Mathematical Resilience

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Life-changing Learning

What is Mathematics Resilience?

- Mathematical resilience (Johnston-Wilder and Lee 2008 , 2010, 2013) is a positive adaptation that allows people to overcome barriers that frequently present when learning mathematics.
- Mathematical resilience is a pragmatic construct designed to give those concerned with helping people learn and use mathematics something to work for, something to develop in learners to counter many historic and current destructive influences.
- Paying attention to mathematical resilience increases students' willingness to engage with mathematics, both now and in the future.
- Mathematical resilience allows students to become part of a community of those learning mathematics – it works against mathematical anxiety.

Pervasive Negative Constructs

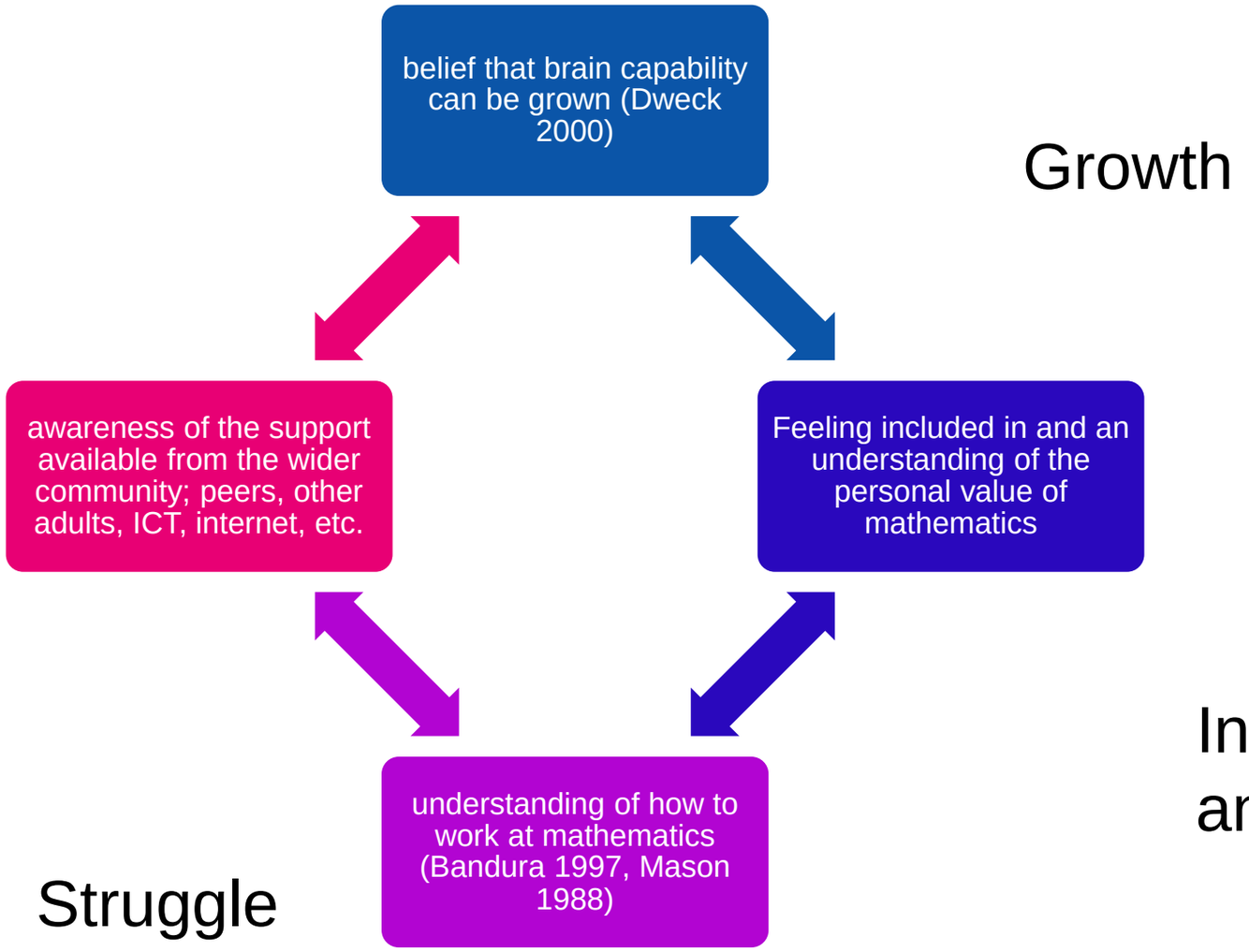
- Mathematics anxiety and phobia (Ashcraft, 2007; Newman, 2004)
- Mathematics teaching that presents learners with adversity, For example:
  - over-regard for rapid technical performance
  - under-regard for understanding
  - particular reliance on memory
  - mathematics as chameleon
- T.I.R.E.D. mathematics teaching (Nardi & Steward 2003)
- The culture of fixed mindset (Dweck 2000) – that mathematics is hard and only for the few.
- The culture of anxiety and helplessness in the face of mathematics is so ingrained in our society that it is difficult to overcome in adults and is readily passed on to children. Such thinking about maths is so prevalent, it has become the norm, and so people think it is normal!

Nardi, E., & Steward, S. (2003). Is Mathematics T.I.R.E.D.? A profile of quiet disaffection in the secondary mathematics classroom. British Educational Research Journal, 29(3), 345–366.

Mathematical resilience is a ….

positive affective stance to mathematics

- Pupils who have mathematical resilience will:
  - be challenged and enjoy meeting the challenge
  - know how to work at mathematics, that it requires struggle and the path is not always smooth
  - have a growth theory of learning (Yeager and Dweck 2012),
  - persevere, seeking appropriate support , when faced with difficulties, (Lee & Johnston-Wilder, 2013)
  - work collaboratively with their peers (Swan 2009);
  - have the language needed to express their understandings, misunderstandings and questions (Lee 2006);



The Four Factors in Developing Mathematics Resilience

A Growth Mindset

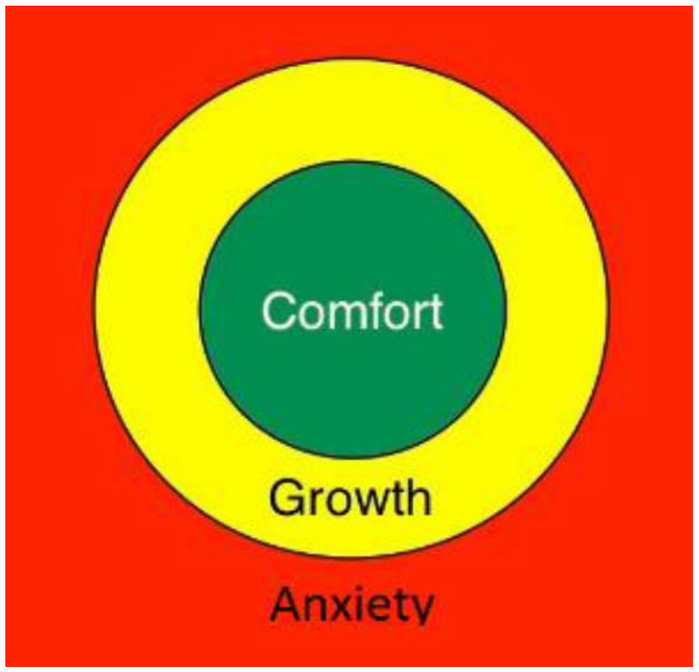
A growth mindset is developed:

- Through the way that you talk to students.
- By experiencing that the more they work at mathematics the more successful they will be (Self-efficacy)
- By stressing that asking is smart
- By “the right to understand” being the pedagogical contract
- By actively seeking student’s understanding and helping students understand that persistent asking allows them to understand and therefore grow.
- By being allowed to take responsibility for your own understanding

Give me a way to talk to students that is fixed and then change it to growth!

Combatting anxiety

Even at primary the pupils were showing signs of anxiety



The vocabulary of the growth zone can enable students to work at mathematics in appropriate ways – not to just say “I’m stuck”

Being Included and valued

In an inclusive community students must:

1. Usually but not always work collaboratively (Swan 2006) not just work in a group;
2. Know the personal value of learning mathematics;
3. Be able to see the mathematics in their world – no chameleons allowed
4. Know their personal value to the group e.g. by knowing the value of giving help as well as receiving
5. be active in their learning and harness their energies constructively;
6. articulate their ideas clearly so that all ideas are included;
7. have independence and choice in what they do.

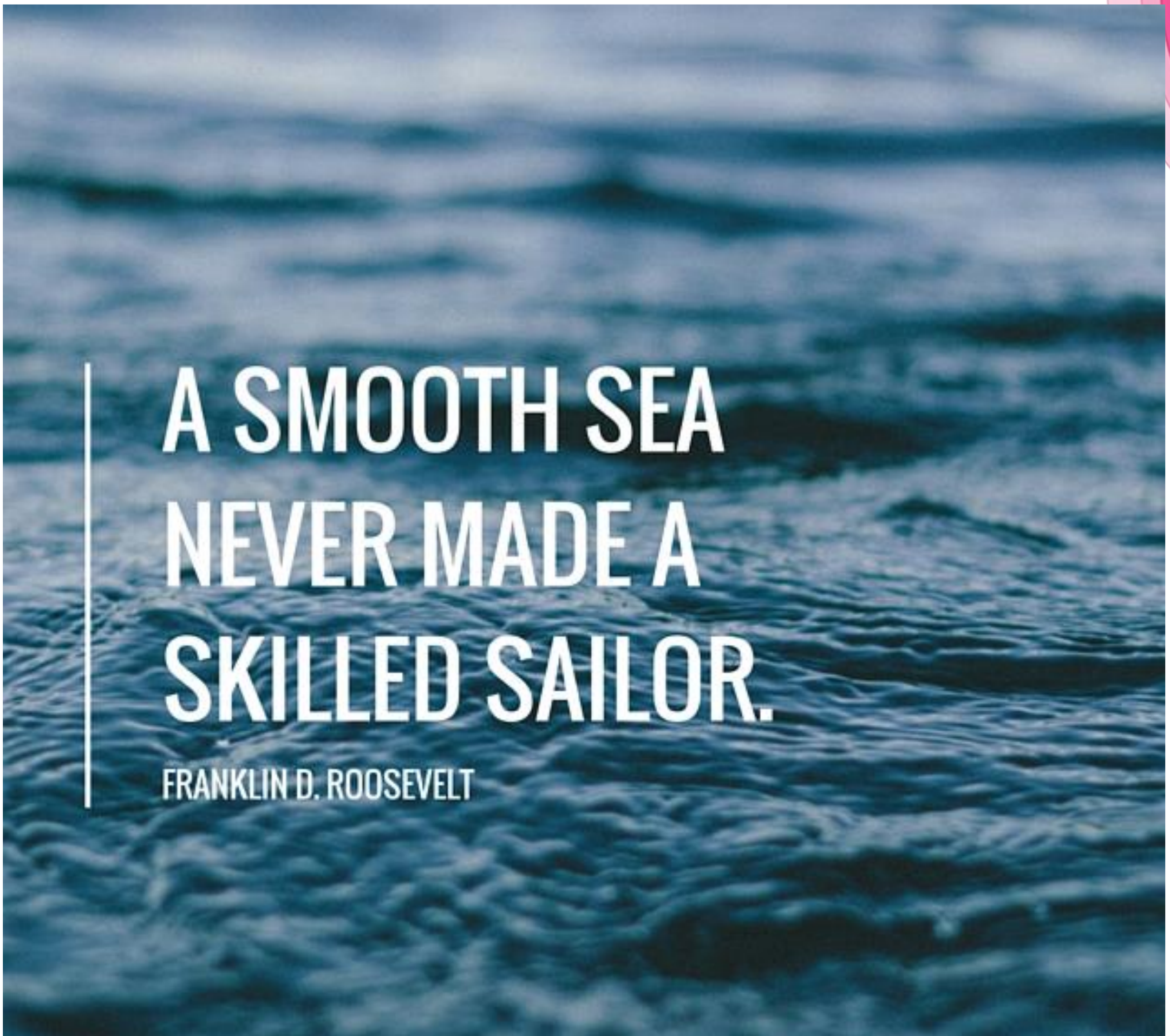
Put these ideas in order, which is the most important which the least? Have I left out an important idea for how you include everyone in your classroom?

"Fairness is not giving everyone
the same thing.
Fairness is giving each person
what they need to succeed"

Working Mathematically at Mathematics

- Working for understanding demands allowing learners to:
  - struggle sometimes, but never feel they have to struggle alone
  - work in their comfort and their growth zone but learn how to stay out of their red zone
  - take an active part in making choices and decisions about their learning
  - develop the vocabulary and phraseology that allows expression of emergent mathematical ideas for themselves;
  - experience experimenting (playing) with mathematical ideas for themselves
  - see for themselves that all mathematics is connected
  - know that mathematics is not all about right answers
  - persevere not just persist, see mistakes as important and is a learning opportunity
  - be able to judge for themselves how much progress they are making
  - engage in repetition and consolidation of ideas (comfort zone) but in the right task these come naturally.

How do you work best mathematically? Do your students have sufficient choice to work at their best?


A SMOOTH SEA
NEVER MADE A
SKILLED SAILOR.
FRANKLIN D. ROOSEVELT

Awareness of how to enlist support

If your students:

- refuse to just accept
- refuse to feel mathematically stupid
- refuse to feel mathematically isolated
- are willing to share their energies
- feel part of a mathematical community

Then they are probably supporting one another!

But where does support come from when you can't talk to your support community?
Try and find five ways of enlisting (appropriate) support

Learners will be Mathematically Resilient if they…

- know they have the right to understand
- feel a valued part of a mathematical community
- know the personal value of mathematics
- know that with appropriate support and work from them they CAN understand
- refuse to just accept
- refuse to feel mathematically stupid
- refuse to feel mathematically isolated and are willing to share their energies
- know that learning mathematics will involve struggle
- can access support as and when they actually need it

CPD Opportuniities

at the Centre for Life Long Learning at Warwick University

The Education and Training Foundation provide a range of CPD opportunities for maths teachers in the FE and skills sector, as part of the Maths Pipeline II funding.

Two new courses will be run by **WMCETT** to support the development of Mathematical Resilience

One-day introduction to mathematical resilience courses will be run around the country in November / December and a 4-day course will be run in January - March 2017.

https://www2.warwick.ac.uk/study/cll/courses/professionaldevelopment/wmcett/resources/maths_teaching_resources/resilience_courses/

Thank

you

and

enjoy the rest

of the conference

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