



For the **Love** of Math
Mathematical
Mindsets to
Promote **Equity**

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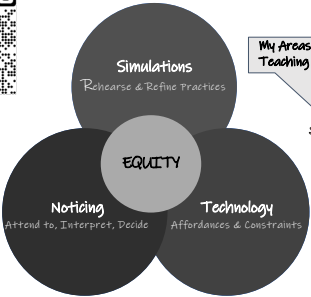
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Moment of Silence



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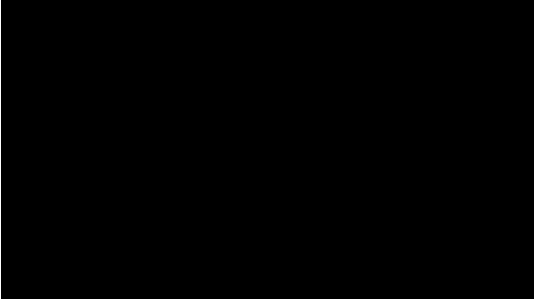


My Areas of Interest in Teaching & Research



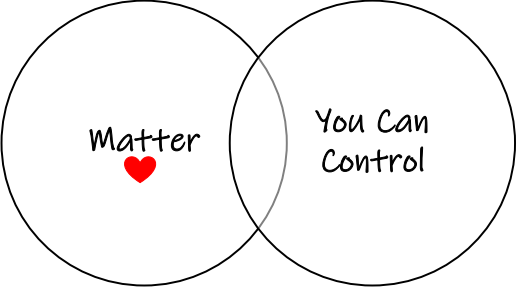
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Know Your Why



4

Things that...



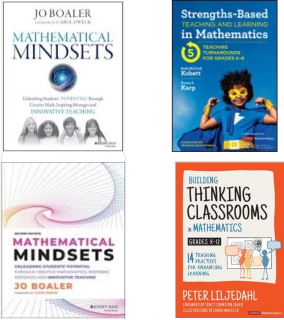
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Agenda

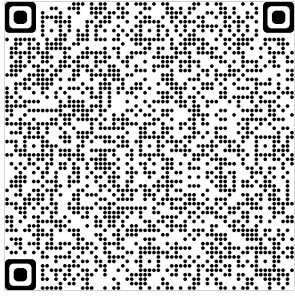
Mathematical Mindsets

- Complex Instruction
- Strength-Based Pedagogy

Becoming a More Equitable Educator course by MIT



6



Mathematical Mindsets:
 Unleashing Students' Potential
 through
 Creative Mathematics, Inspiring
 Messages, and Innovative Teaching

By: Jo Boaler

<https://tinyurl.com/3w3rev32>

7

Mathematical Mindset Practices

- Growth Mindset Culture
- Nature of Math
- Challenge & Struggle
- Connections & Collaborations
- Assessment

8

Growth Mindset Culture

- Mindset Messages
- Praising the Learning Process
- Students' Mindsets

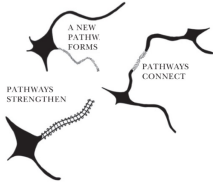
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Growth Mindset Culture



Mindset Messages:

- Teacher gives *explicit messages* about brain growth, challenge, etc.



10

Growth Mindset Culture



Praising the Learning Process:

- Providing *space & time* for students to grapple *on own or w/peers* & to *share* their thinking w/each other



11

Growth Mindset Culture



Students' Mindsets:

- Students sharing thinking, *even if it differs* from others
- Who shares? *Every student*
- Physically, visually* model their ideas
- Students feel *freedom, ownership of the physical space* to share their ideas *w/o asking permission*



12

Growth Mindset Culture

Things to *avoid*:

- Moving forward as soon as the *correct answer* is shared.
- Only valuing *one method or representation*.



13

Growth Mindset Culture

Discuss:

- *In what ways do you maintain classroom norms that foster a growth mindset culture throughout your math class?*

14

Nature of Math

- Open Tasks
- Reasoning & Multiple Perspectives
- Depth Over Speed

15

Nature of Math



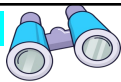
Open Task:

Jo Boaler's suggestions to open mathematics tasks:

1. Task has multiple *methods, pathways, representations*
2. Give task *before* instruction
3. Add *visual* component, ask students how they *see it*
4. Make it *lower floor* and *higher ceiling*
5. Ask students to *convince peers, share reasoning, be skeptical*

16

Nature of Math



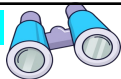
Open Task:

Jo Boaler recommended resources:

- Youcubed: www.youcubed.org
- Piddle Math: <https://mathpiddle.com/>
- Balanced Assessment: <http://balancedassessment.concord.org>
- Math Forum: www.mathforum.org
- Shell Center: <http://map.mathshell.org/materials/index.php>
- Dan Meyer's resources: <http://blog.mrmeyer.com/>
- Geogebra: <http://geogebra.org/cms/>
- Video Mosaic project: <http://videomosaic.org/>
- NRich: <http://nrich.maths.org/>
- Open Middle: <https://www.openmiddle.com/>
- Estimation 180: <http://www.estimation180.com>
- Visual Patterns (grades K-12): <http://www.visualpatterns.org>
- Number Strings: <http://numberstrings.com>
- Mathalicious (grades 6-12); real-world lessons for middle and high school: <http://www.mathalicious.com>
- NCTM: www.nctm.org
- <http://illuminations.uttm.org>

17

Nature of Math



Open Task:

- NCTM Community resources:

<https://docs.google.com/spreadsheets/d/1sKz7p4yNnFAIBQW05iU7tGLqc7x9aySEwhCNTJNzIGM/edit?usp=sharing>

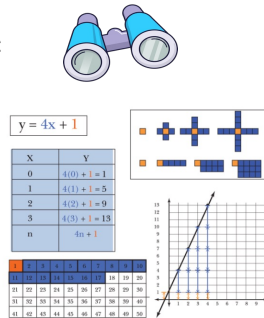


18

Nature of Math

Reasoning & Multiple Perspectives:

- Approach tasks in *multiple* ways
- Various approaches are *valued & explored*
- Access to *resources & materials*
- Students *expected & explicitly invited* to share *multiple ideas*
- Students expected & explicitly invited to *justify reasoning*

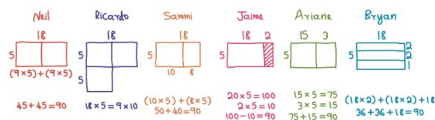


19

Nature of Math

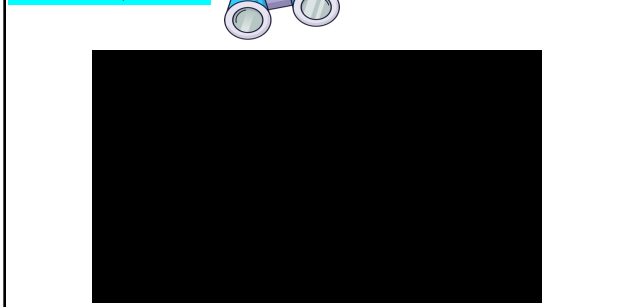
Depth Over Speed:

- *Encourage & makes time* for students to be *curious* about the *task* & their *peer's ideas*
- Encourage class to come to *a consensus* via *justification* (convincing the class), rather than focusing on answers
- *Consensus* comes from the *students*, not the teacher



20

Nature of Math



21

Nature of Math

Things to *avoid*:

- *Prescribing* or *leading* students to a particular method or strategy.



22

Nature of Math

Discuss:

- In what ways do you maintain an emphasis on *multiple approaches, strategies, and ideas* throughout your math class?

23

Challenge & Struggle

- Mistakes
- Struggle & Perseverance
- Questioning

24

Challenge & Struggle



Mistakes:

- *Space & time* provided for thinking to evolve, without undue pressure of finished, correct answer
- Mistakes are *valued & explored*



25

Challenge & Struggle



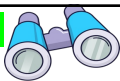
Struggle & Persistence:

- Providing space & time for students to:
 - *grapple* with task
 - *share* their thinking with each other



26

Challenge & Struggle



Questioning:

- Teacher asks *deep thinking* questions that *center* students' *current thinking* before pushing them in new directions, encourages *multiple ways of thinking*, and require *justification*, such as:
 - "What do you notice? What do you wonder?"
 - "What are you trying to figure out?"
 - "Do you agree with ____?"
 - "Does anyone else think it's something different than ____?"
 - "How can you prove it?"
 - "How do you know?"

27

Challenge & Struggle

Things to *avoid*:

- *Intervening* or *moving on* before students have had adequate time to struggle



28

Challenge & Struggle

Discuss:

- *In what ways do you shift students' expectations away from step-by-step assistance?*

29

Connections & Collaborations

- Mathematical Connections
- Connecting in Small Groups
- Connecting as a Whole Class

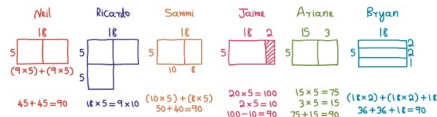
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Connections & Collaborations



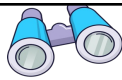
Mathematical Connections:

- Students have **resources & time** to try out different methods
- Connections made **between methods & representations** in synthesis discussions



31

Connections & Collaborations



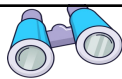
Connecting in Small Groups:

- Collaborate & build off each other's ideas in small groups
- All students within a group are involved



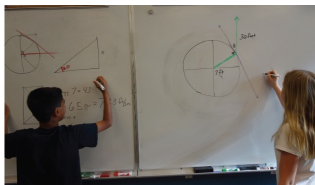
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Connections & Collaborations



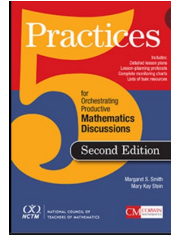
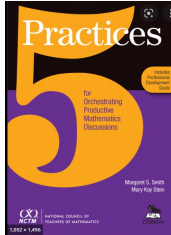
Connecting as a Whole Class:

- Students talk directly to each other, instead of relying on teacher to mediate



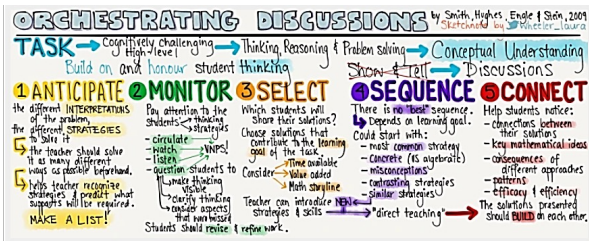
33

Connections & Collaborations



34

Connections & Collaborations



35

Connections & Collaborations

Things to *avoid*

- **Over-revoicing** sharing & connecting students' ideas & thinking in your own voice, without asking them to share their thinking



36

Connections & Collaborations

Discuss:

- *In what ways do you make student thinking and voice the focus of conversations and tasks?*

37

Assessment

- What: Multiple Forms of Assessment
- When: Frequency of Testing & Grading
- How: Nature of Feedback



38

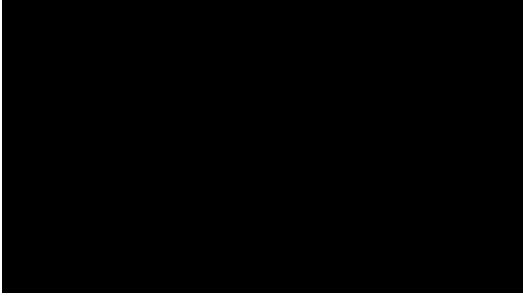
Assessment

If grades required:

1. Always allow resubmit, any work or test
2. Share grades w/administrators, not w/ students
3. Use multidimensional grading
4. Do not use 100-point scale
5. Do not include early assignments in end-of-class grade
6. Do not include homework, if given, as any part of grading.

39

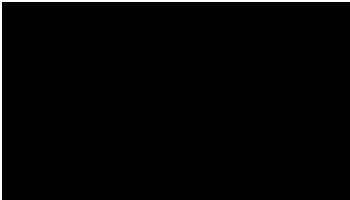
Four Key Mindset Ideas (8 minute summary)



40

Building Thinking Classrooms

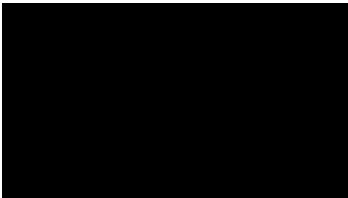
<https://buildingthinkingclassrooms.com/14-practices/>

41

Becoming a More Equitable Educator course by MIT

<https://openlearninglibrary.mit.edu/courses/course-v1:MITx+0.503x+T2020/about>

42

Becoming a More Equitable Educator course by MIT

Educator Mindsets for Equity

Navigating the chart: The chart can be read from left to right. Each mindset has an orientation (common ideas or thought patterns), an explanation of the orientation (describing the reason behind the thought pattern), and a consequence that results from the mindset.

Mindset	Orientation	Explanation	Consequences
EQUITY	Structural injustices distort success	See society as benefiting some and disadvantaging others	Low academic performance analyzed through lens of societal inequities and individual needs
EQUALITY	Everyone has a chance	View societal systems as basically fair or just	Low academic performance explained with "blame the victim" approach
ASSET	Student Potential	Identify and build on students' strengths	Culturally diverse students receive challenging and meaningful curriculum
DEFICIT	Student limitations	Students framed by shortcomings relative to school standards	Culturally diverse students taught with less rigor and lower expectations
AWARE	Courageous conversations	Understand student background informs learning	Consider race and other demographics in instruction and decision making
AVOIDANT	Deny difference	Do not recognize role of student background	Ignore race and other demographics in instruction and decision making
CONTEXT-CENTERED	Look at lived realities	View academic success as product of totality of students' daily lives	Students' lives in local context taken into account
CONTEXT-NEUTRAL	Focus on classroom	View schools and classrooms as closed systems of learning	Students' everyday interactions outside of classroom ignored

43

Becoming a More Equitable Educator course by MIT

Equality vs. Equity: An equality perspective argues that all students should be treated the same, whereas an equity perspective argues that students should be treated differently, and sometimes given additional resources, based on their needs.

44

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Deficit vs. Asset: A deficit perspective focuses on how educators can "fix" students by changing their behavior and attitudes, whereas an asset perspective focuses on how educators can recognize and build on students' existing strengths.

45

Becoming a More Equitable Educator course by MIT

Avoidant vs. Aware: An avoidant perspective explicitly avoids mentioning or considering race to be racially unbiased, whereas an aware perspective acknowledges the role that race plays in students' experiences in schools and seeks to explicitly name and disrupt system that perpetuate racial inequity.

46

Becoming a More Equitable Educator course by MIT

Context-Neutral vs. Context-Specific: A context-neutral perspective maintains that "good teaching" is the same in all contexts and educators do need to adjust their curriculum and instruction to reflect the community students are in, whereas a context-specific perspective argues that communities and home-lives affect learning and thus these need to be integrated these into teaching.

47

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48
