

Mathematics Discourse without Words

*Silent Collaborative Tasks That Raise All
Learners' Voices*

silent

#NCTMBoston19
@normabgordon
she/her(s)



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have fun!

participants will

understand how to create opportunities for student voice, foster collaboration and assign competence to students as doers of mathematics.

go deep with the mathematics of the task(s) assigned and SMP1, make conjectures, plan solution pathways, monitor/evaluate progress and change course as needed.



breathe

#DESTRESSMONDAY



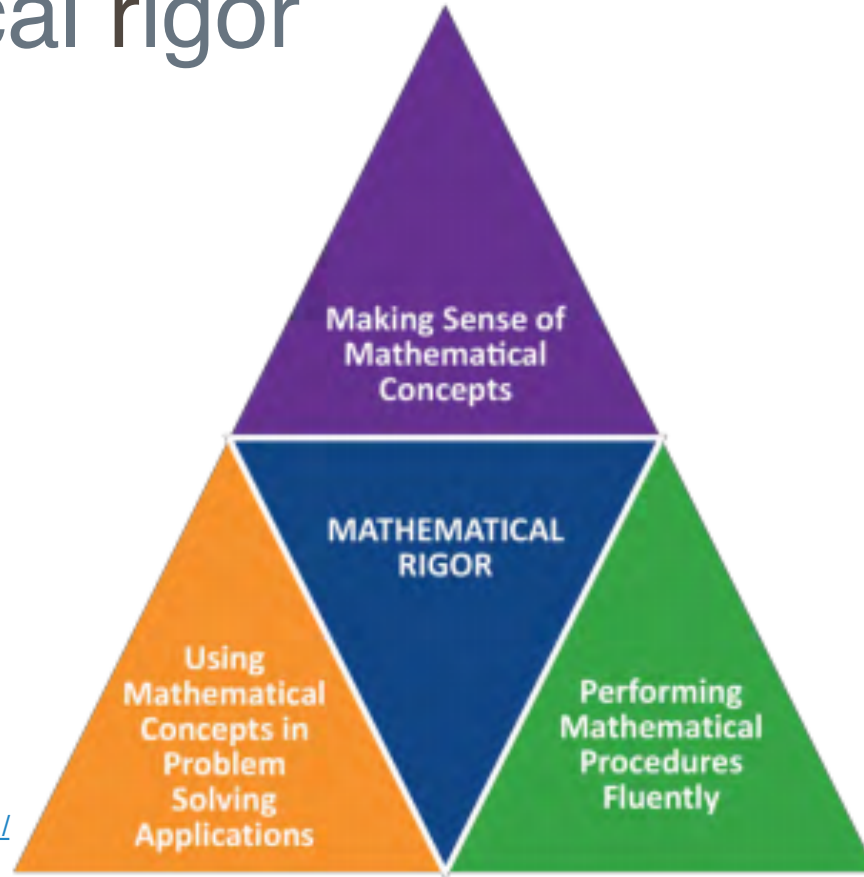
BREATHE WITH THE SHAPE

<https://twitter.com/destressmonday>

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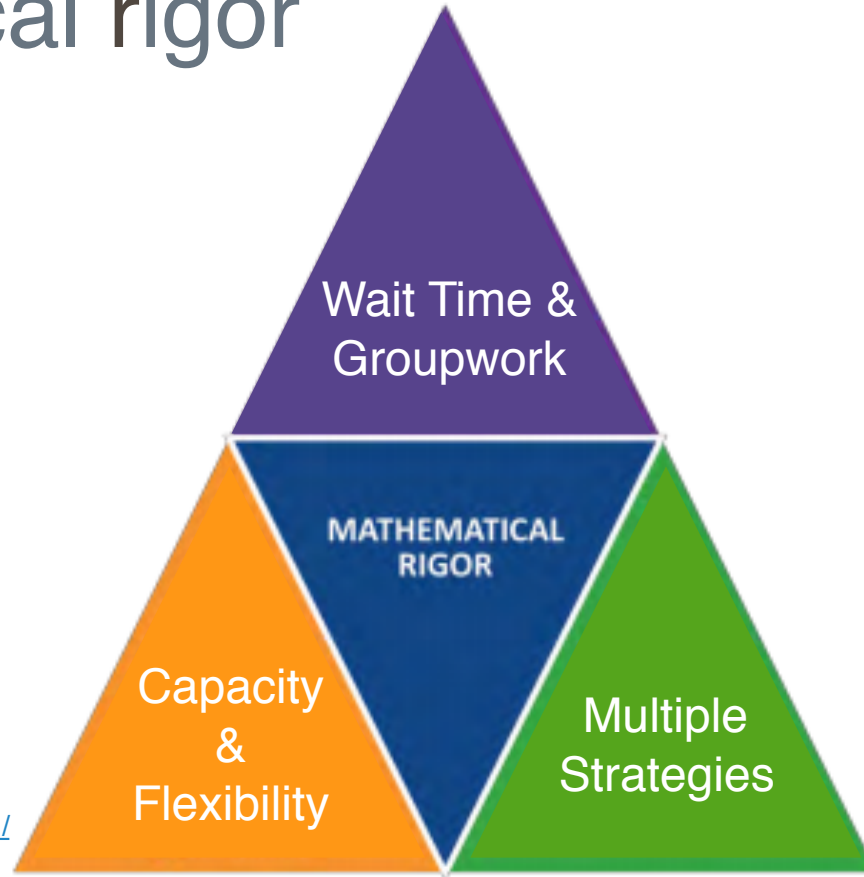
mathematical rigor



<http://www.doe.mass.edu/stem/math/>

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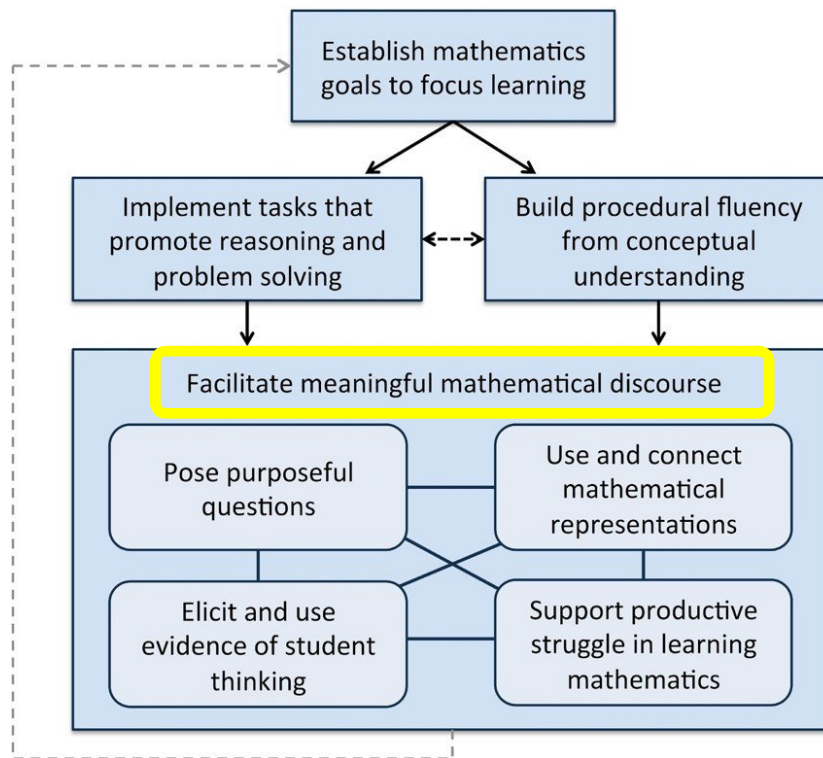
mathematical rigor



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mathematics teaching framework



mathematics teaching framework



https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Robert-Q_-Berry-III/Examining-Equitable-Teaching-Using-the-Mathematics-Teaching-Framework/

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The teaching practices within the Mathematics Teaching Framework are a coherent and connected set of practices that when implemented together, create a classroom learning environment supportive of equitable mathematics teaching practices.

Robert Berry, NCTM President 2019

https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Robert-Q_-Berry-III/Examining-Equitable-Teaching-Using-the-Mathematics-Teaching-Framework/

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math 2gether *set up but don't start (please!)*

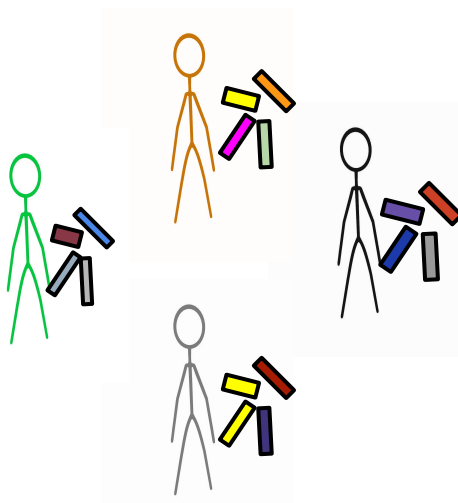
4 people per basket



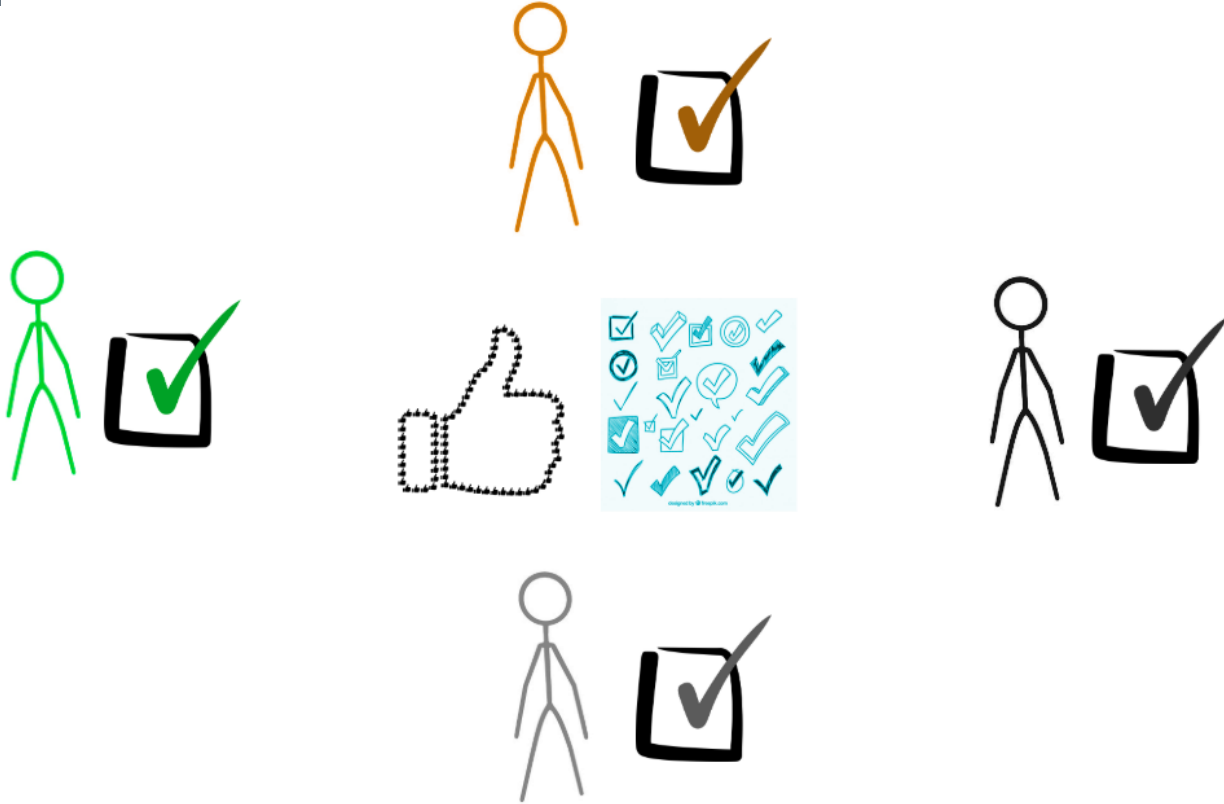
BLUE basket
choose **ONE**
puzzle set



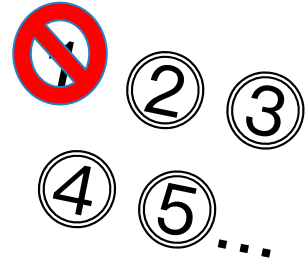
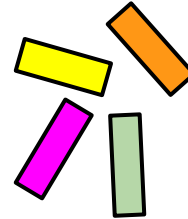
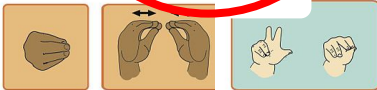
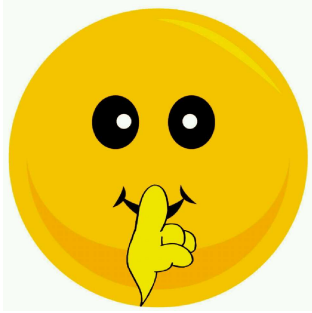
Each person takes
4 puzzle pieces



goal

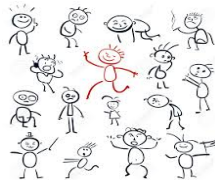


rules

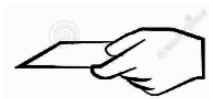


rules

No talking, sign language or gestures.



You can give cards to someone. You **cannot** place it for them.



Always have at least two cards.

2

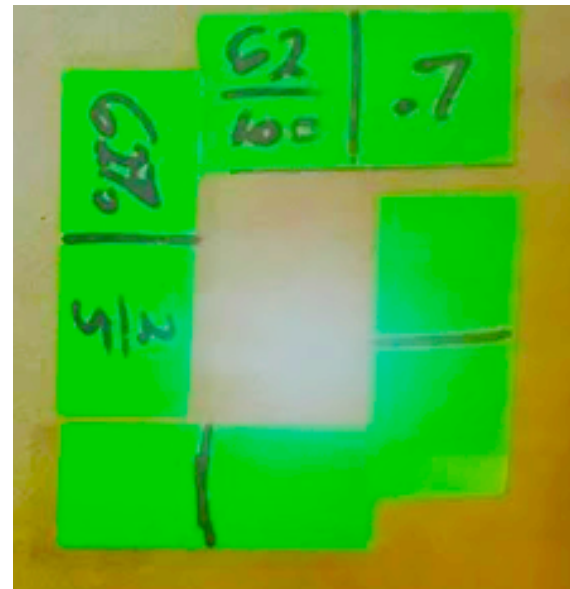
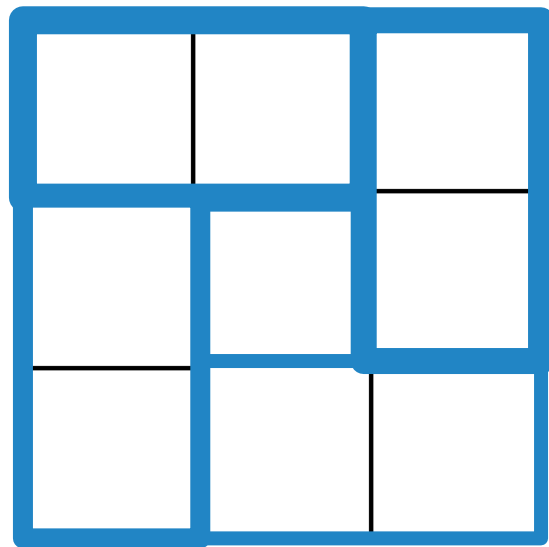
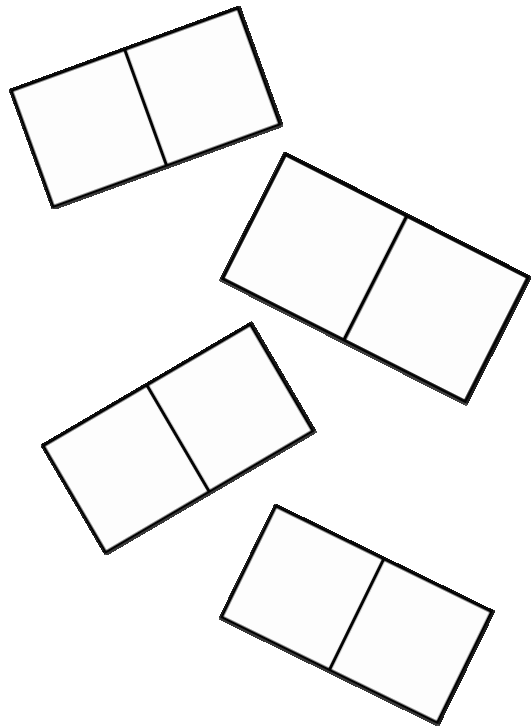
You **cannot** take a card from someone.



Your team is **successful only** when **everyone** has a complete set.



domino pieces demo



we'll check in part way

10 : 00



quiet time

01:00

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share out 1st at tables then "2 words"





Mathematical discourse includes the purposeful exchange of ideas through classroom discussion, as well as through other forms of verbal, visual, and written communication.

Principles to Action, NCTM, 2014

Facilitate meaningful mathematical discourse

Teacher and student actions

What are <i>teachers</i> doing?	What are <i>students</i> doing?
<p>Engaging students in purposeful sharing of mathematical ideas, reasoning, and approaches, using varied representations.</p> <p>Selecting and sequencing student approaches and solution strategies for whole-class analysis and discussion.</p> <p>Facilitating discourse among students by positioning them as authors of ideas, who explain and defend their approaches.</p> <p>Ensuring progress toward mathematical goals by making explicit connections to student approaches and reasoning.</p>	<p>Presenting and explaining ideas, reasoning, and representations to one another in pair, small-group, and whole-class discourse.</p> <p>Listening carefully to and critiquing the reasoning of peers, using examples to support or counterexamples to refute arguments.</p> <p>Seeking to understand the approaches used by peers by asking clarifying questions, trying out others' strategies, and describing the approaches used by others.</p> <p>Identifying how different approaches to solving a task are the same and how they are different.</p>



[https://
www.nctm.o
rg/PtA/](https://www.nctm.org/PtA/)



what's 1 thing ***YOU*** learned?



To look for other people who are struggling, and see if you can help them. By you helping them, they will get the card they need (because you gave it to them), and they might give you their extra cards, which you possibly will be able to use to finish your puzzle.

what's 1 thing ***YOU*** learned?



I think when you work together as a team it will help other people who don't know math well participate in the activity because they want to take on the challenge.

what do you think **TEACHERS** learned?



*I think that the teachers learned [ways of]
helping us towards finishing without giving us
the answering [and] making us think hard about
the problem.*

what do you think **TEACHERS** learned?



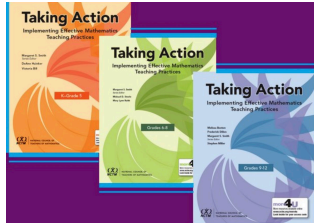
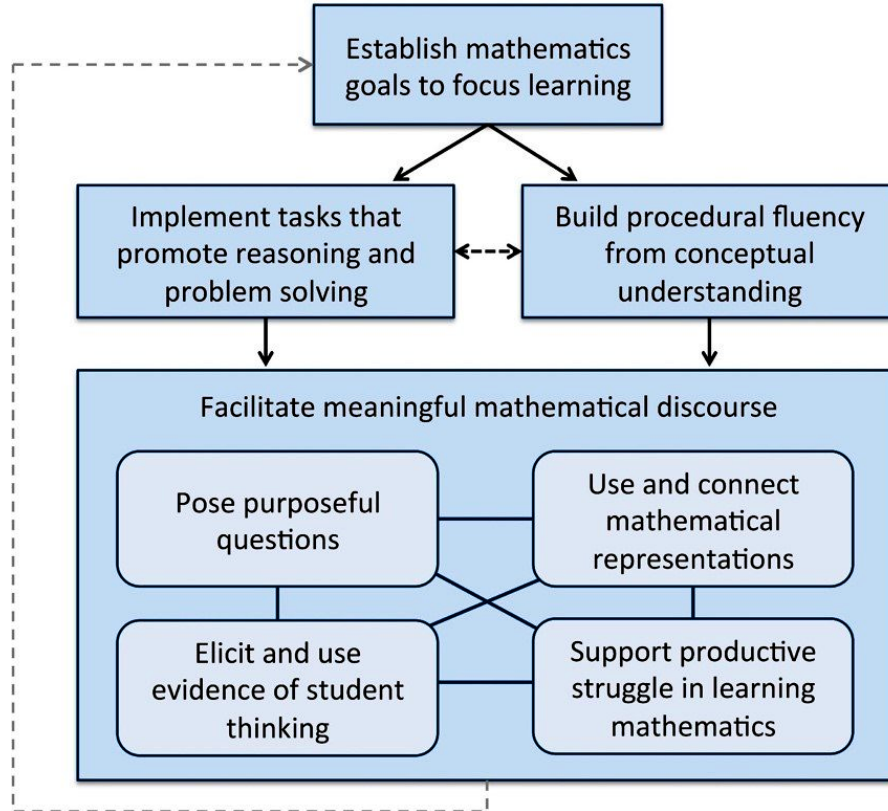
I think the teachers learned how to also communicate without talking, except for a bunch of moments of weaknesses when they just had to call a teacher time out. (haha)

what do you think **TEACHERS** learned?



I think the teachers learned that we can solve some of the problems ourselves without talking and they could maybe trust us more.

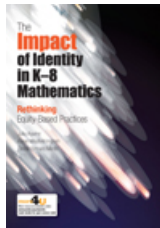
mathematics teaching framework



[NCTM Taking Action Series](#)

equity-based teaching practice

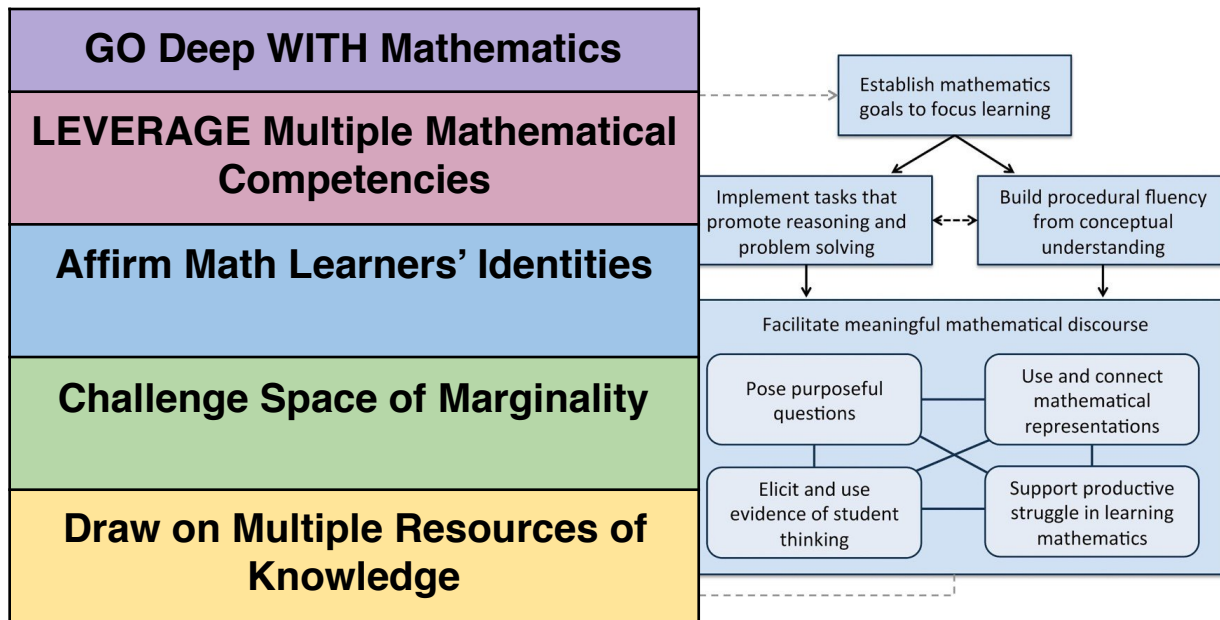
GO Deep WITH Mathematics	✓
LEVERAGE Multiple Mathematical Competencies	✓
Affirm Math Learners' Identities	✓
Challenge Space of Marginality	✓
Draw on Multiple Resources of Knowledge	✓



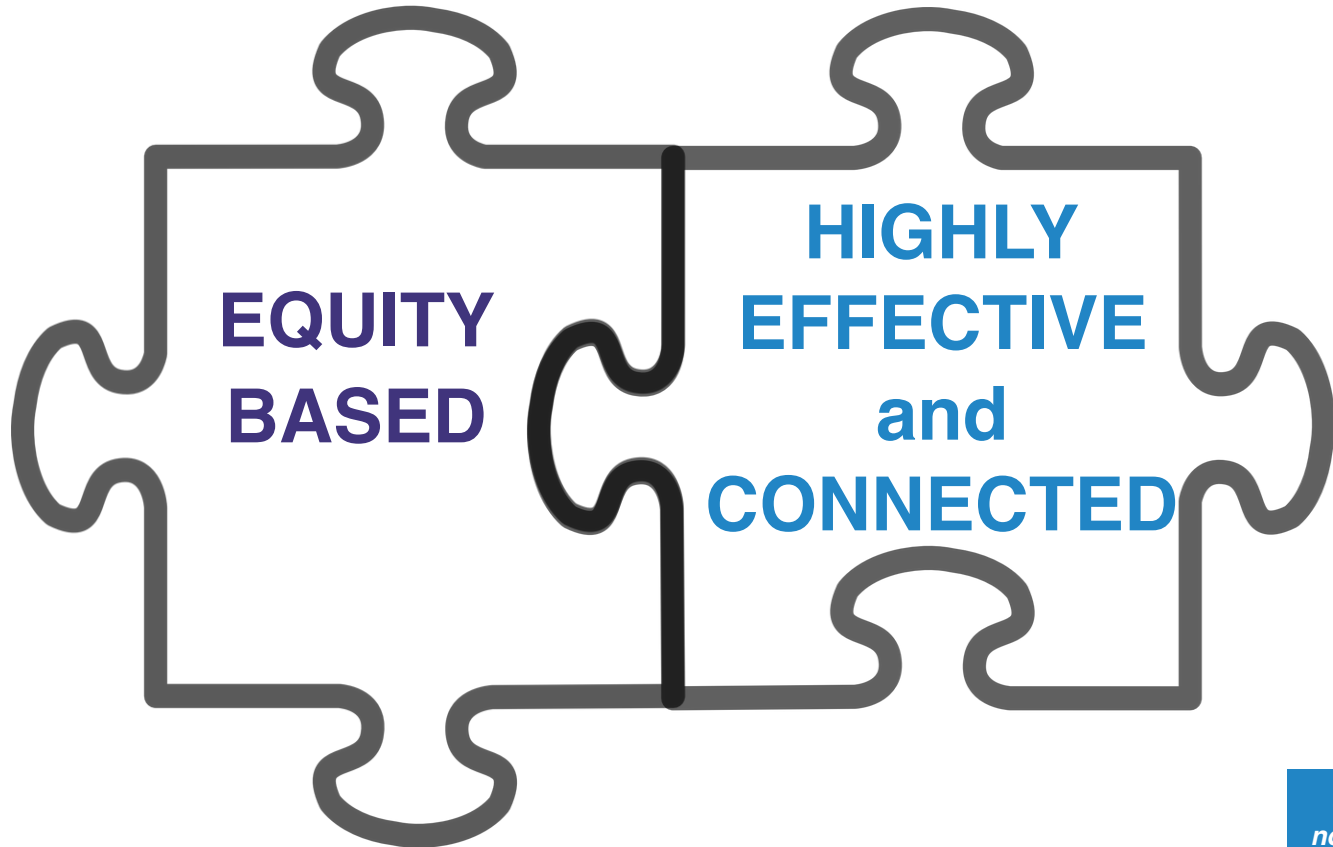
<https://www.nctm.org/Store/Products/The-Impact-of-Identity-in-K-8-Mathematics--Rethinking--Equity-Based-Practices/>

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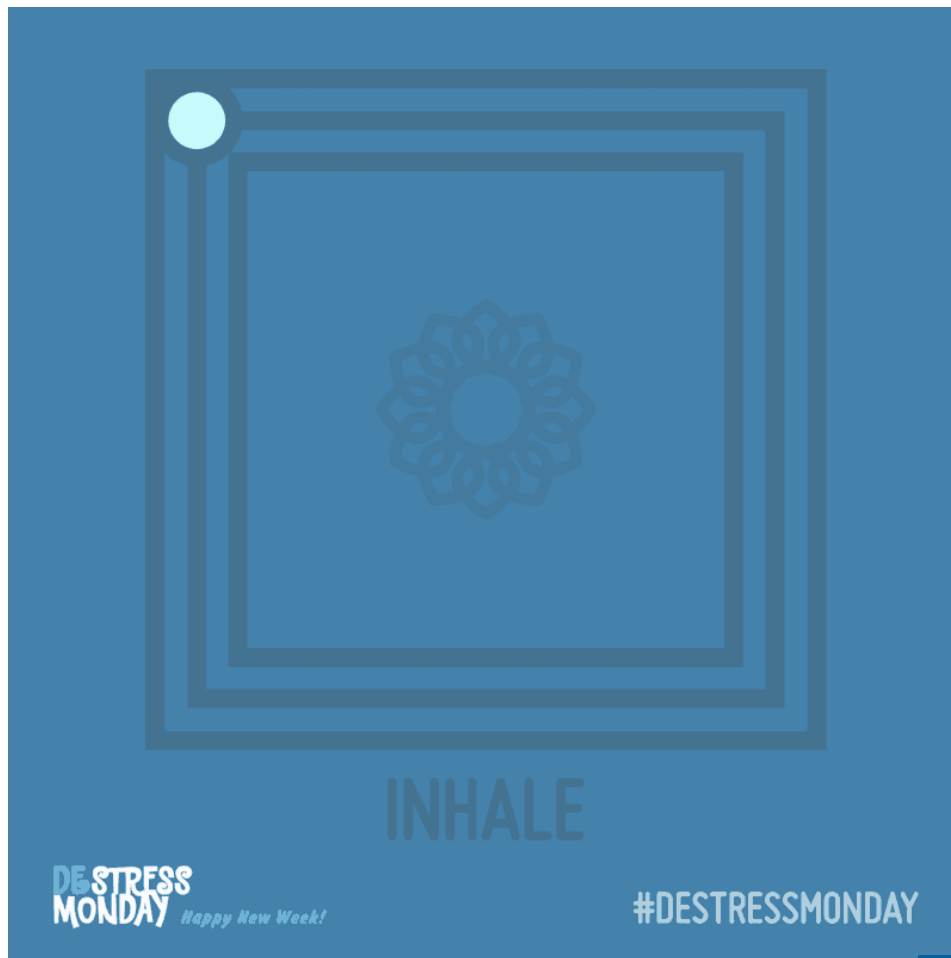
teaching and learning



teaching and learning



breathe & self check in



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math 2gether round 2

If your group:



***Move to a
new table
and use***



Stay and use

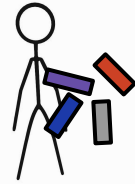
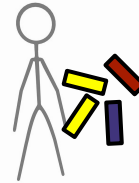
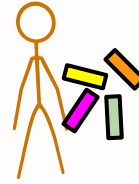
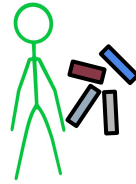


set up hasn't changed

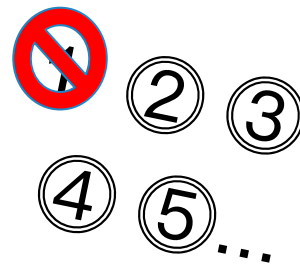
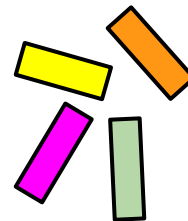
4 people per basket



Each person takes 4 pieces



rules haven't changed



we'll check in part way

10 : 00



breathe

#DESTRESSMONDAY



BREATHE WITH THE SHAPE

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share out



launch

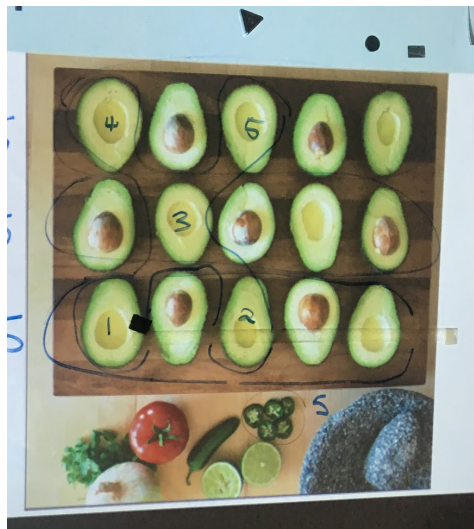
Find any
equivalent
Fraction, Decimal,
or Percent.

$$\frac{2}{5} = ?$$

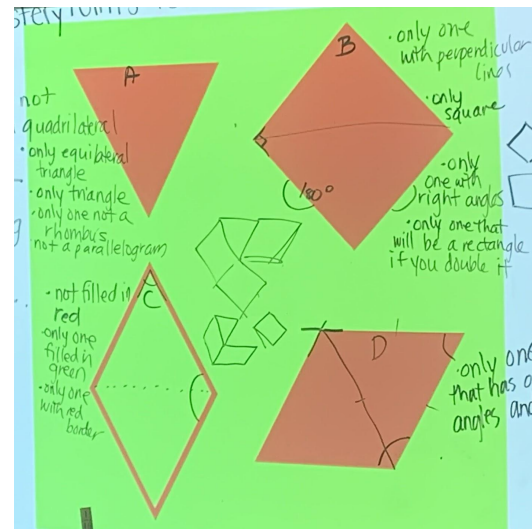
$$0.05 = ?$$

$$62\% = ?$$

How Many?



Notice & Wonder.



Images used in class: How Many and
Which One Doesn't Belong - Stenhouse

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close

Survey

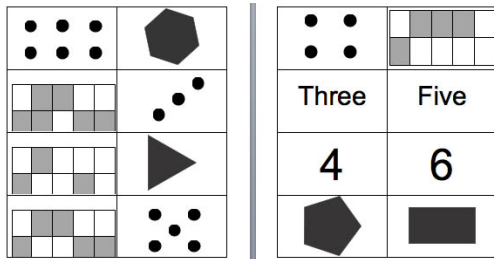
- ▶ What is 1 important thing ***you*** learned today? ***Teachers*** learned?
- ▶ How would you describe your experience to a friend who was not here?
- ▶ What would you say about the rule of not speaking? Was that helpful? If so, how did it help you? If not, why not.

1 or 2-word check in

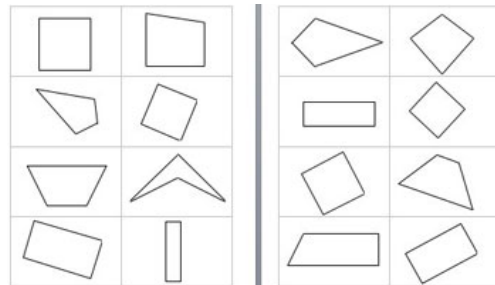
- ▶ Number, word, game, counting, match, dots, shapes, ten-frames, cubes, puzzle, squares, winning (K)
- ▶ Pair, number, counting, (no) depth, 2-D, quiet, signs, equal, shape, fun (Gr1)

tasks freely available nrich.maths.org

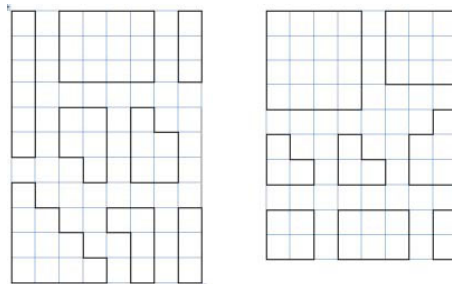
Number Match



Quad Match



Making Rectangles



Doughnut Percents

0.3	20%	$\frac{9}{10}$	30%
0.8	25%	$\frac{1}{2}$	40%
$\frac{1}{5}$	66 $\frac{2}{3}$ %	$\frac{1}{4}$	0.5
0.4	$\frac{4}{5}$	$\frac{3}{10}$	10%

0.6	$\frac{1}{4}$	0.8	33 $\frac{1}{3}$ %
$\frac{1}{3}$	50%	$\frac{1}{10}$	$\frac{3}{4}$
75%	90%	$\frac{3}{5}$	80%
50%	0.6	0.25	30%

Algebra Match

$a+b-a$	$b+a-b$
$a-b$	$a+b$
a	b
$3a-b$ $+2(b-a)$	$2a-3a+2a$

$2(a-b)$ $-(a-2b)$	$2(a+b)$ $-a-b$
$b-a$ $+2(a-b)$	$2a+b$ $-a-2b$
$2(a-b)$ $+(b-a)$	$2a-b$ $+2b-a$
$2(a-b)$ $+(3b-2a)$	$2(a-b)-a$ $+3b-a$

Simplifying Doughnut

$\frac{a^2-b^2}{a+b}$	$\frac{a+b}{a-b}$	$b-a$	$\frac{ab^2}{ab}$
$\frac{b(a-b)}{a(a-b)}$	$\frac{a^2-b^2}{a^2-b^2}$	$a-b$	$\frac{a^2b}{a^2b}$
ab	$\frac{a}{b}$	$\frac{(a-b)^2}{a-b}$	$\frac{a^2b^3}{ab}$
a^2+b^2	$\frac{a^2b^2}{a^2b}$	$a+b$	$\frac{b^2-a^2}{a+b}$

$\frac{b}{a}$	$a+b$	$\frac{a-b}{-(a-2b)}$	$\frac{(a+b)^2}{a^2-b^2}$
$\frac{a^2b}{ab}$	$\frac{a(a+b)}{b(b-a)}$	$\frac{a^3b^2}{ab}$	b
$\frac{a^2b^2}{a^2}$	$\frac{a^2b}{ab^2}$	$b-a$	$\frac{a(a-b)}{b(a-b)}$
$\frac{a(2a+b)}{-2a^2}$	$\frac{(a-b)^2}{(a-b)^2}$	$\frac{a(b+1)}{-ab}$	$\frac{(2b+a)}{-(2a+b)}$

learning goals -in

Understand how to create opportunities for student voice, foster collaboration and assign competence to students as doers of mathematics.

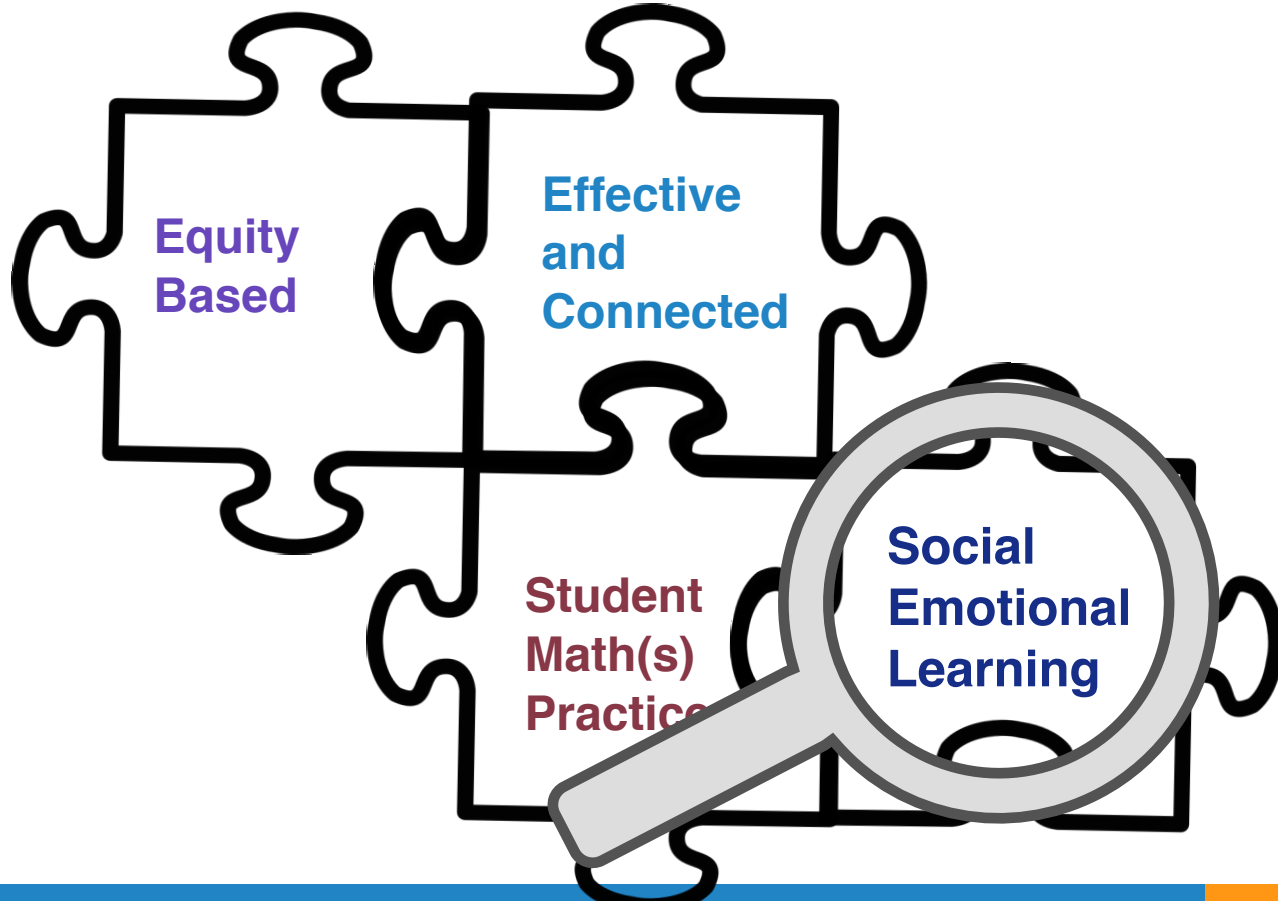
Go deep with the mathematics of the task(s) assigned and SMP1, make conjectures, plan solution pathways, monitor/evaluate progress and change course as needed.

fun (?)



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+ + puzzle pieces



something to 🤔 about



SEL4MA
@SEL4MA



#sociallearning Look at any newspaper today. Name the **#SEL** skills that would have helped to resolve the situation. Seriously. Try it.

7:06 PM · Sep 21, 2019 · [Twitter for iPhone](#)

Sneak Preview SMPs+SEL (soon at normabgordon.com)

Make sense & persevere

①



Reason abstractly & quantitatively

②



Construct arguments & critique

③



Model with mathematics

④



Use appropriate tools strategically

⑤



Attend to precision

⑥



Look for and make use of structure

⑦

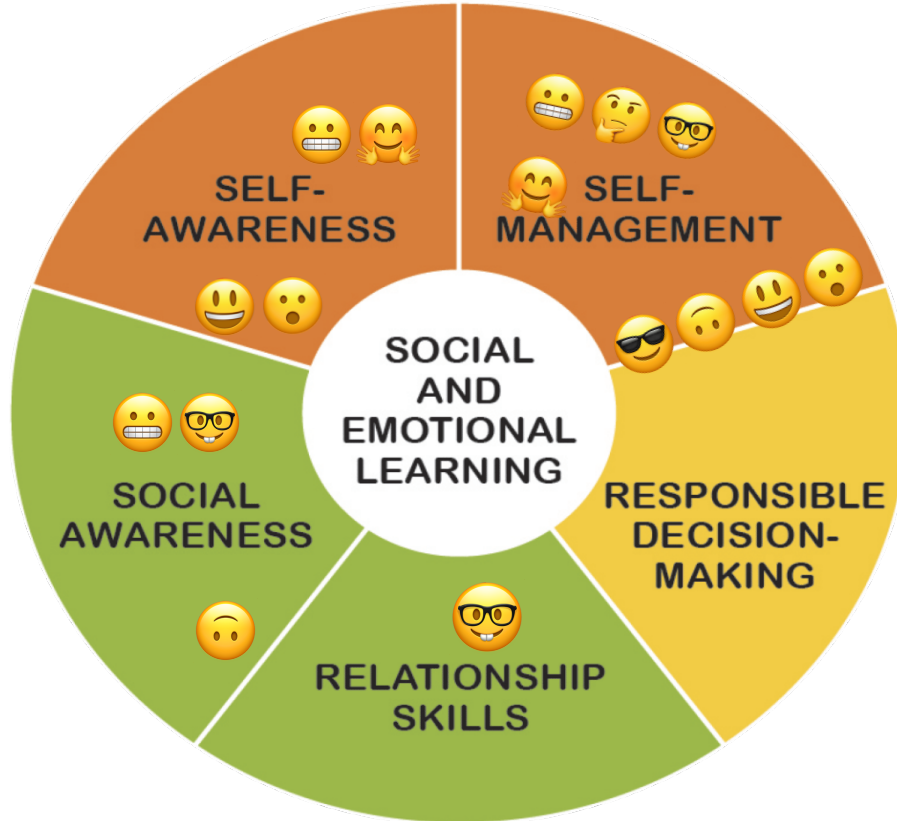


Use repeated reasoning

⑧



Sneak Preview SMPs+SEL (soon at normabgordon.com)



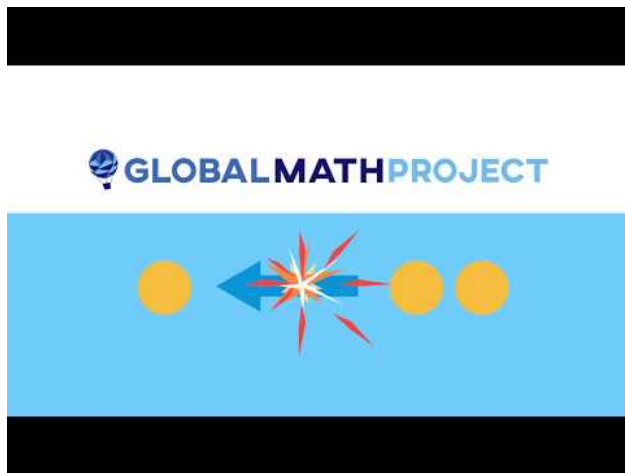
Feedback appreciated

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➡ **3 surprises**

➡ **2 things to try**

➡ **1 wondering**



globalmathproject.org



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