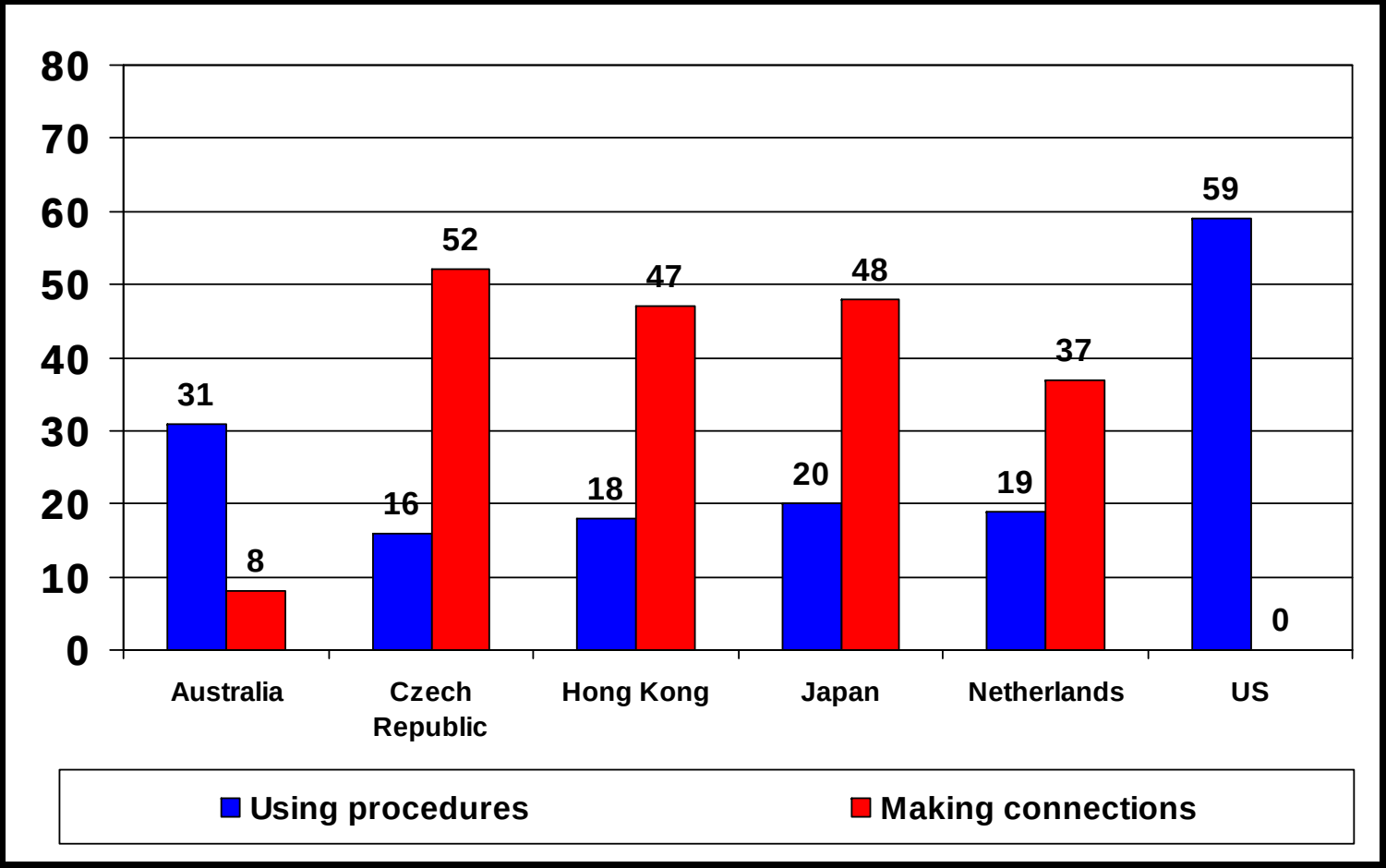
How Teachers Implemented *Making Connections* Math Problems



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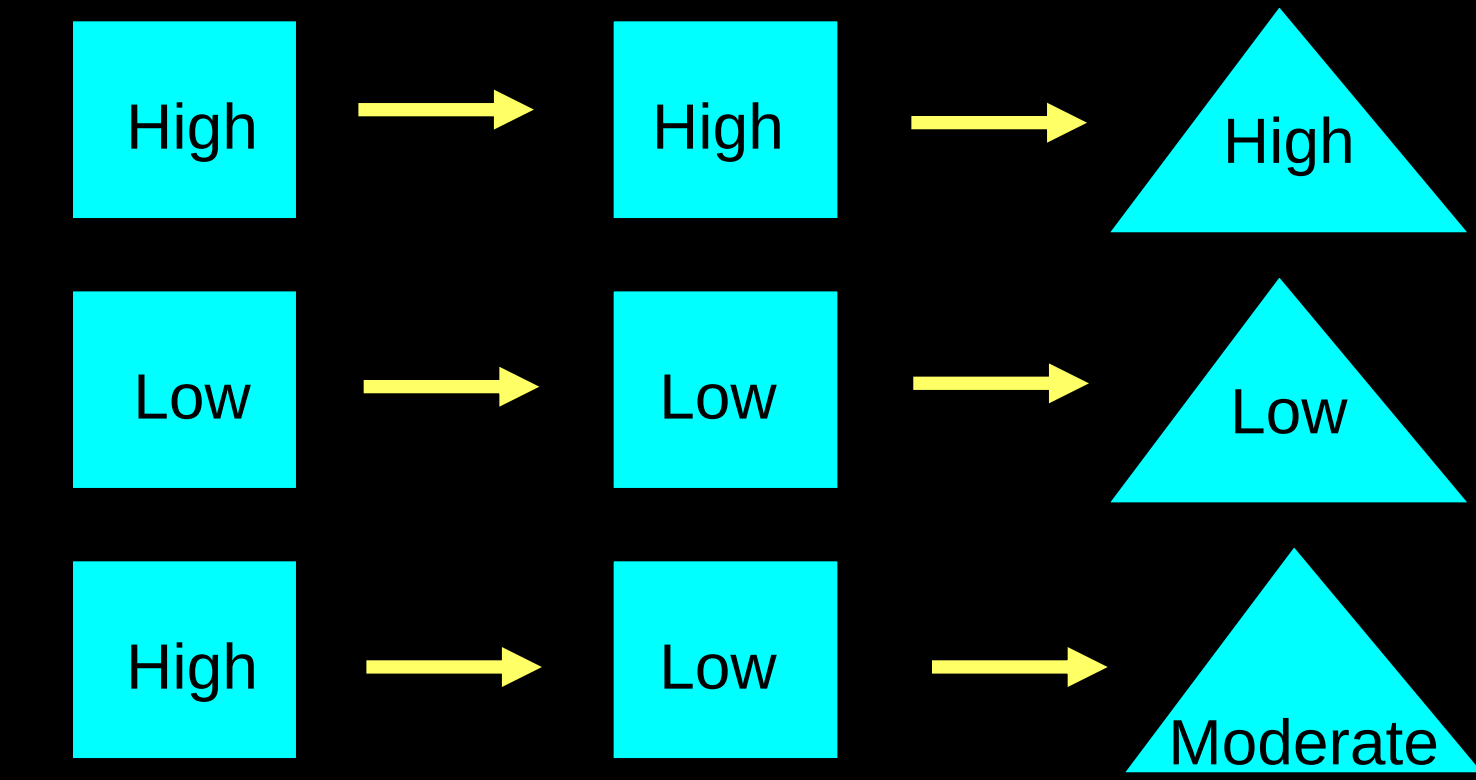
Effect on student achievement



Stein & Lane, 1996

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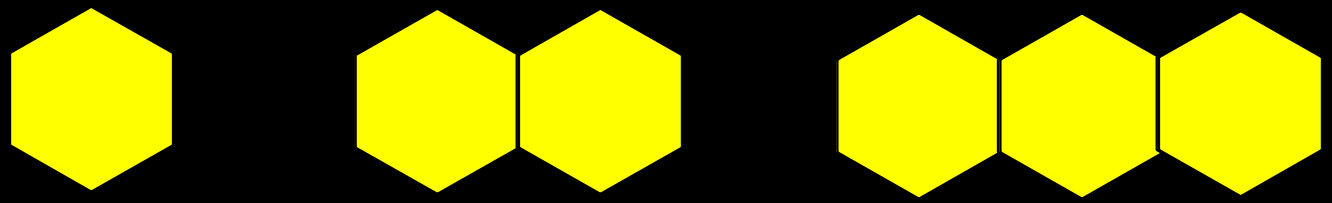
Hexagon Trains



- Compute the perimeter for the first four trains.
- Determine the perimeter for the tenth train without constructing it.
- Write a description /expression that could be used to compute the perimeter of any train in the pattern.
- Find as many different ways as you can to represent the perimeter of any train.

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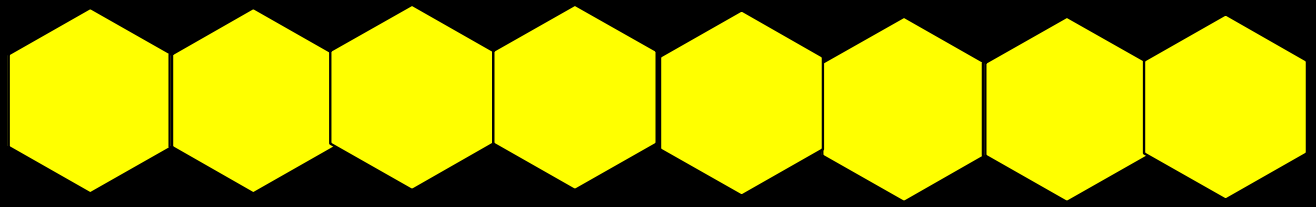
Hexagon Trains



- Explain what each student was thinking to find the perimeter of the n^{th} train.
- Connect your explanation to the picture of the tables.

  Terri: $1 + 4n + 1$

  Tim: $1 + 2(2n) + 1$

  Jerry: $5 + 4(n - 2) + 5$

  Linda: Multiply n times 6, then subtract n-1 times 2.

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Research-Informed Instructional Strategies

- **Combine graphics with verbal descriptions** to facilitate encoding of individual mathematical representations and to make conceptual connections between representations.
- **Incorporate analyzing and explaining examples of both correct and incorrect solutions;** Incorrect examples that anticipate common student misconceptions push students to more deeply process and reason with greater understanding.

IES Practice Guide, 2007

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Teacher Actions that Affect Cognitive Demand

- Task set-up
- Supporting students' exploration of the task
- Orchestrating debriefing discussion

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Learning from the Japanese: What it Takes to Plan a Lesson

- Anticipating solutions, thoughts, and responses that students might develop as they struggle with the problem
- Generating questions that could be asked to promote student thinking during the lesson, and considering the kinds of guidance that could be given to students who showed one or another types of misconception in their thinking
- Determining how to end the lesson so as to advance students' understanding

Stigler & Hiebert, 1997

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Research-Informed Practices

- On-going cumulative distributed practice increases learning and retention.
- Accessing prior knowledge and addressing students' misconceptions increases learning.
- Engaging students with challenging tasks that involve active meaning-making increases learning.
- Promoting learners' beliefs about their own intelligence can increase their motivation and effort to learn mathematics.

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Students' Beliefs about Their Intelligence Affect Their Academic Achievement

- Fixed mindset:
  - Avoid learning situations if they might make mistakes
  - Try to hide, rather than fix, mistakes or deficiencies
  - Decrease effort when confronted with challenge
- Growth mindset:
  - Work to correct mistakes and deficiencies
  - View effort as positive; increase effort when challenged

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Students' Beliefs about Their Intelligence Affect Their Academic Achievement

When confronted with challenging school transitions or courses, students with growth mindsets outperform those with fixed mindsets, even when they enter with equal skills and knowledge.

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Students Can Develop Growth Mindsets

- Explicit instruction about the brain, its function, and that intellectual development is the result of effort and learning has increased students' achievement in middle school mathematics.
- Teacher praise influences mindsets
  - Fixed: Praise refers to intelligence
  - Growth: Praise refers to effort, engagement, perseverance

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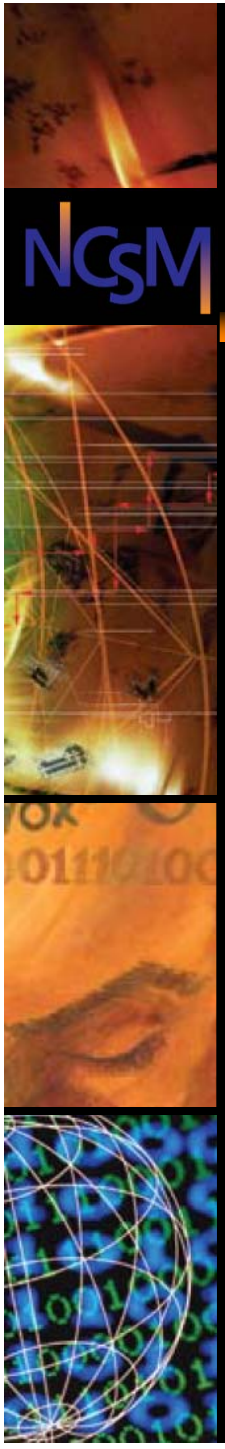

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Bring it All together – Closing the Knowing - Doing Gap of the CCSS

Closing session

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Leading the actual implementation of the CCSS Actions…

Depends on three issues:

1) Do I believe you have the knowledge base for the Vital Behavior required?

2) Do I trust your intentions regarding the Vital Behavior?

3) As a stakeholder - Do I have a voice in the behavior mandate?

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How will school and District leaders help others enact the CCSS?

Will a school faculty/community enact a "Vital Behavior" policy or practice that you seek?

1) Is it worth it? (to me)

2) Can I do it? (yes or no)

The support and pressure required to enact a Vital behavior… what is working for you this year?

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How do you close the "Expectations – Acceptance" Gap of the CCSS?

Master the 3 Sources of Influence:

1) Personal Motivation – make the "Undesirable Desirable"…

2) Social motivation – Harness peer pressure and find strength in numbers…

3) Structural Motivation – Design rewards and expect action… (Support and pressure though monitoring)

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What are the current and widest CCSS Knowing - Doing Gap you face?

Consider your "café conversation…

How could you not use words, but use…

1) Personal Motivation – make the "Undesirable Desirable"…

2) Social motivation – Harness peer pressure and find strength in numbers…

3) Structural Motivation – Design rewards and expect action… (Support and pressure though monitoring)

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Student motivation is often destroyed or enhanced by…

… *ASSESSMENT*

The Teaching Profession is a calling, a calling with the potential to do enormous good for students…used with skill, assessment can motivate the unmotivated, restore the desire to learn, and encourage students to keep learning…

p.46

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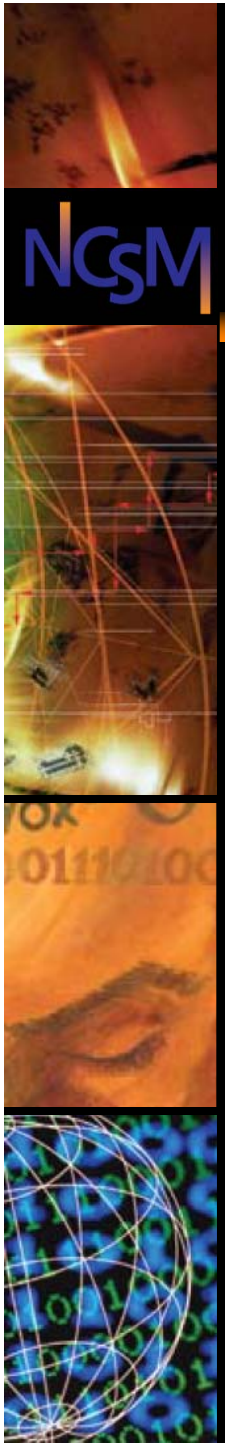
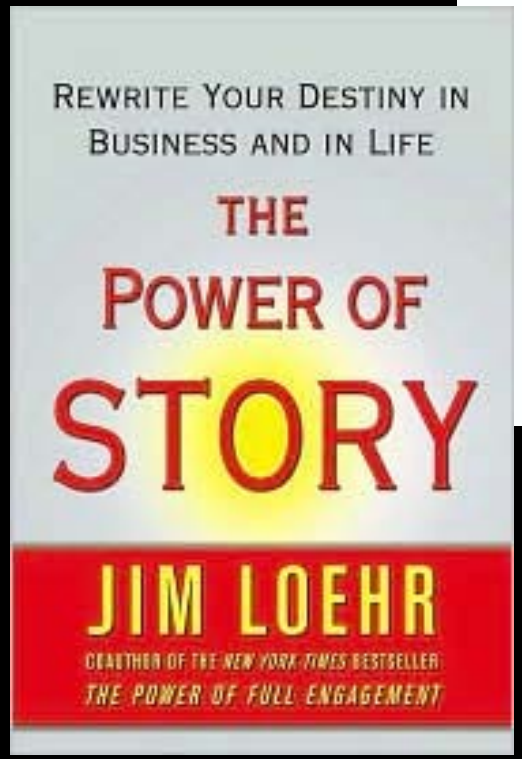
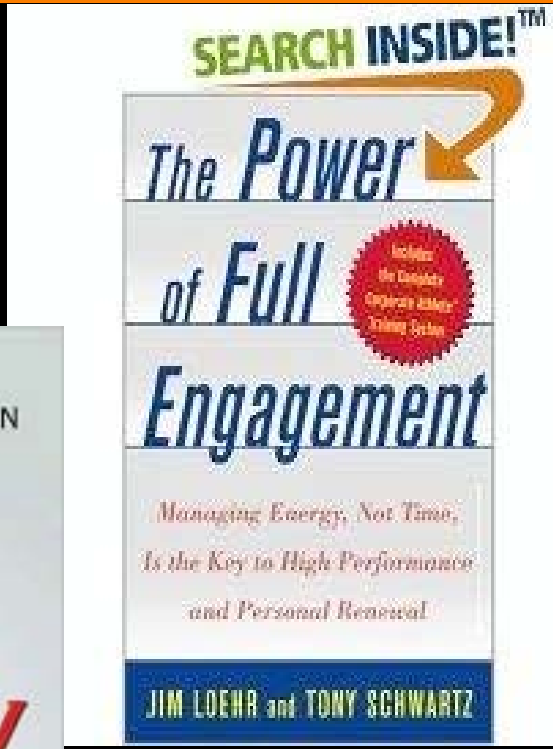
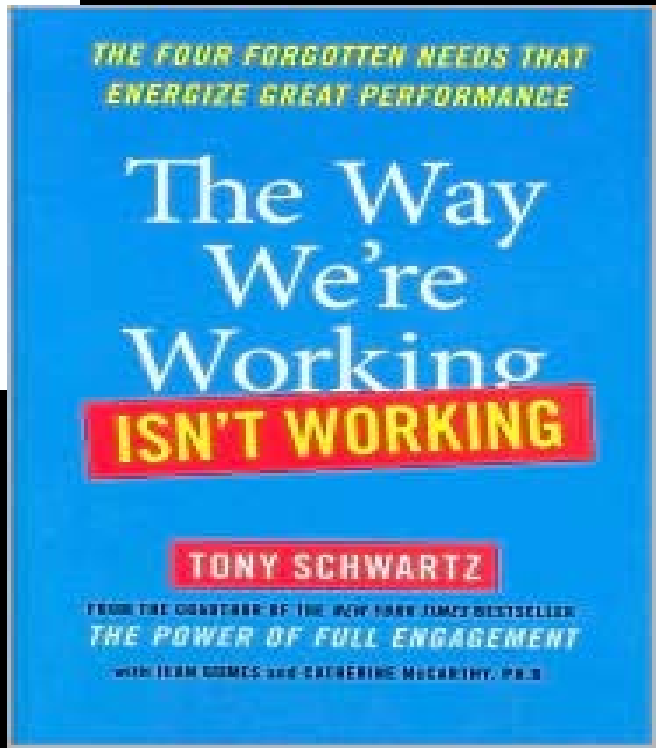
How do I ensure that as a teacher I stay inspired or motivated?









What is the real work PRIME teacher/leaders are to do?

Leaders in mathematics education at all levels of the school or district organization – people who are well trained, broadly informed, and perceptive – are crucial for ensuring attainment of high-quality school mathematics programs. High-quality programs provide access to effective teaching of important mathematics and foster high levels of achievement for every student. High-quality programs are grounded in school-level conditions that enhance adult professional development and learning, support research-informed practice, and are guided by leadership that supports the ongoing improvement of curriculum, instruction, and assessment…

PRIME Leadership Framework - 2008, p.1

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