Supporting Students with Mathematics Anxiety

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Overview

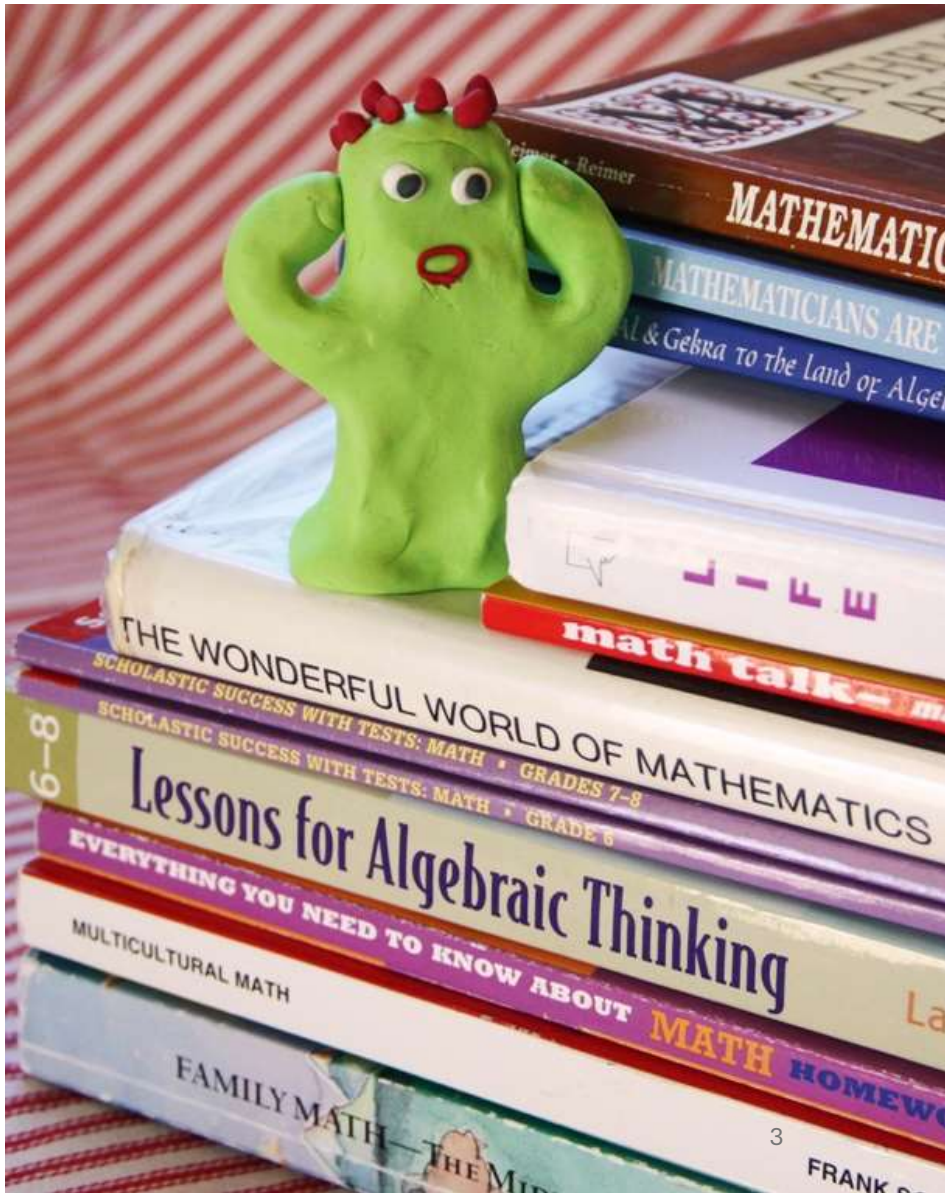
1. What is maths anxiety?
2. What causes maths anxiety?
3. How does it affect students?
4. How can teachers/schools help alleviate it? Suggested strategies and resources
5. Q&A

Mathematics anxiety

What do you mean?

How does maths make you feel?

- ✓*Nervous*
- ✓*Uncomfortable*
- ✓*Inadequate/useless/stupid*
- ✓*Fearful*
- ✓*Hate it*
- ✓*Panicky*
- ✓*Avoid it*



Mathematics anxiety

What do you mean?

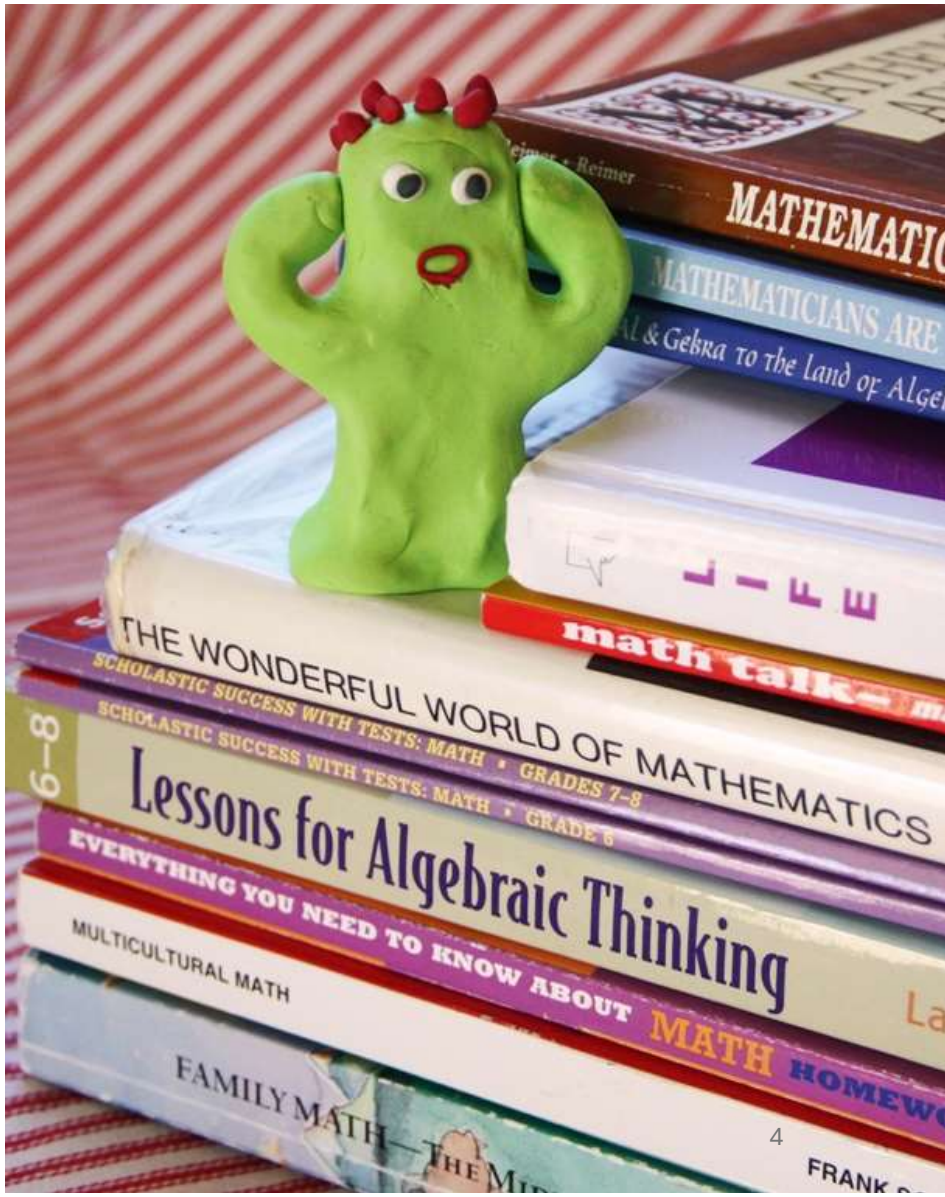
How does maths make you feel?

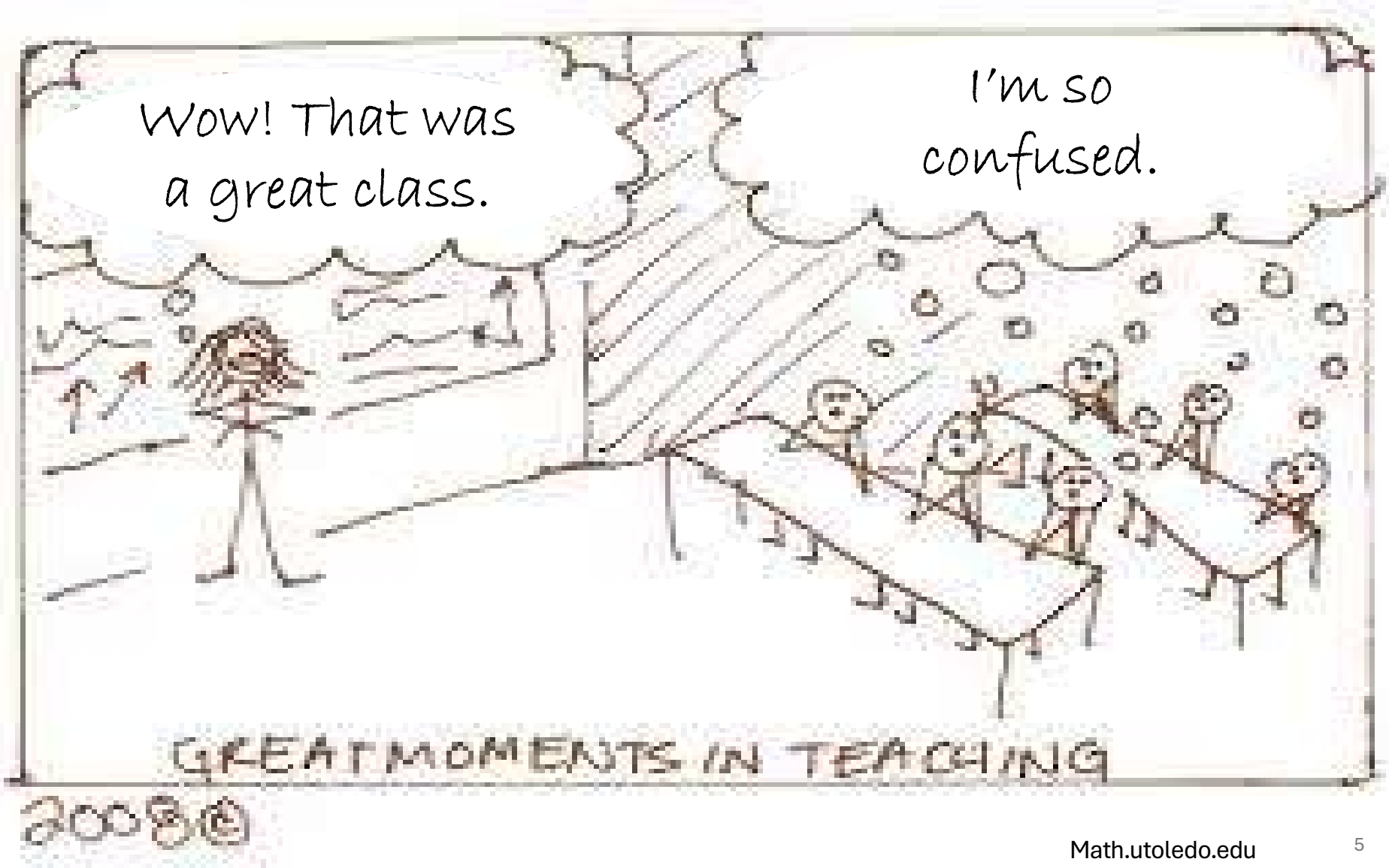
'I don't like maths'

'I can't do maths'

'I don't have a maths brain'

'None of my family is any good at maths'

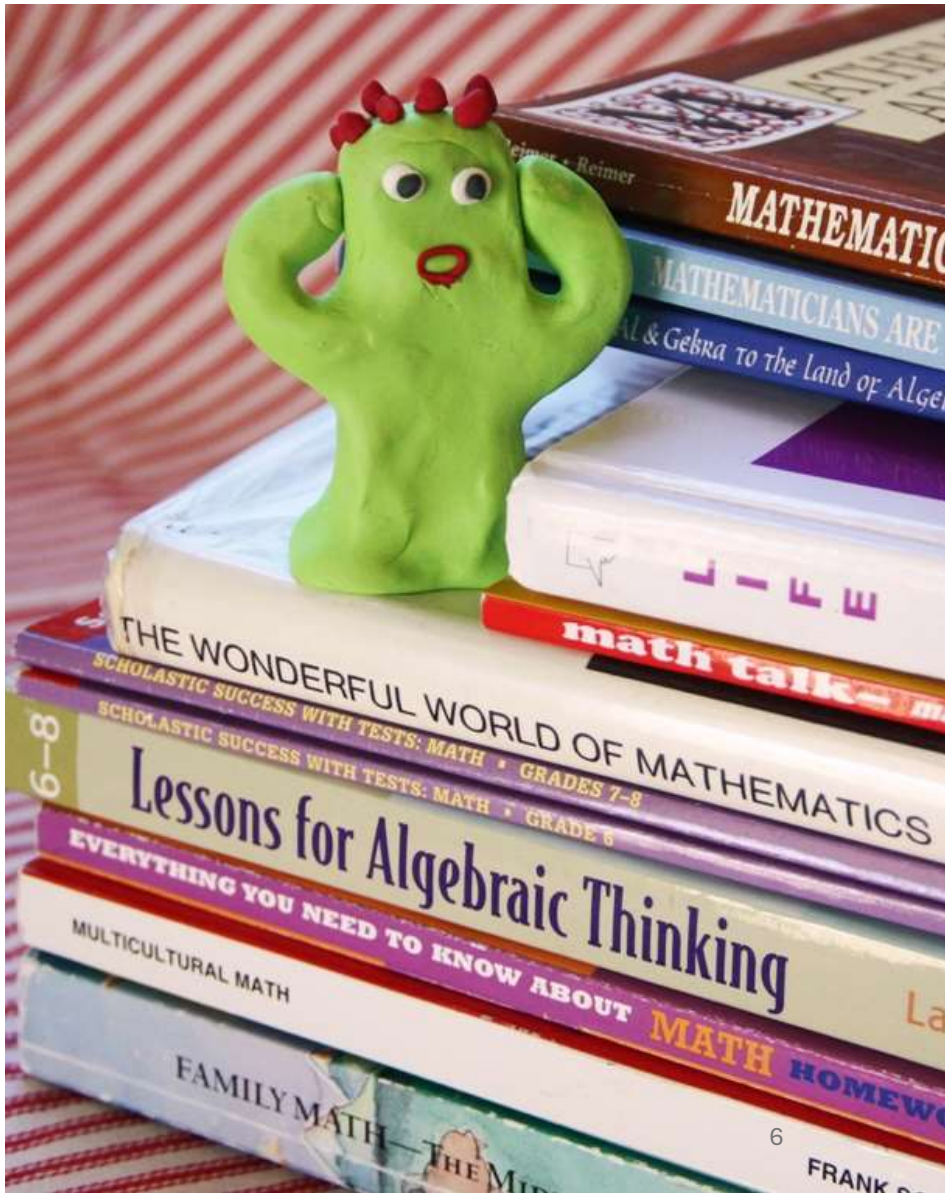



Wow! That was a great class.
I'm so confused.
GREAT MOMENTS IN TEACHING
2008©

1. What is maths anxiety?

"feelings of tension and anxiety
that interfere with
the manipulation of numbers
and the solving
of mathematical problems
in .. ordinary life
and academic situations"

Richardson & Suinn, 1972

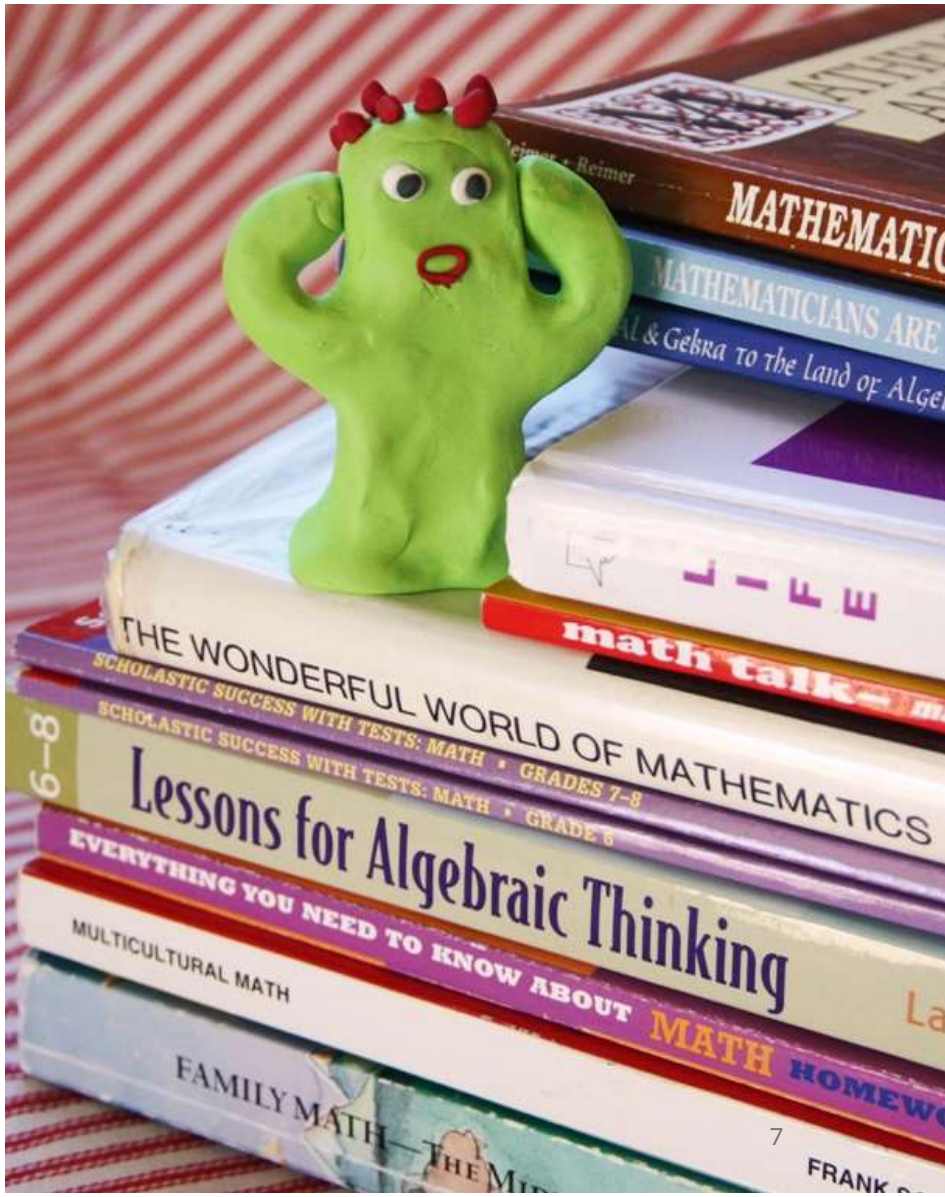


Mathematics anxiety

- Impact on performance and motivation
  - Significant negative correlation with MA
  - High correlation with test anxiety

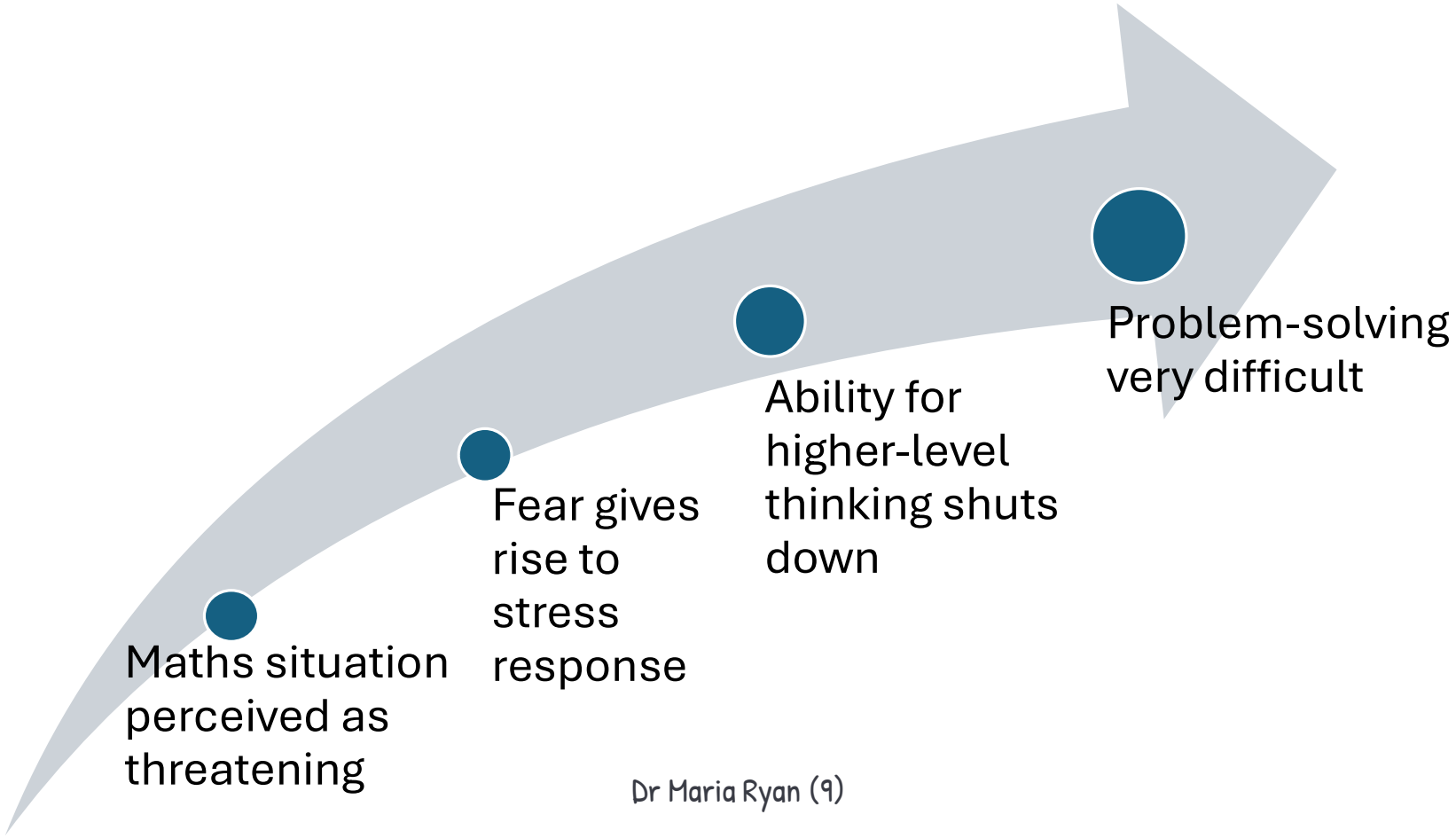
- Perceived ‘threat’ to the individual
  - Singling out
  - Evaluation
  - Humiliation

- A potentially very scary and detrimental experience



If a tiger walked into the room right now, how would you feel?

What is going on in the maths anxious brain? (1)



What is going on in the maths anxious brain? (2)

In psychological terms, we refer to the '***fight, flight or freeze***' response

- **Fight**: disruptive learner
- **Flight**: avoidant behaviour
- **Freeze**: feeling stuck where you are

(Cannon, 1915; Gray & McNaughton, 2000)

So, the maths anxious learner is feeling threatened and is panicking; they are unable to process information!

Why is maths anxiety problematic?

- Contagious and transmitted by significant people
  - Parent to child
  - Teacher to student
- Causes student to feel intimidated and helpless
- Leads to avoidance of situations involving mathematics/ being numerate
- Long term consequences of innumeracy on:
  - the individual
  - society
  - future generations

‘A child with maths anxiety might become a parent or teacher with maths anxiety’

(Santos, 2023)

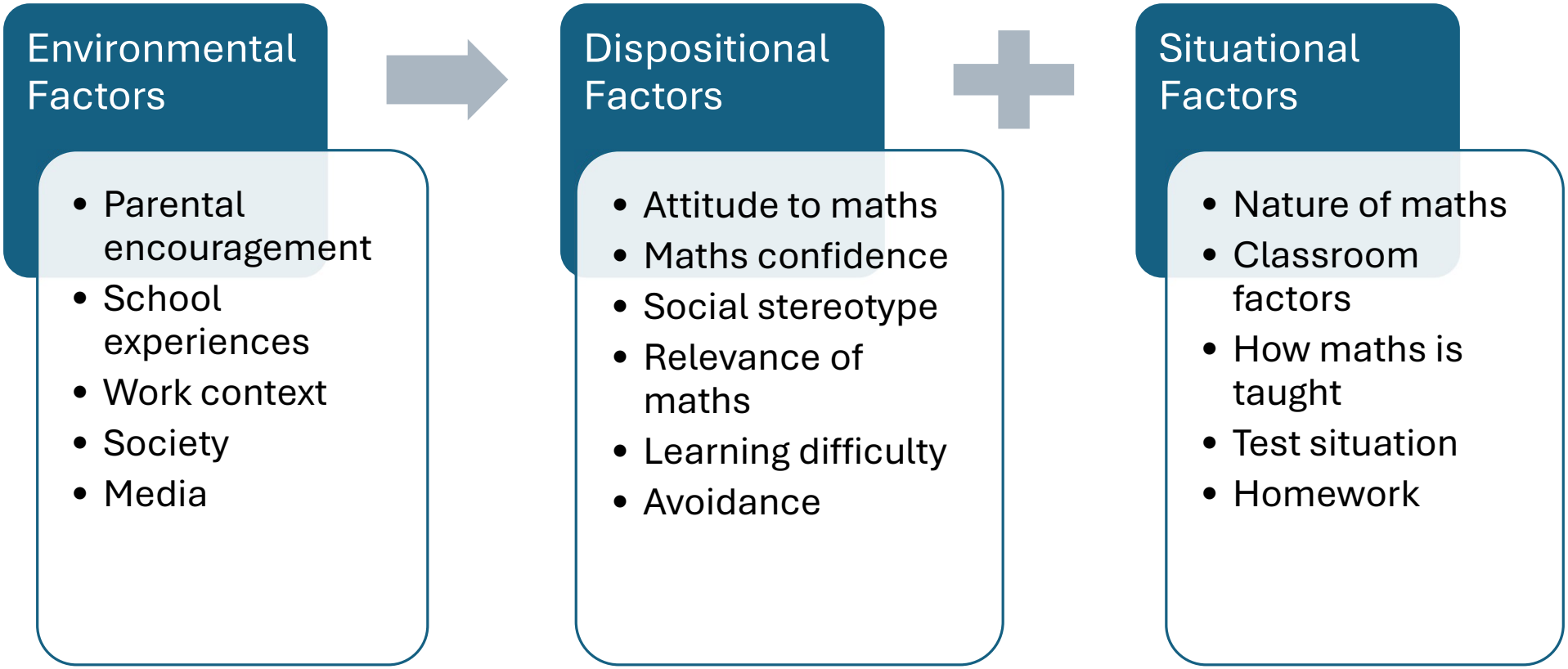
(Arem, 2009)

2. What causes maths anxiety?

✓No single cause

✓No person is to blame

What causes the mathematics anxiety reaction?



Model of a Mathematics Anxiety Reaction (adapted), Cemen, 1987; Baloglu & Kocak, 2006; Ryan 2019, 2023

3. How does mathematics anxiety affect learners?

The Highly Maths Anxious Student

- Has trouble grasping maths concepts
- Resorts to rote learning and following procedures rather than understanding concepts
- Focuses on just passing an examination
- Is less likely to seek support
- Has poor self-concept in mathematics
- Has difficulty moving on from past negative experience
- Little or no support from parents or teachers
- Tends to avoid everyday/work contexts involving calculations or numbers
- May have a learning difficulty, or specific maths learning difficulty, i.e. Dyscalculia.

What is it like for the maths anxious student?

Being left behind

Humiliated

Labelled (stupid, etc)

Not as fast as the others

Inadequate supports

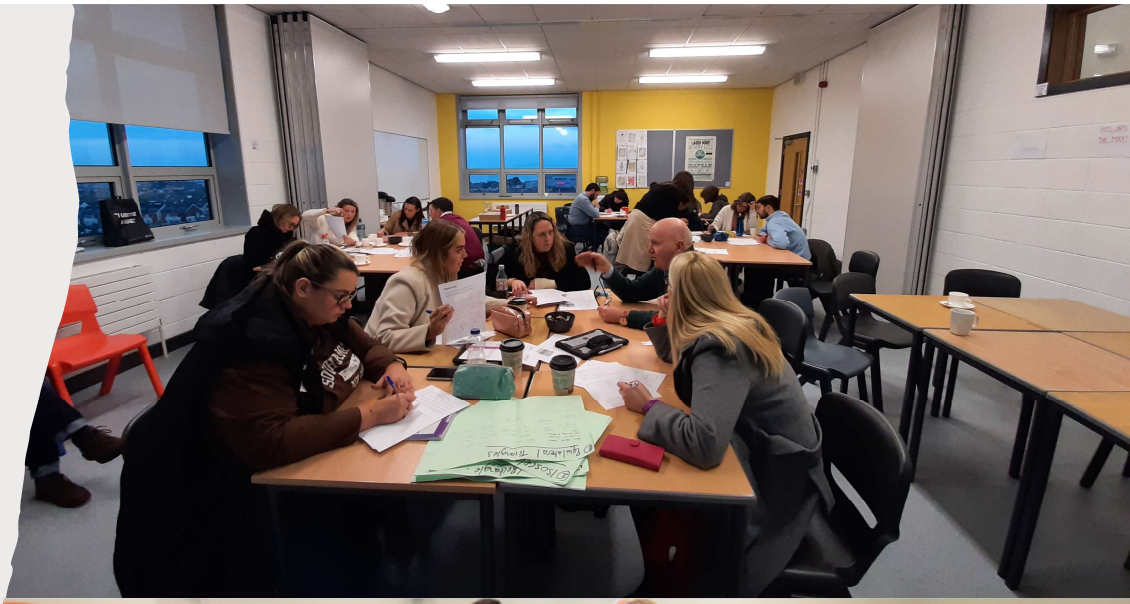
Learning difficulty – dyscalculia, dyslexia

4. How can teachers/schools help alleviate maths anxiety?

- Psychologically safe learning environment
- Understanding and empathy
  - Significance of mathematics to the student
  - Their motivation for learning mathematics
- Support and guidance
  - Start from where the student is at!
- Space to allow students to share their experiences of doing mathematics

Talking to each other

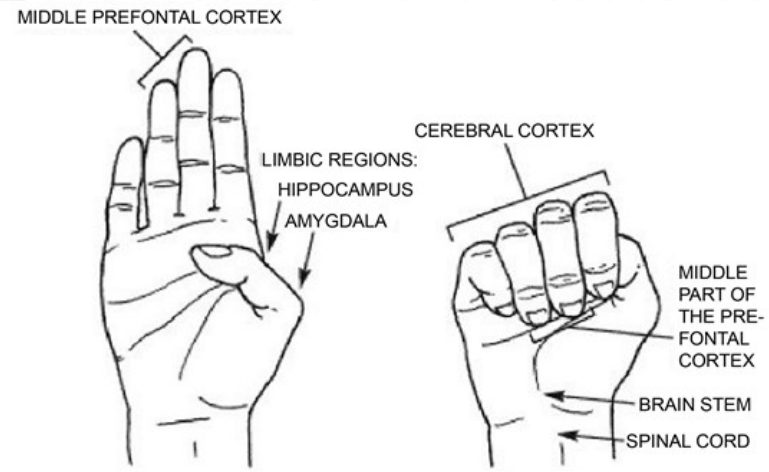
- Reflect on your own maths learning journey
  - Aim to reduce <u>your</u> MA
  - Awareness that maths anxiety is separate from maths ability
- Look for support!
  - Department level
  - Teacher CPD
  - Mathematics Networks



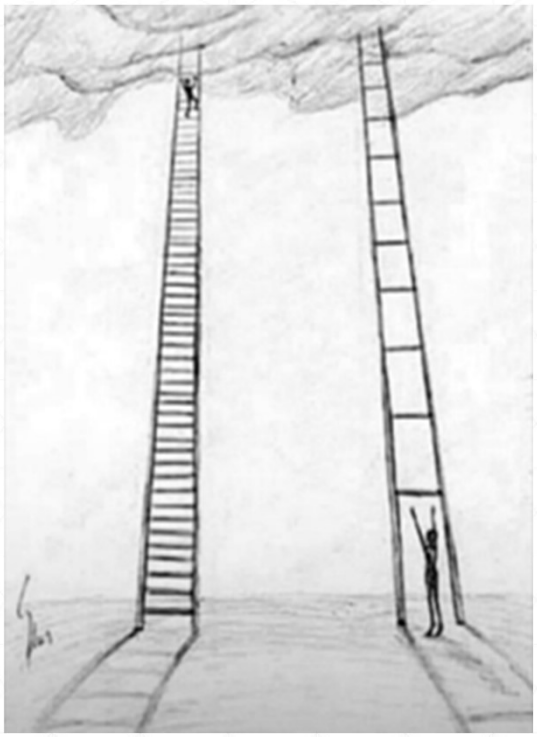
Growth Mindset

- Normalise the journey
- Start from where the MA student is at
- Set of class rules to allow for MA students to seek help
- Fostering **mathematical resilience**
  - Allow for mistakes and struggle
  - Tools, the stuck sheet
  - *'I can't do it **YET**'*
  - Valuing hard work and effort

Mathematical Resilience Toolkit (Johnston-Wilder et al., 2020; 2023)



Hand Model of the Brain (Siegel, 2010)



Ladder Model
(Bruner, 1966;
Johnston-Wilder & Lee, 2023)

Growth Zone Model (GZM)
(Johnston-Wilder et al., 2013)

Framing and Reframing Failure

- Reframe failure in a positive light reduces MA and improves student engagement and performance
- What is the goal for the learner (Achievement Goal Theory: Nicholls, 1984; Dweck, 1986)
  - Ego-oriented goals (outperforming peers)
  - **Task-oriented goals** (improving and mastering tasks)
- What is the mindset (Growth mindset theory: Boaler, 2013; Dweck, 2006)
  - **Growth mindset** rather than Fixed mindset
- Focus on **controllable inputs to learning**, not outcomes

e.g. Compile a 'Stuck Sheet'

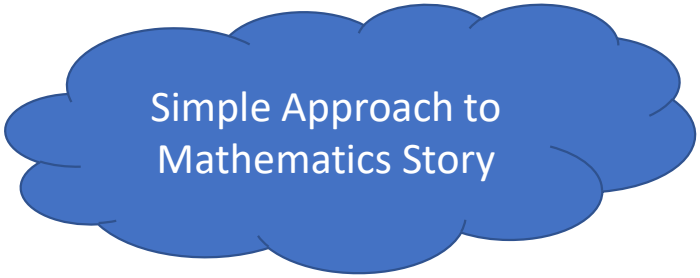
A list of ideas to help the student become 'unstuck'

Stuck Sheet

- Ask a friend
- Read the question carefully/what is being asked?
- Think about how you approached similar problems
- Look at your notes, read the textbook
- What information is important?
- What maths is needed?
- Can you express the problem another way, i.e. visually?
- Don't give up, keep on going!

(Adapted from Chisholm, 2017)

Sharing one's Mathematics Story



1. • Identify a significant mathematics moment in your life
2. • Write a few lines about it
3. • Share with the person beside you (*optional*)

Teaching for mathematical resilience

(Ward-Penny & Thomas, 2024; Johnston-Wilder & Lee, 2010,2024; Mason, 2015))

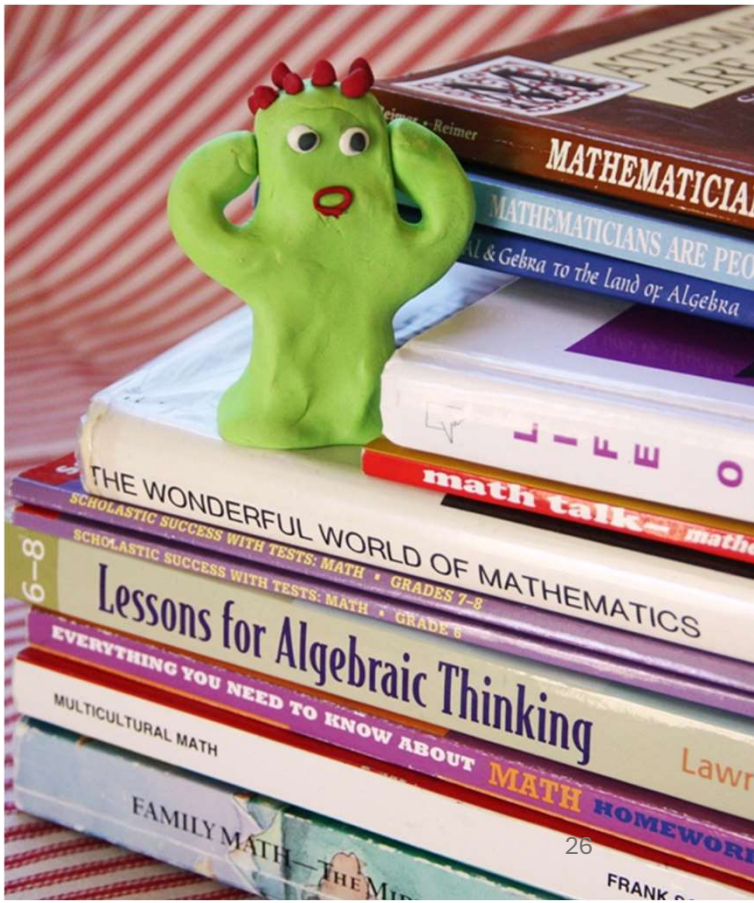
1. Create a supportive learning environment
2. Address disengagement in mathematics
3. Questioning routines to encourage thoughtful responses
4. Foster an inclusive learning environment
5. Embrace and encourage struggle – normalise it!
6. Support beyond the teacher
7. Frequent low-stakes assessment with growth-oriented feedback and without time pressure
8. Promote collaborative learning – group work and peer coaching
9. Low threshold, high ceiling tasks – every learner experiences success and challenge
10. Foster a growth mindset – encourage student reflection on their progress

Questions for practice

1. What specific strategies can you use in a maths classroom to ensure every student feels safe to ask questions, regardless of their current skill level?
2. **How can mathematical tasks be designed or presented to make maths more engaging for students who have previously struggled or shown little interest?**
3. How can you adjust your questioning in maths to involve all students, particularly those who are less confident in their abilities?
4. In what ways can you create an inclusive (mathematics) learning environment that reflects the diversity of student strengths and abilities?
5. **How do you communicate to students that struggle is a natural and valuable part of learning mathematics?**
6. What resources can you provide in the maths classroom to help students become more independent in solving difficult problems?
7. How do you ensure that feedback is constructive and growth-oriented, rather than focusing solely on correctness?
8. **How do you create a classroom culture where collaboration is valued as much as individual achievement?**
9. How do you balance the varying levels of difficulty in tasks to keep both advanced learners and those struggling engaged?
10. How do you celebrate progress and effort in your classroom to reinforce the value of persistence and learning from challenges?

If MA is not addressed …

- High levels of school leavers with maths anxiety
- More school leavers with lower maths achievement levels
- Limitations on further/higher educational prospects
- Narrower range of employment opportunities
- Greater knock-on effect on society



QR Code to **Padlet** with Resources for Mathematics Anxiety and Mathematical Resilience

Thank you!
Questions?

- Please complete this Short Questionnaire using the link or QR Code

  - 3 minutes
  - anonymous
  - voluntary

Link: https://forms.office.com/e/XRLkjKt075

Maths Teacher Journey