Jo Boaler's Common Ground Talk Notes

The Myth of the Math Brain: Inspiring a Growth Mindset

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Math Mindset:

- The myth of the math person
    - No one is born with a math brain, no one is born without. There is no such thing as a math person. What we believe will change our cognition.
    - Brain plasticity: everyone's brain can grow and change. Neuroscience confirms that our brains are "plastic" and when we create new neural pathways, our intelligence increases.

- Students with growth mindset outperform those with a fixed mindset in math.

- Students of color and girls show sharpest increase in achievement with mindset interventions.

- Everytime we make a mistake a synapse fires. 2 possible synapses- the first comes when we make a mistake, the second comes when we are aware we have made a mistake. Less growth when answers are correct. When your brain is struggling, you are challenged and growth occurs.

- Everything changes when we believe our brains grow and change and we have unlimited potential our brains will react differently and grow.

- Giftedness is harmful to students. If you believe you are gifted, then to struggle is devastating.

- Tell kids you believe in them and their potential is unlimited. This is called the butterfly effect of belief and change. "I am giving you this feedback because I believe in you" is a good message to give your child/students.

- Math appears harder than other subjects because of the way it's taught in the U.S. When you teach it well, it's no harder than anything else. The myth that math is harder and is just for "some" students is harmful. These ideas need to change. These are western myths and don't exist everywhere.

- Grades give fixed mindset message. Instead narratives on what materials the student knows and doesn't know is more helpful. Students belief in their own ability declines steadily from 5th to 12th grade. Grades give ego feedback that is damaging to learn.

- Parents' beliefs about math change their children's achievement. In a study of grade 1 and 2 students, parents' math anxiety influenced the amount their children learned over the school year (more parental anxiety = less growth). Parents' math knowledge, however, had no impact on student performance. The findings applied only when parents helped with homework.

- Speed and pressure blocks math processing in the brain. Early onset of math anxiety is timed test. What is important is deeply understanding things and their relations to each other. This is where intelligence lies. The fact of being quick or slow isn't really relevant. Don't value speed; value struggle, depth, creative representation of ideas.

We need to stop associating math with speed and
discouraging the deep, slow thinkers who we need going forward in math.

<u>What we can do:</u>

If we want to change students' mindsets we have to change mathematics teaching in classrooms & homes. How do you maintain a growth mindset when math class is a series of closed questions that you get right or wrong? Those questions, themselves, transmit fixed ideas about math learning. Math is visual and open. Tasks need to give students the space to learn.

Brian connections develop as students get older. Children between the ages of 8 to 12. As they learn and develop, the brain becomes more interactive. The connections between symbolic and visual representations of numbers: ex: 4 and **** Teaching number sense (number lines, math bingo, math games, how numbers relate) is the best way to increase math intelligence.

Finger perception improves math achievement. Finger perception in grade 1 is a better prediction of math achievement in grade 2 than test scores. College students perception

predicts calculation scores. Work on improving finger perception in your child/student. Fingers should be the link between numerical quantities and their visual representation. Fingers should be the physical support for learning arithmetic problems. Schools should have a greater focus on finger discrimination.

Productive practice: seeing an idea in different ways, different forms and representations, not the repetition of on ida in near identical questions. Questions for students: How do you see the idea? Why do you think this method works? How are these methods connected to each other? How can these ideas be represented in different ways? Why does it make sense?

When we make these changes, we don't just give our children higher test scores, we give them an intellectual empowerment that they can take into the rest of their lives.

Apps & games recommended: Wuzzit Trouble, Motion Math and www.mathbreakers.com.

Helping with math at home

Don't	Do
Emphasize speed	Emphasize depth and creativity
Use flash cards	Give practice through exciting apps and games
Use "smart" praise	Praise what children have done/learned
Encourage drill and practice	Encourage conceptual thinking

Go to YouCubed for activities, videos, parent games and more information on math mindset.

Benefits of YouCubed math lessons:

- Students engage more actively in math lessons
- They believe that math is a subject of ideas, not procedures
- They stop fearing math
- They have a growth mindset

Handout given to attendees at the talk: "Advice for Parents, from Professor Jo Boaler" - https://bhi61nm2cr3mkdgk1dtaov18-wpengine.netdna-ssl.com/wp-content/uploads/2016/03/Parent-Night-Handout-vF-1.pdf

Discussion questions for the small groups:

- What thoughts about your own experience learning math did Dr. Boaler's findings elicit?
- Dr. Boaler is an opponent of several popular components of traditional math instruction, including leveled courses and traditional grades. How important are these components to your child's educational experience?
- What practices have you used to help your child develop a growth mindset? Do you model the idea that "anyone can learn anything"?
- Does your child approach math differently than any other subjects?
- What sources of information are most helpful as you gauge your child's progress in math?