Math People:

Neuroscience, math anxiety and positive learning experiences for students and teachers who aren't sure they *are* math people

First Literacy - March 2023

About Me:

Former self-described “non-math-person” turned enthusiastic math teacher; program coordinator, writer-trainer-consultant; brain-geek and life-long learner.

I believe in reflective practice, my students, and color-coded spreadsheets.

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Agenda

- What Does ‘Not A Math Person’ Even Mean?
- What We Really Teach, when We Teach Math
- Neuroscience & Research Highlights
- Math anxiety strategies & responses
- Gifts of Our Experience
- Creating Positive Math Learning Environments
- Putting it into Practice

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We hear the phrase “not a math person” a lot. What does it even mean?

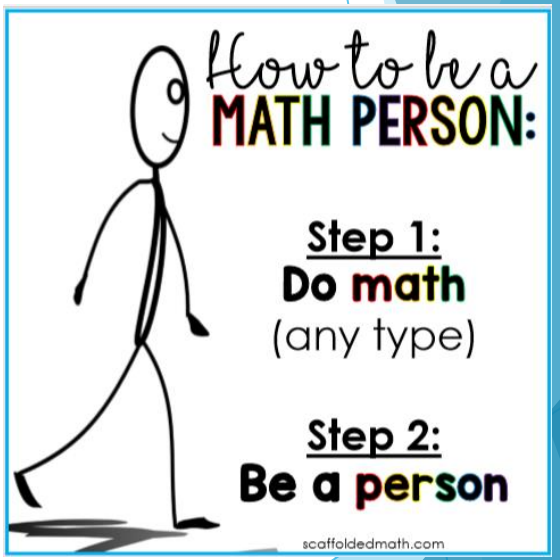
If “not a math person” means…

“Someone who doesn’t enjoy or seek out math”. No problem, we all have different preferences. (Although you might find math isn’t all bad)

“Someone who has struggled with math in the past” Sure, that might be your experience. (Although it could be different now)

“Someone who can’t learn math” or “

The research does not back this.



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What We Really Teach, When We Teach Math

Hidden Curriculum

"**Hidden curriculum** refers to the **unwritten, unofficial, and often unintended lessons, values, and perspectives that students learn in school**. While the "formal" curriculum consists of the courses, lessons, and learning activities students participate in, as well as the knowledge and skills educators intentionally teach to students, the hidden curriculum consists of **the unspoken or implicit academic, social, and cultural messages that are communicated to students while they are in school.**"

-EdGlosary.org

What we really teach, when we teach math

Mini-Reflection: What “unwritten, unofficial, and often unintended lessons” did you and/or your students learn about or through math?

Take a minute to (privately) journal. Use paper or this document with prompts.

https://docs.google.com/document/d/1kMHBYVGdGVxj5tnCreGtFYKxxTJhklyhHaffxVCwJsU/copy

Messages might include...

"Some people are smarter than others"

"Faster is better"

"You either get it or you don't"

"There's only one right answer/way"

(Ick. This is not a worldview I want to teach)

What we really teach, when we teach math

The ‘hidden curriculum’ is often unintentional … but we can be intentional

Key question: What are the values or messages we want to teach, when we teach math?

What we really teach, when we teach math

- On the same paper or document as your mini reflection, finish this sentence stem:

When I teach math, I want to teach my students …

Messages might include...

You can do things you thought were impossible (or at least really, really hard)

Everyone can learn. And, we often learn in different ways.

There are multiple/different ways to do or see things

If you don't get something the first time, you can still get it

Math, brains and neuroscience

Neuroplasticity

- Our brains grow new connections as we use them
- This continues our entire lives
- It can contribute to feedback loops

Working Memory

- Our brains are amazing, and can learn/store massive amounts

but …

- We can only hold **4-7 things in working memory** at the same time
- If we spend some of that on stress, worry, etc. about math, that's less working memory available to do math

Math Anxiety & Fight, Flight or Freeze

- Many people experience math anxiety. It can trigger the threat circuits in the brain
- When we are in fight-flight-freeze/crisis/freakout modes, our brains reallocate power away from big picture/learning and towards survival

(This was a good plan, when the threat was saber toothed tigers)

But... The Neocortex!
(Also, again, neuroplasticity)

With awareness, we have some control over where we focus (what's occupying our working memory) and can learn to manage anxious responses.

Because our brains are plastic, the more we do this, the stronger that pathway becomes

Big Ideas

Math anxiety is acquired... not an inherent personality trait.

Our brains are always capable of changing.

Anxiety is not fun, but we can respond in ways that help.

What helps: Mindfulness

Mindfulness does not have to mean meditation

Awareness (of how we respond in general, how we are responding in the specific)

What helps: Mindfulness

Stress management techniques

Slow/controlled breathing can activate physical anti-stress responses

What helps: Unloading

How: Some studies show that writing about it before a test helps concentration and performance

Why: Free up working memory

What helps: Time

Why: Reducing sense of pressure/performance

Why: Can use that time to try a strategy, take breath etc.

What helps: Wait Time

How: Teachers can extend wait time at least 3-5 seconds after a question

How: Classes can use response structures like think/pair/share that build in processing time

How: Classes can favor untimed or flexible assignments and assessments

What helps: Attitude & Approach

- Reframing stress can help
- Our mindsets/attitudes/ expectations impact how we respond to setbacks or challenges (self-fulfilling prophecies)

What helps: Positive Learning Experiences

Because: neuroplasticity.

Positive experiences help build new associations… also, confidence.

Topic Rotations

As a group, brainstorm what each of these might look like in your classrooms.

Rotate to the next topic; read the responses of the previous group. Add a star to indicate agreement and add any new ideas

The Gifts of Our Experience

“In most cases, **strengths and weaknesses are two sides of the same coin.** A strength in one situation is a weakness in another, yet often the person can't switch gears. It's a very subtle thing to talk about strengths and weaknesses because almost always they're the same thing.”

- Steve Jobs

Jamboard Brainstorm

Add your ideas about the strengths or challenges that different past experiences might give someone teaching math.

The first slide has instructions for using the sticky note tool.

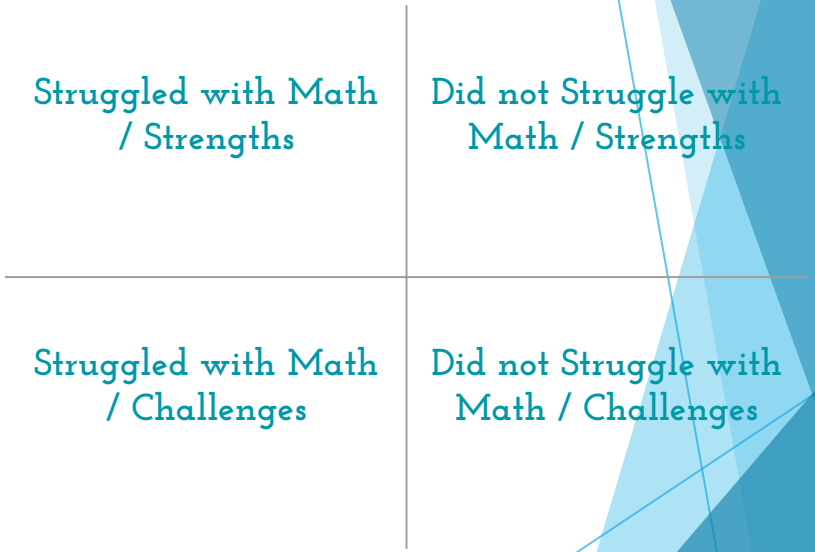
There are two content slides: someone who has struggled with math; someone who has not. You can move back and forth using the arrows at the top of the screen.

Please try to add some ideas for each category. You may work in any order or skip around.

Break Out Group Discussion

Reflection: Choose 1 set of experiences to think more deeply about.

What might it look like to either **address challenges** or **build intentionally on strengths**?



If you have struggled with math, your gifts might include:

- ❑ Empathy
- ❑ Insight & Awareness
- ❑ Creativity & Openness
- ❑ Modeling strategies/ productive struggle / resilience

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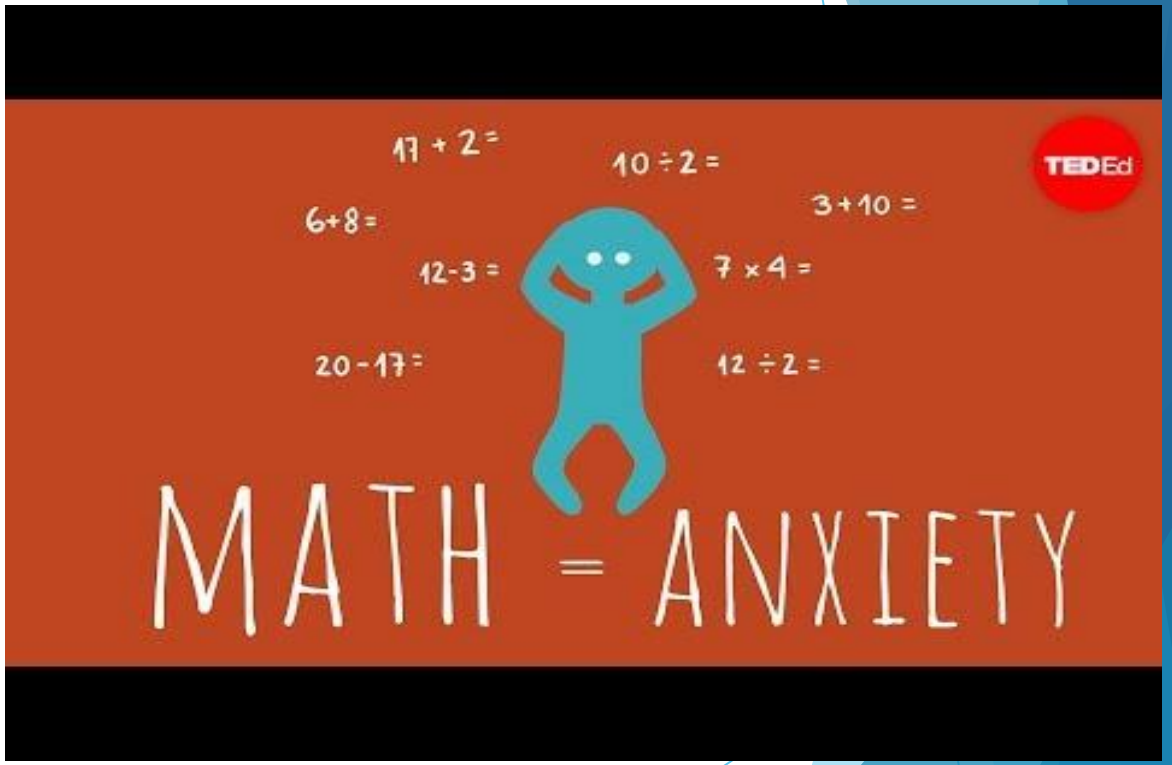
Supporting Students

Talk about it

(or play a video and let someone else talk about it)

My playlist



Pay Attention to Classroom Culture

- Challenge ideas/language around “math people” or “just not good at…”
- Reward effort, creativity, perseverance rather than speed
  - Wait time
  - Feedback
- Normalize struggle
  - Neuroscience: mistakes help you learn
  - Share stories of struggle -> success

Teach Strategies Students Can Use

- Stress/Anxiety Strategies:
  - Breathing
  - Writing about it
  - Focus techniques
  - Etc.
- Problem Solving Strategies
  - Re-read
  - Sketch/Diagram/Visuals
  - Benchmarking/Estimating
  - Etc.

Connect to something you/they ARE excited about

My formula:

Content I'm excited about + simple survey =

Graphs OR fraction OR ratios OR percents OR averages OR decimal number lines OR integers OR statistics OR …

Planning Guide

Putting it in to Practice

Three Question Action Planning

What could you stop?

What could you tweak or change?

What could you start?

… To improve your math teaching practice?

Following Through

- Please use the chat to share one step you'll take to follow up on our conversation

- If you would benefit from an encouraging nudge or other follow up from me, please share your email: https://forms.gle/Etwfz7KsycyXriBz8

Thanks & Stay in Touch

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We want your feedback.
Insert evaluation link

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