# Smarter Than We Think

Cathy Seeley (cseeley@austin.utexas.edu
Charles A. Dana Center
University of Texas at Austin
April 28, 2012

# Today...

- Thinking about how smart our students are
- How much smarter (or less smart) will your students be when they leave you?
- The influence of teaching on what students learn
- What can you do to help your students develop mathematical habits of mind and get smarter?

# Discussion

What does it mean to be smart in mathematics?

# Being smart

- Good at asking questions
- Logical
- Knowing facts
- Comfortable with tables and graphs
- Visualizing
- Estimating
- Using multiple strategies to solve a problem
- Thinking under pressure
- Working well in groups
- Explaining my thinking

**(Pre-service teachers)**
***Smarter Together!*, Featherstone et al, NCTM, 2011**

# Being successful in mathematics

- Justifying work
- Asking good questions
- Rephrasing problems
- Explaining ideas
- Being logical
- Helping others
- Using different representations
- Bringing a different perspective to a problem

**(Tenth-graders)**
**Boaler and Staples, 2008**

# Our Students

# Discussion

What factors keep some students from succeeding in mathematics?

# Factors to consider

- Student factors: Motivation, intelligence, beliefs
- Teacher factors: Beliefs, knowledge, and expectations
- 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
- Insidious factors...

# Insidious factors...

- Lack of real opportunity to learn
- Less qualified teachers in high-needs classrooms, especially for high-poverty students, students of color, English language learners, and high needs students
- Unequal access to technology, textbooks, and other instructional resources
- Too many unsafe, unhealthy, unstable, unacceptable learning environments

# What shapes student learning / success?

- Theories of intelligence
- Self-efficacy
- Persistence
- Motivation
- Self-regulation
- Community of learners

www.learningandtheadolescentmind.org

# What if all students...

engaged in new ideas
in productive ways?

- Theories of intelligence
- Self-efficacy
- Motivation
- Persistence
- Self-regulation
- Community of learners

www.learningandtheadolescentmind.org

# 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?

# Consequences of view of intelligence

Most students who view intelligence as being fixed:

- Avoid challenges, seek easy successes, pass up valuable learning opportunities
- Desire to "look smart" at all costs
- Worry about failure and question their ability

Most students who view intelligence as being malleable:

- Pursue and enjoy challenges
- Care less about "looking smart"
- Engage in self-monitoring and self-instruction

Dweck, 1999

[People with a growth mindset] believe that a person's true potential is unknown (and unknowable); that it's impossible to foresee what can be accomplished with years of passion, toil, and training.

Carol Dweck, *Mindset*, 2008

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)

# Classroom Culture
# Promoting a Growth Mindset

- Demystify intelligence
- Avoid trait-focused feedback
- Praise effort: highlight process, strategies and progress
- Model positive views: convey that confusion can be a good thing

Lisa Brown, Dana Center, 2012

Many students have difficulty in school not because they are incapable of performing successfully, but because they are incapable of believing that they can perform successfully.

Pajares and Schunk, 2002

# Targeting beliefs with action

- Students' beliefs matter.
- Teachers' beliefs and actions matter.

# Targeting beliefs with action

- Students' beliefs matter.
- Teachers' beliefs and actions matter.
- Modest interventions make a difference.

# High Expectations means...

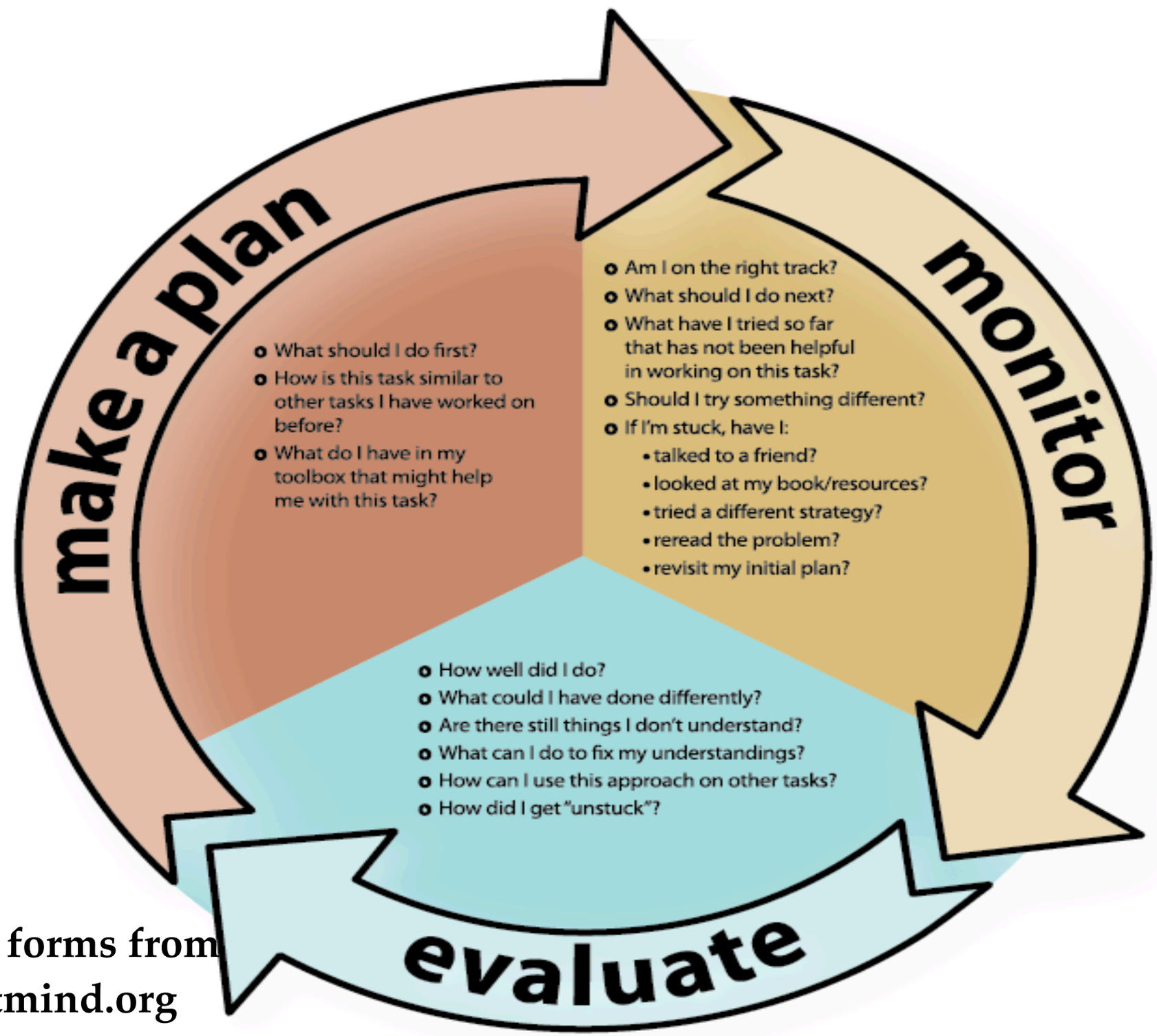
- Challenging our habits and beliefs
- Setting challenging standards for all students
- Doing whatever it takes for students to achieve the standards
- Never thinking in advance that you know where they're headed
- Making sure they all get to struggle and succeed

# Motivation

1. Motivation is learned.
2. Motivation is adaptive.
3. Motivation is in the moment.
4. Motivation creates long-term attitudes.
5. Motivation is social.
6. Success (on the right stuff) matters.

Middleton & Jansen, *Motivation Matters* 2011

# Barry Zimmerman on Self-regulation




**Download problem-solving forms from learningandtheadolescentmind.org**

# How you teach matters...

The way to help students develop mathematical habits of mind and the transferable skills they need in their future is to engage every student in challenging mathematics and help them assume increasing levels of responsibility for their learning.

# Math Reasoning Inventory™

mathreasoninginventory.com

Marilyn Burns, PI

Funded by Gates Foundation

https://www.mathreasoninginventory.com/Home/AssessmentsOverview

# Discussion

- What has Marisa learned about solving problems posed in a ‘real-world’ context?
- What kind of teaching may have led her to this learning?
- What do you think Marisa’s teacher might do to help her?
- How smart is Marisa?

# Three Responses to a Math Problem

- Answer-getting
- Making sense of the problem situation
- Making sense of the mathematics you can learn from working on the problem

Phil Daro, 2012

# Getting Answers ...

- Answer-getting short circuits mathematics, making mathematical sense
- Very habituated in US teachers versus Japanese teachers
- Devised methods for slowing down, postponing answer-getting

Phil Daro, 2012

# Answer-getting vs. learning mathematics

- USA:
  **How can I teach my kids to get the answer to this problem?**
    - Use mathematics they already know.
      Easy, reliable, works with bottom half,
      good for classroom management.

- Japanese:
  **How can I use this problem to teach the mathematics of this unit?**

Phil Daro, 2012

# The difference between Japan and the US

- “You quit teaching too soon and go on to the next thing.”
- “We finish.”
- Finishing happens when students have learned.

*Marisa...*

***Premise:***

What students need for their future is
as much about how they ***think*** as it is
about what they ***know,***
and helping students succeed is as much
about ***how*** we teach as
about ***what*** we teach.

# The difference between...

- Memorizing clue/key words vs. learning how to communicate and think mathematically
- Learning how to do mathematics vs. learning mathematical habits of mind
- Learning rules and tricks vs. constructively struggling with good problems

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

# Upside-down teaching

- From: *"I - We - You"*
- To: *"You - We - I"*

# Upside-down teaching

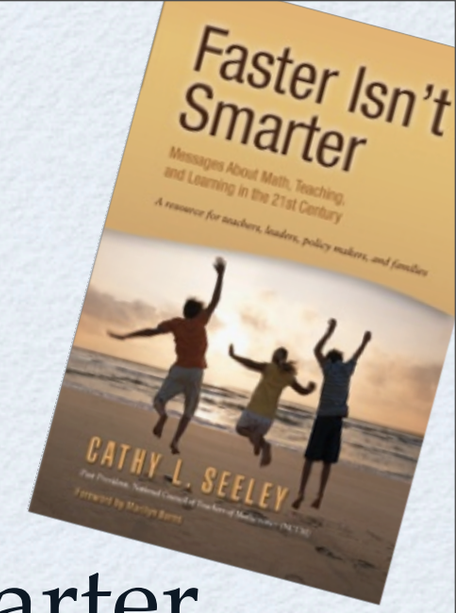
- Starting with a rich problem
- Students engaged in dealing with the problem
- Discussion, comparing, interacting
- Teacher helps students connect and notice what they've learned
- Then, exercises and homework

# Getting from here to there...

- Stop quitting--Finish teaching
- Stop covering--Go slower and deeper
- Stop fragmenting--Connect the pieces

E-mail (for a link to a pdf of the slides):

cseeley@austin.utexas.edu




*Faster Isn't Smarter:*

http://mathsolutions.com/fasterisntsmarter

(Now on Kindle with a new Bonus Message: "Clueless")
And look for the sequel in April 2013...*Smarter Than We Think*

www.learningandtheadolescentmind.org

www.utdanacenter.org/ayd

*Cathy's websites:*

http://cathyseeley.com http://csinburkinafaso.com

*Their future is in our hands*

*...and ours is in theirs*