Promoting a Positive Math Identity

Module 2
Building the Math Environment (Part 2)

Classroom Practices to Promote a Positive Math Identity, Module 2 of 3

Note. These materials were produced for the Idaho State Department of Education and the Idaho Regional Mathematics Centers and were presented on August 13, 2019 at the Idaho Council of Teachers of Mathematics conference.

Training series progression

Module 1

The importance of math identity for math success

- Build knowledge of what math identity is and why it is important for math success

Module 2

Building the math environment (2 parts)

- Learn how to create a classroom environment that supports a positive math identity

Module 3

Kernels of practice

- Learn how to implement targeted activities that promote a positive math identity

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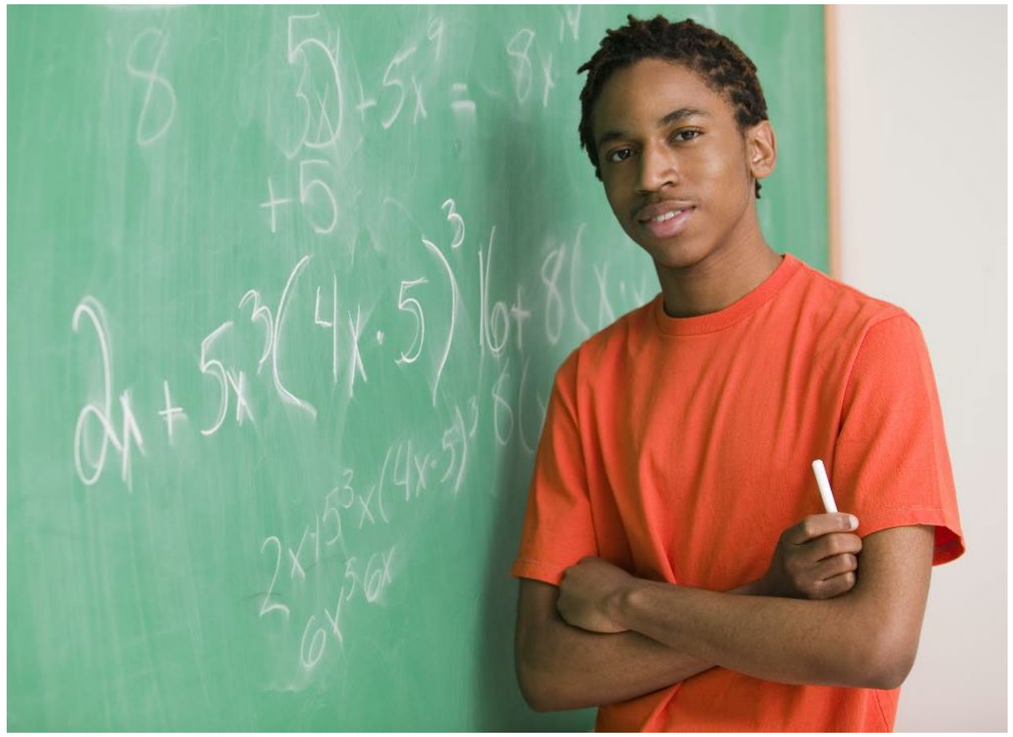
Module 2 learning objectives

By the end of this session, you will be able to:

- Reflect on your math attitudes and beliefs
- Understand how to create a classroom climate that is identity-affirming for all students and promotes math learning
- Develop instructional practices that foster positive math attitudes



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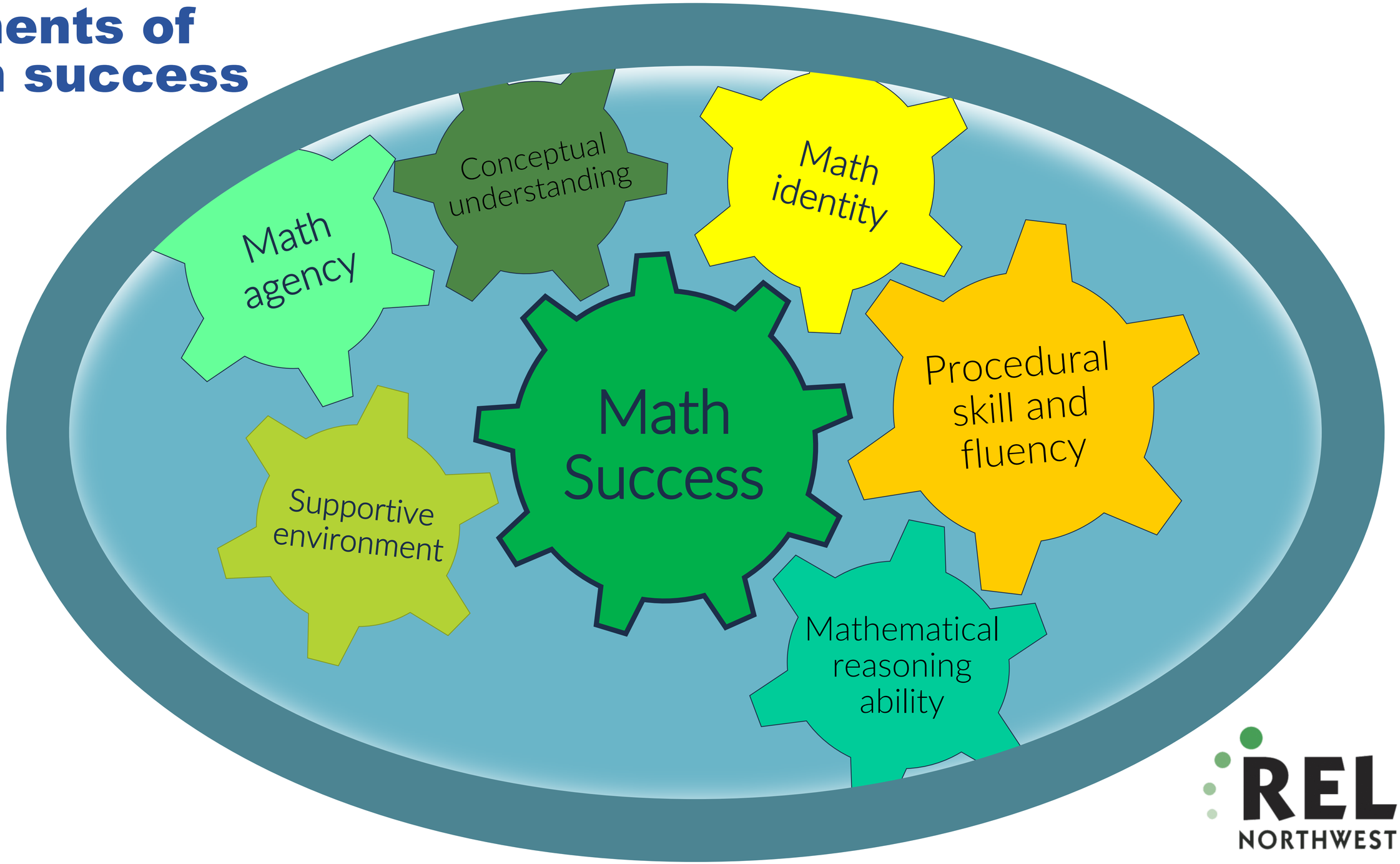
Elements of math success



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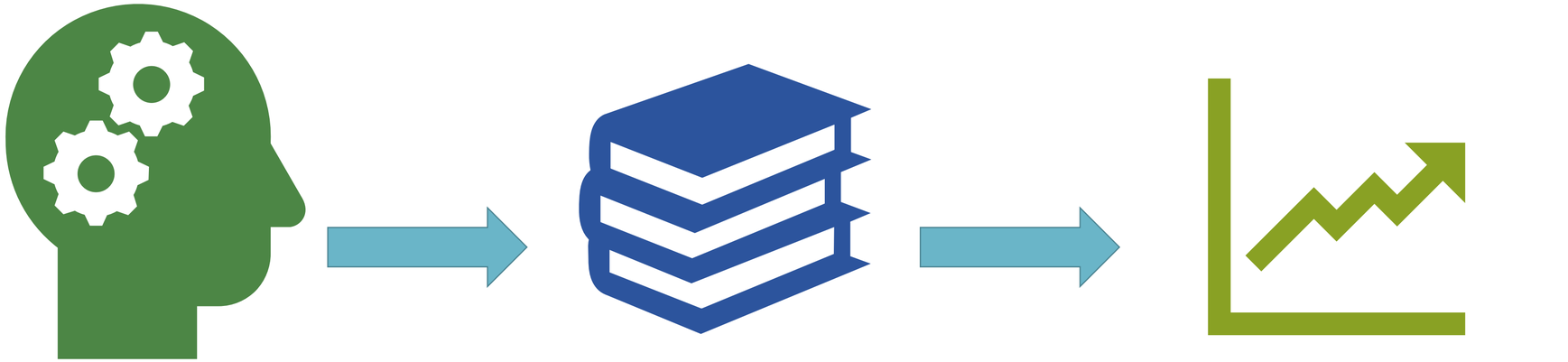
Math identity and agency critical for math success



Key aspects of math identity

Sense of belonging

- Feeling like an accepted, valued, and legitimate group member

Growth mindset

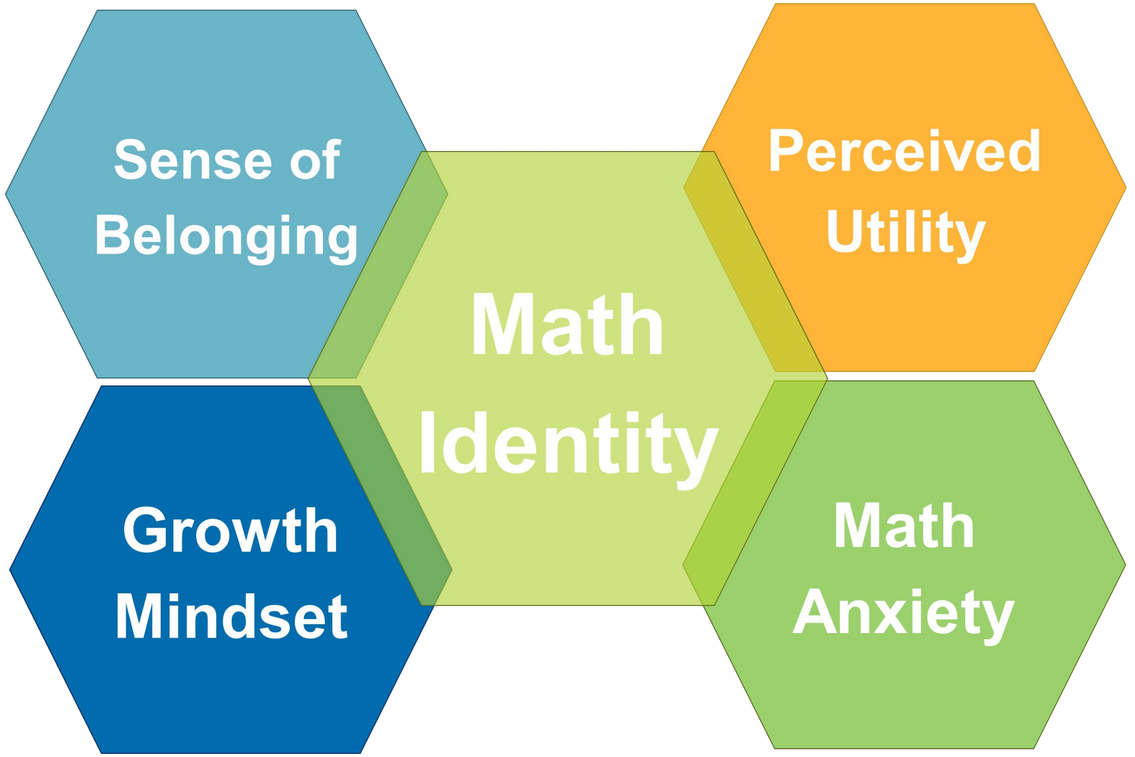
- The belief that intelligence and ability can be developed with effort, strategies, and support

Perceived utility

- Belief that math is useful, worthwhile, and relevant to life outside of school, now and in the future

Math anxiety

- Feeling apprehensive, tense, and fearful about situations involving math



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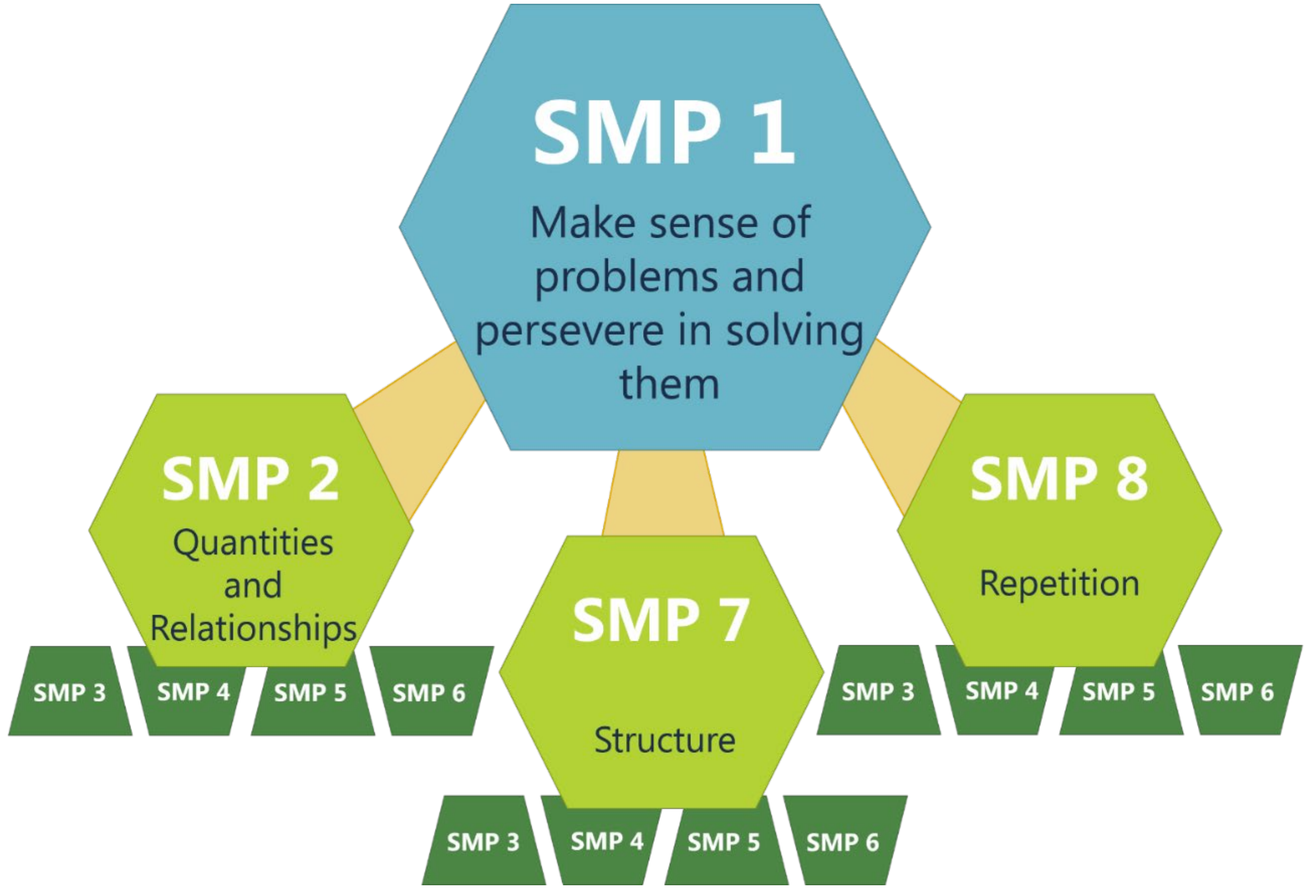
Connections with the Standards for Math Practice

Standards for Mathematical Practice

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



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Content source: Common Core State Standards Initiative, n.d.; Kelemanik, Lucenta, & Janssen Creighton, 2016

Summary of evidence-based strategies

Focus	Strategy	Key Aspect(s) of Math Identity Affected			
		Belonging	Growth Mindset	Perceived Utility	Math Anxiety
Classroom Culture	Bust stereotypes	✓			
	Positive climate	✓			
	Honor mistakes	✓	✓		✓
	High expectations	✓	✓		
	Time pressures				✓
	Make math collaborative	✓			
	Messaging	✓	✓	✓	✓
	Process feedback		✓		

Covered in Part 1

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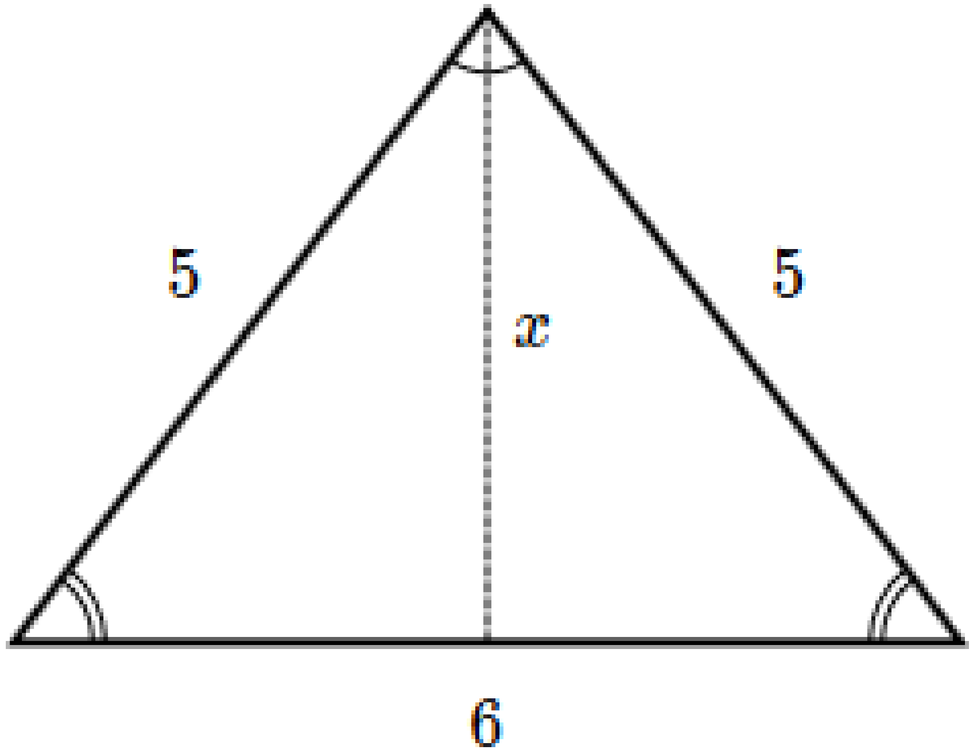
Icebreaker

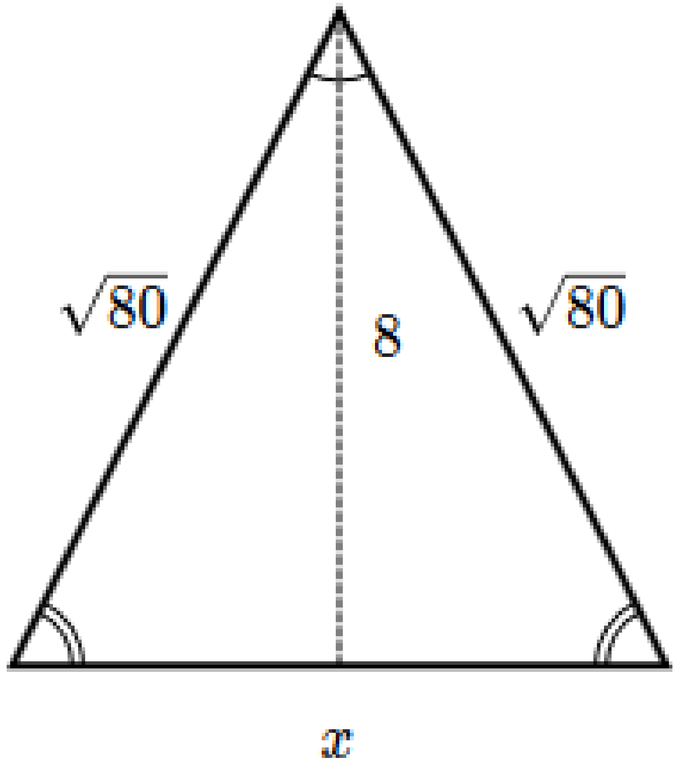
Problem 1

Find the value of x in the isosceles triangle shown below.



Problem 2

Find the value of x in the isosceles triangle shown below.



Problem 3

Solve for d.

$$2(5-d)=2-4d$$

$d=$ ☐

Problem 4

Solve for g.

$$6(-2g-1) = -(13g+2)$$

$g =$ ☐

How’d you do?

Solutions

1. x = 4
2. x = 8
3. d = -4
4. g = 4

What was it like to do these problems?

Summary of evidence-based strategies: Time pressures

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	Messaging	✓	✓	✓	✓
	Process feedback		✓		

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Timed drills and number sense

- As a way to alleviate math anxiety, recent research urges teachers to avoid unnecessary time pressures (e.g., timed drills, timed tests) in math class.
- But, developing fluency is a CCSS math goal and an important precursor to mastering high-level math concepts.

Relevant factors
- Belonging
- Mindset
- ✓ Anxiety
- Utility

Content sources: Boaler, 2014; Faust, Ashcraft, & Fleck, 1996; Feikes & Schwingendorf, 2008

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Timed drills and number sense

Fluency develops through **number sense**, which is a deep understanding of numbers and the ways they relate to each other.

Relevant factors

- Belonging
- Mindset
- ✓ Anxiety
- Utility

Content sources: Boaler, 2014, 2015; Delazer et al., 2005

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Timed drills and number sense

1. Count off by 3's.
2. Join your number group to read about and discuss a strategy that is an alternative to timed drills. Become an expert in this strategy.
3. Form a new group with one representative from each of the other expert groups. Tell your group about your strategy and they'll do the same about their strategies.

Number talks

Math cards

How close to 100?

Relevant factors
- Belonging
- Mindset
- ✓ Anxiety
- Utility

Content sources: Boaler, 2014, 2015; Delazer et al., 2015

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Discussion

What other strategies do you use in your classroom to develop students' number sense and fluency?

Are there times you choose to use timed drills or tests? Why or why not?

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Summary of evidence-based strategies: Make math collaborative

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	Make math collaborative	✓			
	Messaging	✓	✓	✓	✓
	Process feedback		✓		

REL NORTHWEST

Make math collaborative

Group membership

Relevant factors
- ✓ Belonging
- Mindset
- Anxiety
- Utility

Content sources: Master & Meltzoff, 2016

REL NORTHWEST

Make math collaborative

SMPs

How does collaborative group membership support and build on the SMPs?

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
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5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Relevant factors
- ✓ Belonging
- Mindset
- Anxiety
- Utility

Video source: Inside Mathematics, n.d.

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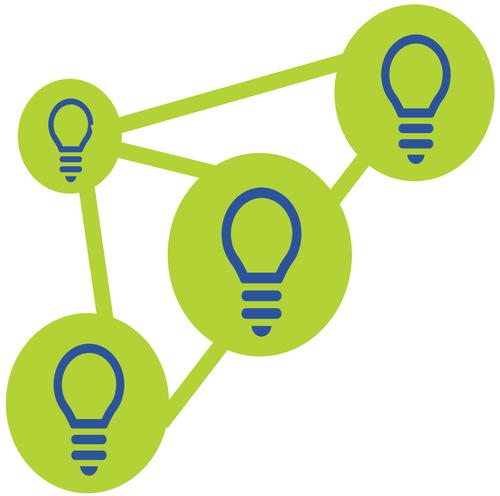

Make math collaborative

How does collaborative group membership support and build on the SMPs?

SMPs

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Relevant factors

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- Mindset
- Anxiety
- Utility

Content source: Common Core State Standards Initiative, n.d. Inside Mathematics, n.d.

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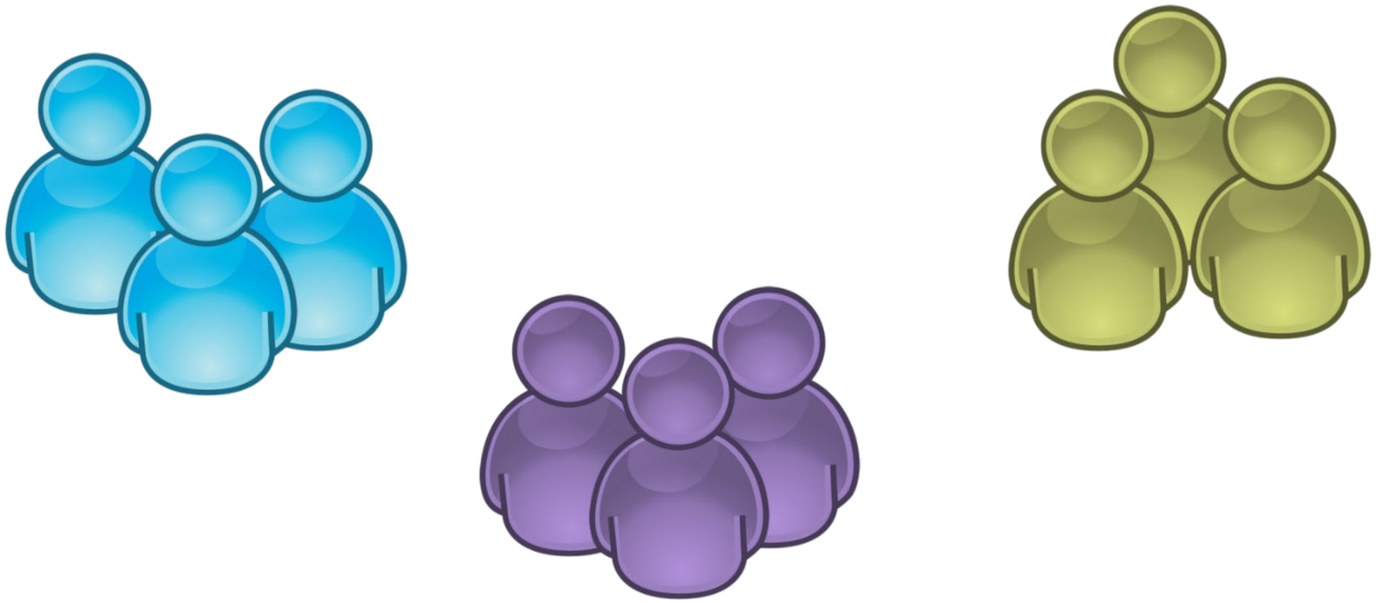
Make math collaborative: The jigsaw classroom

Method of organizing classroom lessons in a way that fosters relationships. Group members depend on each other and must interact to complete the lesson.



Relevant factors

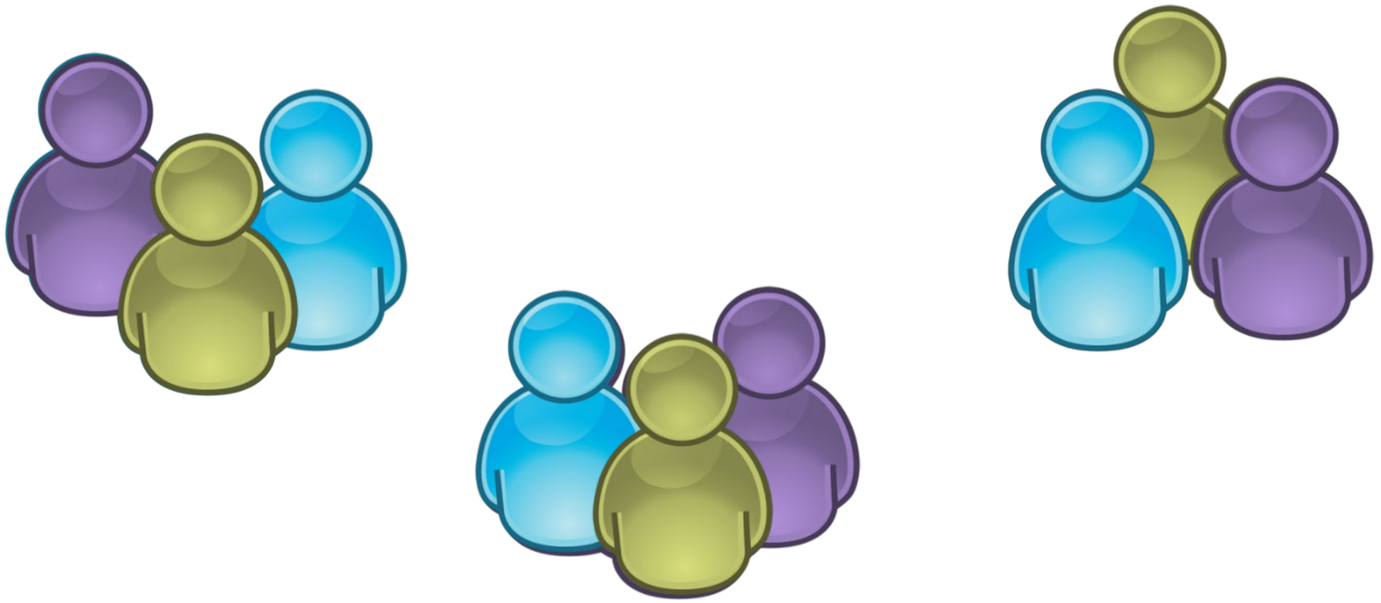
- ✓ Belonging
- Mindset
- Anxiety
- Utility

Content source: Walker & Crogan, 1998

REL NORTHWEST

How-to: Jigsaw classroom

1. Divide students into “expert” groups. Each expert group learns extensively about one component of the lesson.
2. Next, students regroup into “home” groups. Each home group includes one expert on each different component of the lesson.
3. Each expert is in charge of explaining his or her expert topic to the rest of the home group.



Relevant factors
- ✓ Belonging
- Mindset
- Anxiety
- Utility

Content source: Walker & Crogan, 1998; Yeager, Dahl, & Dweck, 2018

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A note of caution

- Because students are sensitive to social cues, group membership must be used carefully
- Associating groups with activities may increase motivation, but associating groups with an underlying or *fixed* ability at those activities may decrease motivation
- Take care to express that you value each group's contributions equally

Relevant factors
- ✓ Belonging
- Mindset
- Anxiety
- Utility

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Make math collaborative: Routines for reasoning

Think-pair-share instructional strategies

- Step 1: Individual think time
- Step 2: Partner work
- Step 3: Whole-class discussion

Relevant factors
- ✓ Belonging
- ✓ Mindset
- ✓ Anxiety
- • Utility

Content source: Kelemanik, Lucenta, & Creighton, 2016

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What do students say about think-pair-share techniques in the math classroom?

Video source: Mathematical Agency Improvement Community, n.d.

Brainstorm

Are there other strategies you use to make the math classroom more collaborative?

Are there barriers to using collaborative strategies that you have encountered or anticipate encountering? What are ways to deal with those barriers?

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Summary of evidence-based strategies: Messaging

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	Make math collaborative	✓			
	Messaging	✓	✓	✓	✓
	Process feedback		✓		

REL NORTHWEST

Be conscious of messages

Be conscious of how you speak to students. How teachers talk to students can have a powerful impact on students math attitudes.

Relevant factors
- ✓ Belonging
- ✓ Mindset
- ✓ Anxiety
- ✓ Utility

Content source: Beilock, Gunderson, Ramirez, & Levine, 2010; Rattan, Good, & Dweck, 2012

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Be conscious of messages

Consoling students who are struggling can comfort them in the moment, but it can also be demotivating. It's better to express **confidence** and **encouragement** and to give them **strategies to succeed** in math.

Relevant factors

- Belonging
- ✓ Mindset
- ✓ Anxiety
- Utility

Content source: Rattan, Good, & Dweck, 2012

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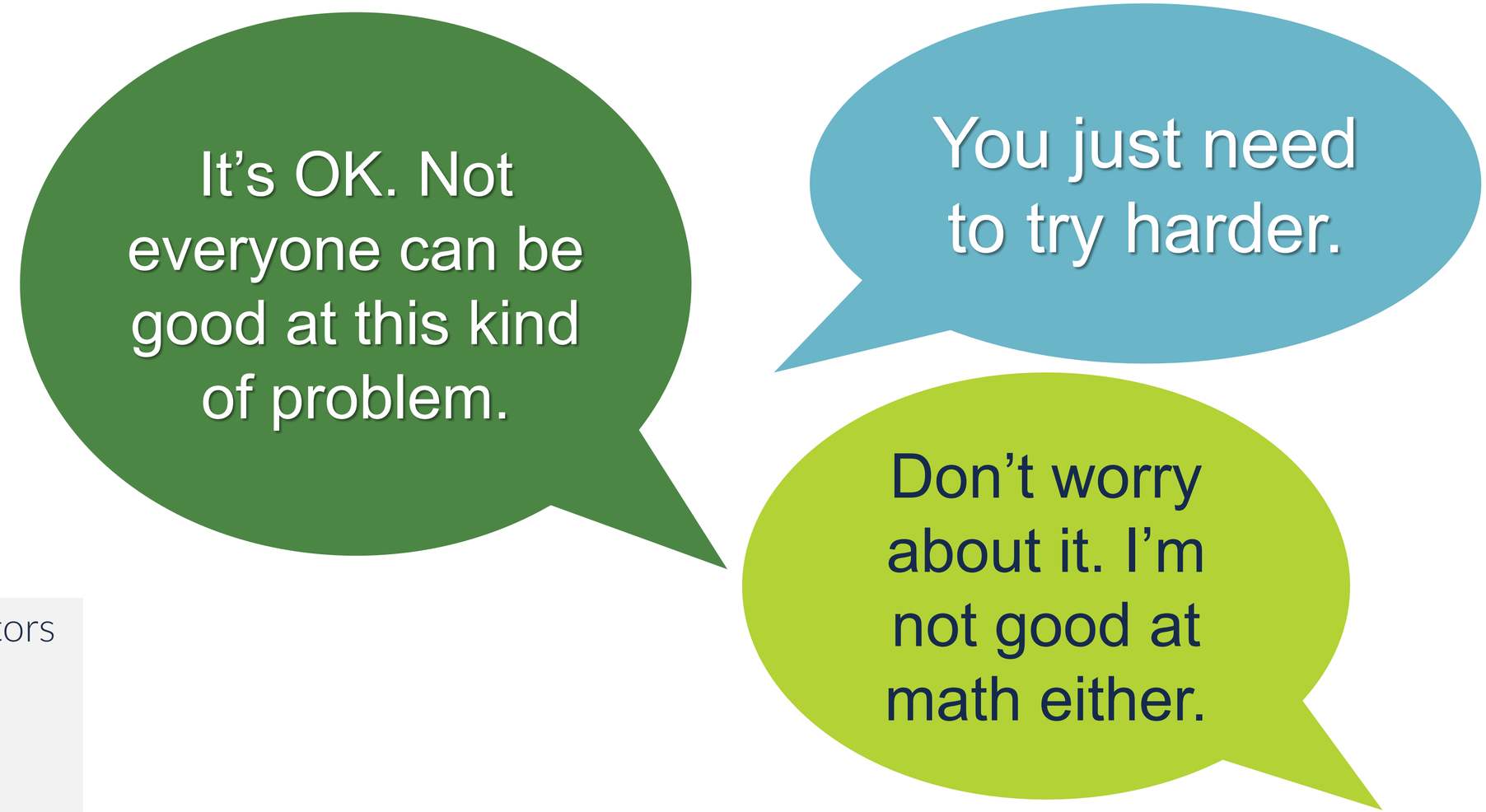
Mixed messages

How might students interpret these messages?



Relevant factors

- Belonging
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Mixed messages

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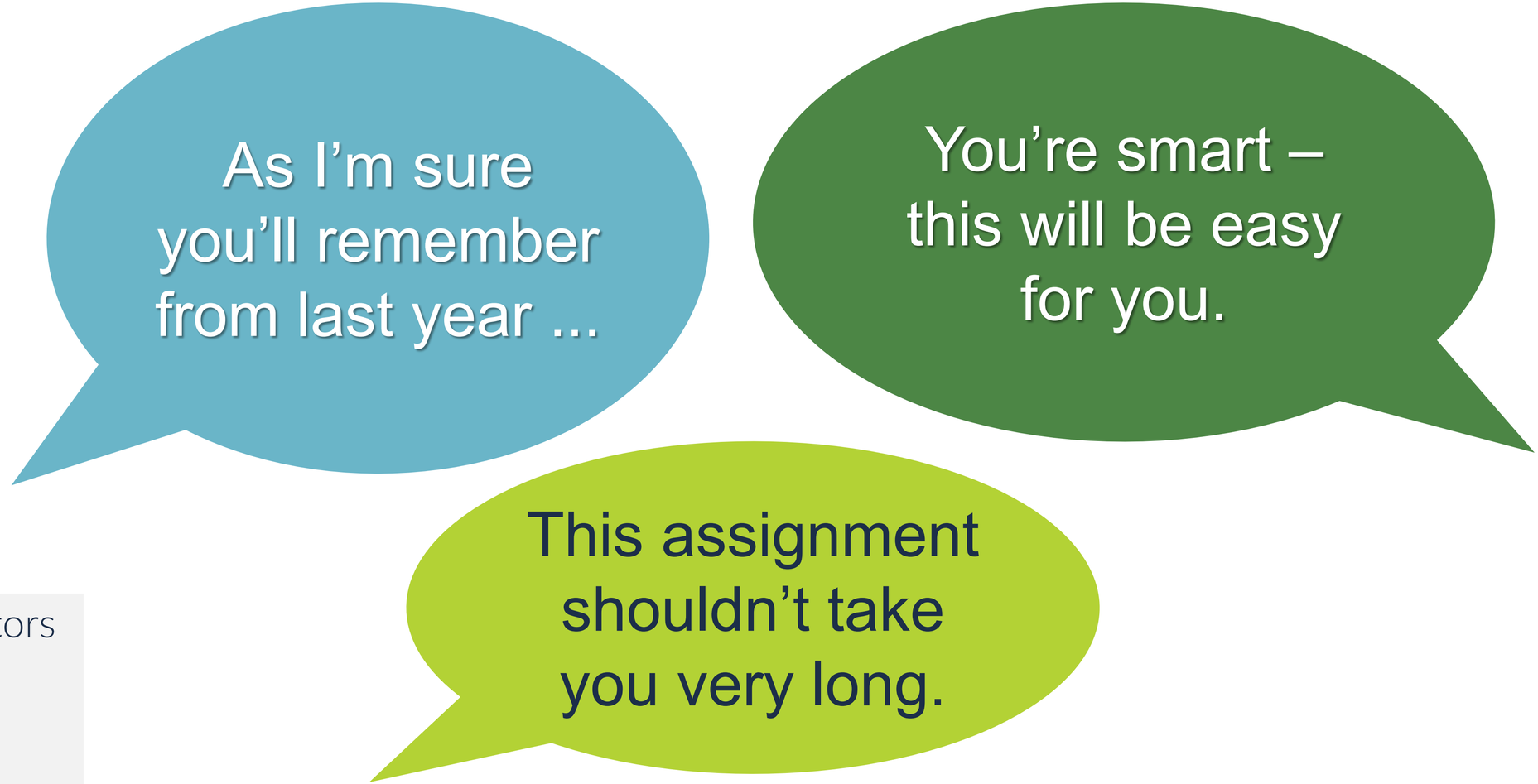

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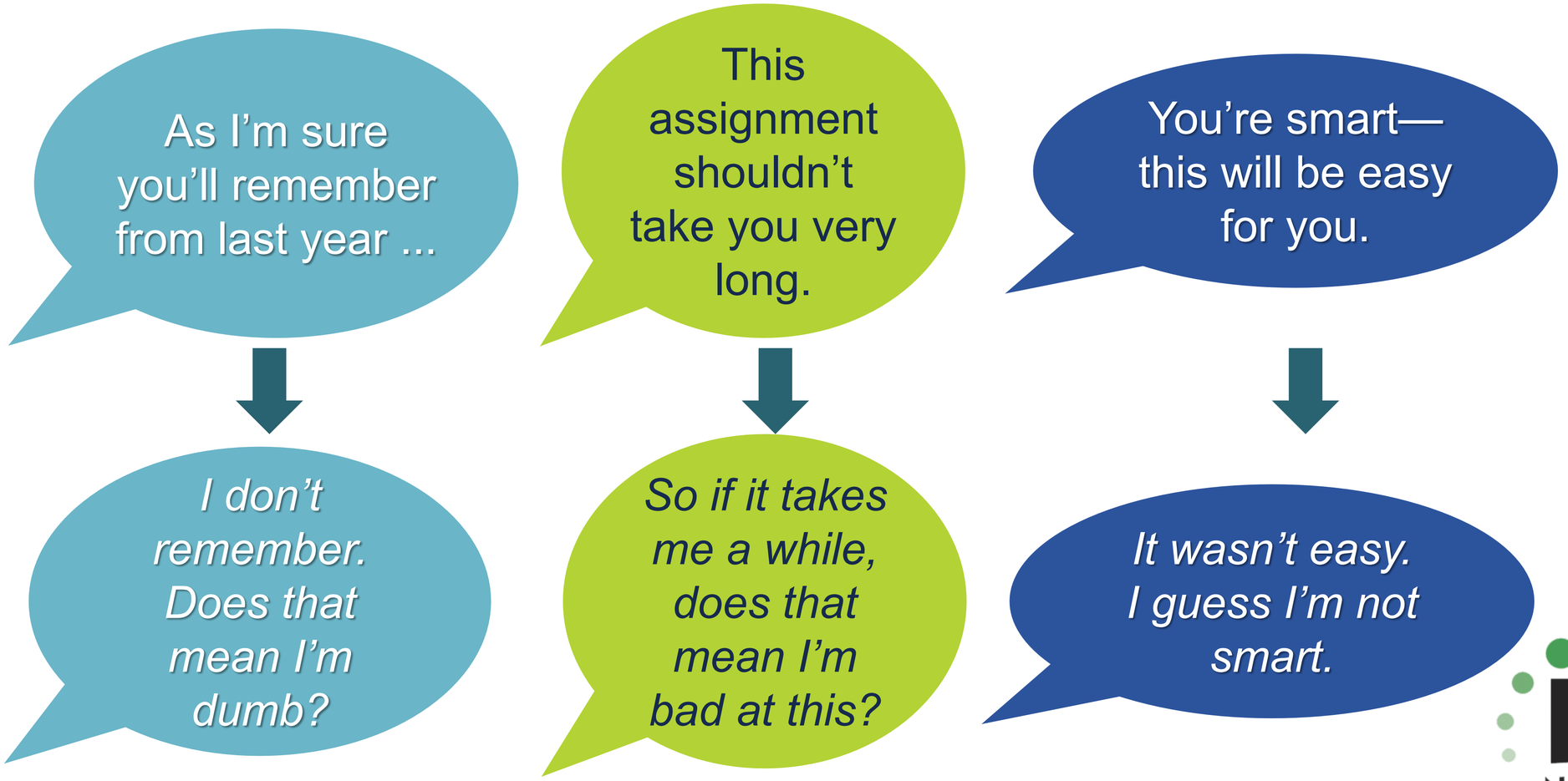

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Mixed messages

In groups, replace one of these unhelpful messages with a helpful one.

- You just need to try harder
- You're smart - this will be easy for you.
- Don't worry about it. I'm not good at math either.
- It's OK. Not everyone can be good at this kind of problem.
- This assignment shouldn't take you very long.
- As I'm sure you'll remember from last year….

Relevant factors
- Belonging
- ✓ Mindset
- ✓ Anxiety
- Utility

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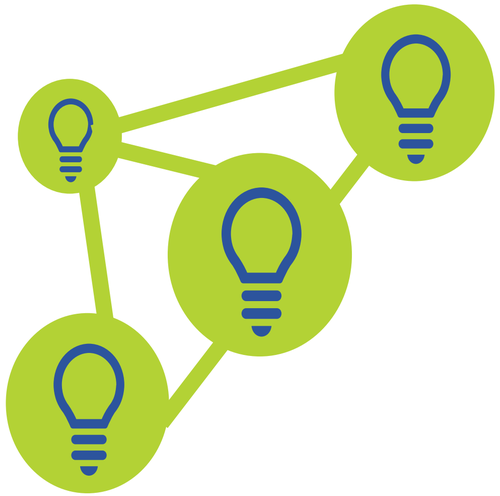

Be conscious of messages

SMPs

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Relevant factors
- Belonging
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- Utility

Content source: Common Core State Standards Initiative, n.d.

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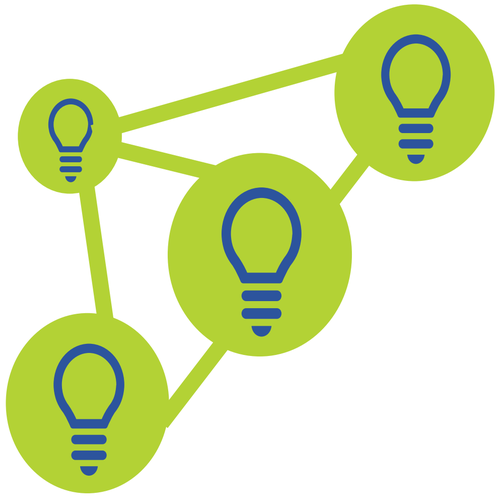

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Relevant factors
- Belonging
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- ✓ Anxiety
- Utility

Content source: Common Core State Standards Initiative, n.d.

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Summary of evidence-based strategies: Process feedback

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	Process feedback		✓		

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Growth mindset and equity

It is imperative that growth mindset is not oversimplified to just telling students they need to work harder.

- Hard work on the part of students from traditionally marginalized communities is not enough to overcome systemic racial, gender, and economic oppression.
- Telling students to “just try harder” places the burden of effort only on their shoulders.
- Praising effort when students aren’t learning sends the message that learning isn’t the objective—effort is.

Relevant factors
- Belonging
- ✓ Mindset
- Anxiety
- Utility

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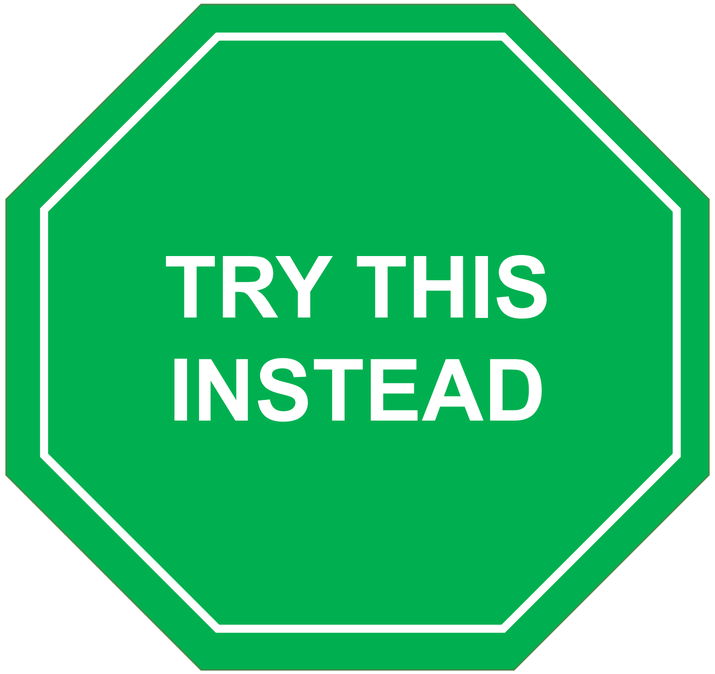
Growth mindset and equity



- Keep the focus on effort *in the service of learning*.
- Encourage students to seek out and try new strategies, or seek assistance from others when they're stuck.
- When students are trying but not learning, appreciate their work so far, but then talk about what they can try next.

Relevant factors
- Belonging
- ✓ Mindset
- Anxiety
- Utility

Content source: Dweck, 2015

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Process-related feedback

SMPs

Different types of feedback promote different mindsets

Fixed mindset

Feedback about the person/their intelligence

"You must be smart to solve these problems."

Growth mindset

Feedback about the process/effort

"You must have worked really hard at these problems."

Relevant factors

- Belonging
- ✓ Mindset
- Anxiety
- Utility

Content source: Mueller & Dweck, 1998

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Process-related feedback

Person/intelligence

Great job! You're really good at math!

See, you *are* smart. You got an A on your last math test.

I know you are a talented student in general—it's just not the case that everyone is a math person.

Process/effort

Great job! This was a challenging problem, and I can see you worked hard and tried different strategies until you figured it out.

The extra time you spent studying for your math test really paid off.

I know you can solve this problem, because I remember last month when we worked on common denominators. That was hard, but you did it! Let's talk about a new strategy you can try to solve this math problem.

Relevant factors

- Belonging
- ✓ Mindset
- Anxiety
- Utility

Content source: Rattan, Good, & Dweck, 2012

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YOU GOT THIS

Relevant factors

- Belonging
- ✓ Mindset
- Anxiety
- Utility

Content source: Siegle & McCoach, 2007

Process-related feedback

- Be specific
- Be honest and realistic
- Challenge negative self-talk

"That was great work, Salome! You remembered to start by finding the greatest common factor for that equation, and then you were able to factor it out."

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YOU GOT THIS

Relevant factors

- Belonging
- ✓ Mindset
- Anxiety
- Utility

Content source: Siegle & McCoach, 2007

Process-related feedback

- Be specific
- Be honest and realistic
- Challenge negative self-talk

"I can tell you're frustrated, Lila. You're having a hard time solving this equation. I remember how last week you did a great job of following the right order of operations. I wonder if you can use that knowledge now."

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Regional Educational Laboratory at Education Northwest

YOU GOT THIS

Relevant factors

- Belonging
- ✓ Mindset
- Anxiety
- Utility

Content source: Siegle & McCoach, 2007

Process-related feedback

- Be specific
- Be honest and realistic
- Challenge negative self-talk

*"Daren, I heard you say this is too hard. It's true that this is challenging, and you might not be able to do it **yet**. But I know you can if you keep at it. Let me show you a different approach that might help."*

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Growth mindset feedback frames

Different situations call for different feedback. What might you say to a student who is…

1. Struggling despite putting forth strong effort.
2. Struggling and needs help with strategies.
3. Succeeding with strong effort.
4. Succeeding easily without effort.

Relevant factors
- Belonging
- ✓ Mindset
- Anxiety
- Utility

Content source: Mindset Works, n.d.

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Reflection

What stood out for you, increased your knowledge, or changed your thinking during this session?

What is one thing you learned or discussed today that you will take back and apply to your work with teachers and/or your classroom?

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REL Northwest partners with practitioners and policymakers to use data and evidence to help solve educational problems that impede student success. We do this by:

- Conducting rigorous research and data analysis
- Delivering customized training, coaching, and technical support
- Providing engaging learning opportunities

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