CURRICULUM, PEDAGOGY AND BEYOND

THE MATHEMATICAL ASSOCIATION OF VICTORIA

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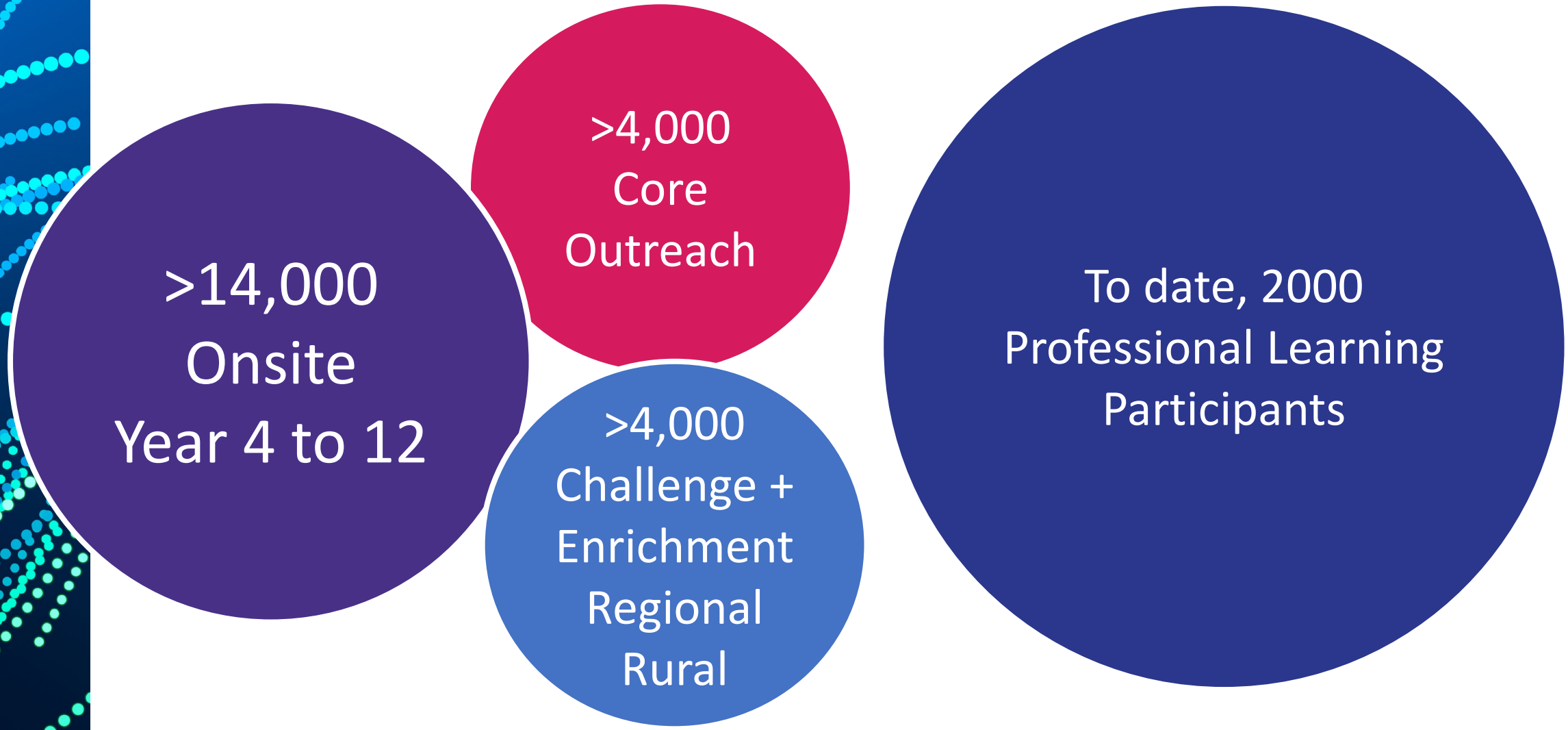
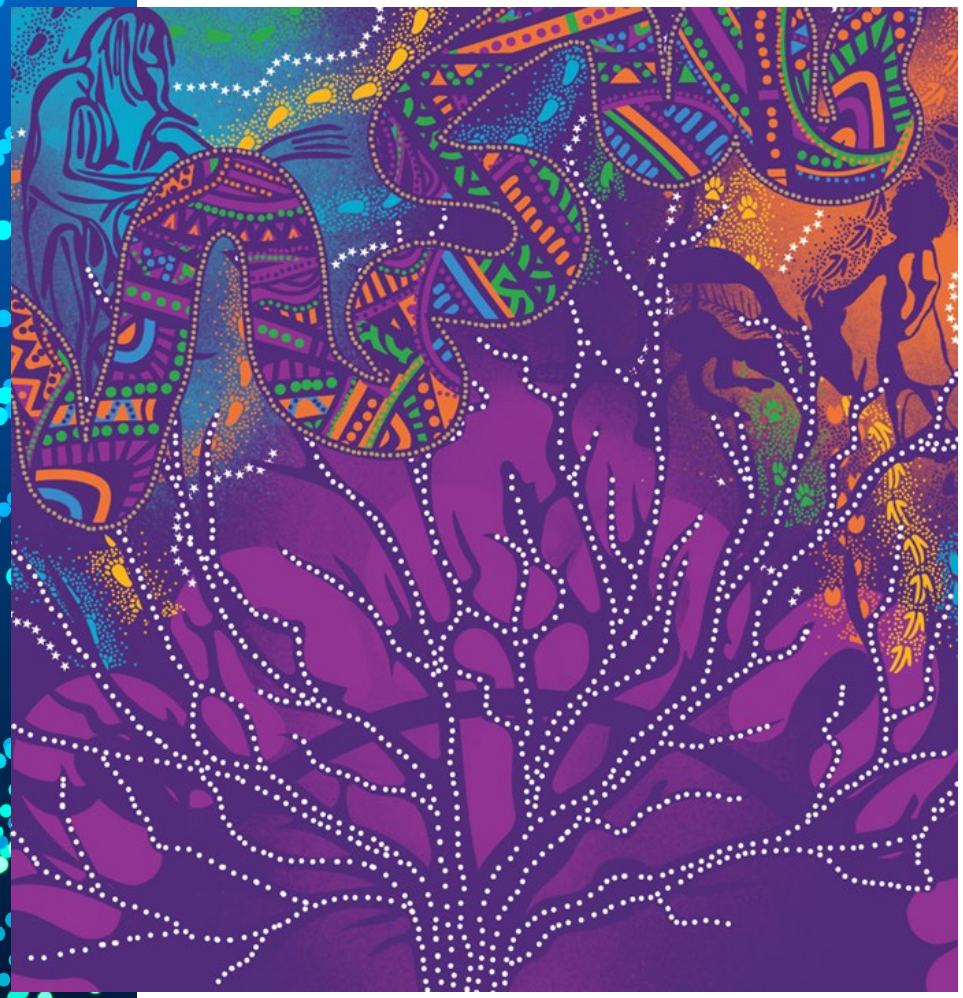
Shifting student mindset toward celebrating the process, not the answer.

Mark Gleeson
Victorian Space Science Education Centre

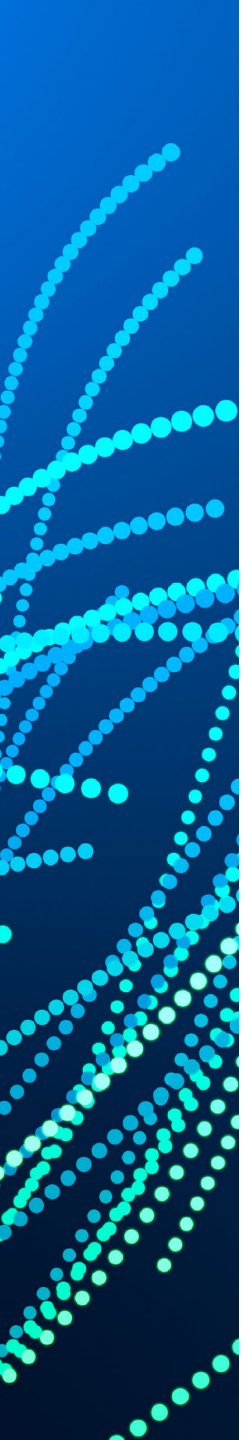
Supporting Victorian STEM Education





The Victorian Space Science Education Centre acknowledges the Traditional Owners of the lands on which we meet today.

We pay our respects to Elders past and present.



How do you deal with failure?

Mindsets

Mathematics subjects as a performance indicator
PISA, NAPLAN… etc. etc.

‘Onset of timed testing is the beginning of math anxiety’

Boaler, 2014c

Ever felt anxious? Your working memory can become blocked. Recall is difficult… how will that impact performance based subjects?

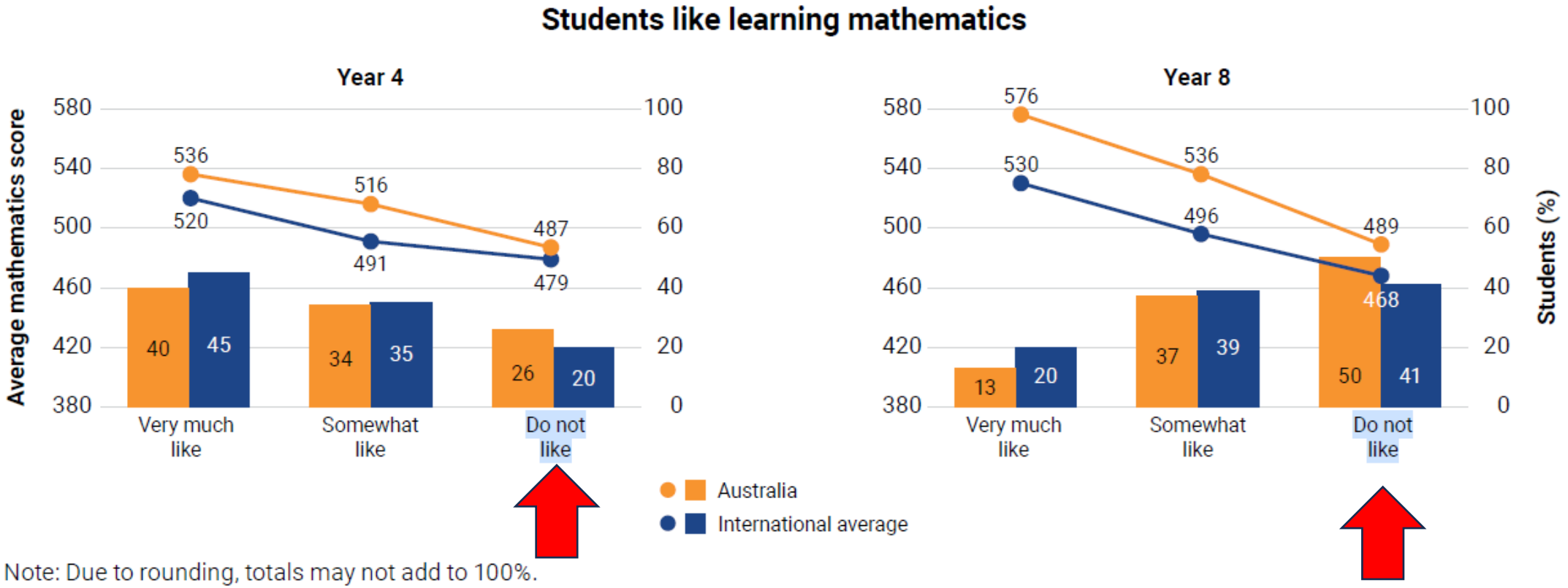
Silva & White 2013

“I either get it, or I don’t.”

“I’ve never been good at math”

“I can’t do these quickly!”

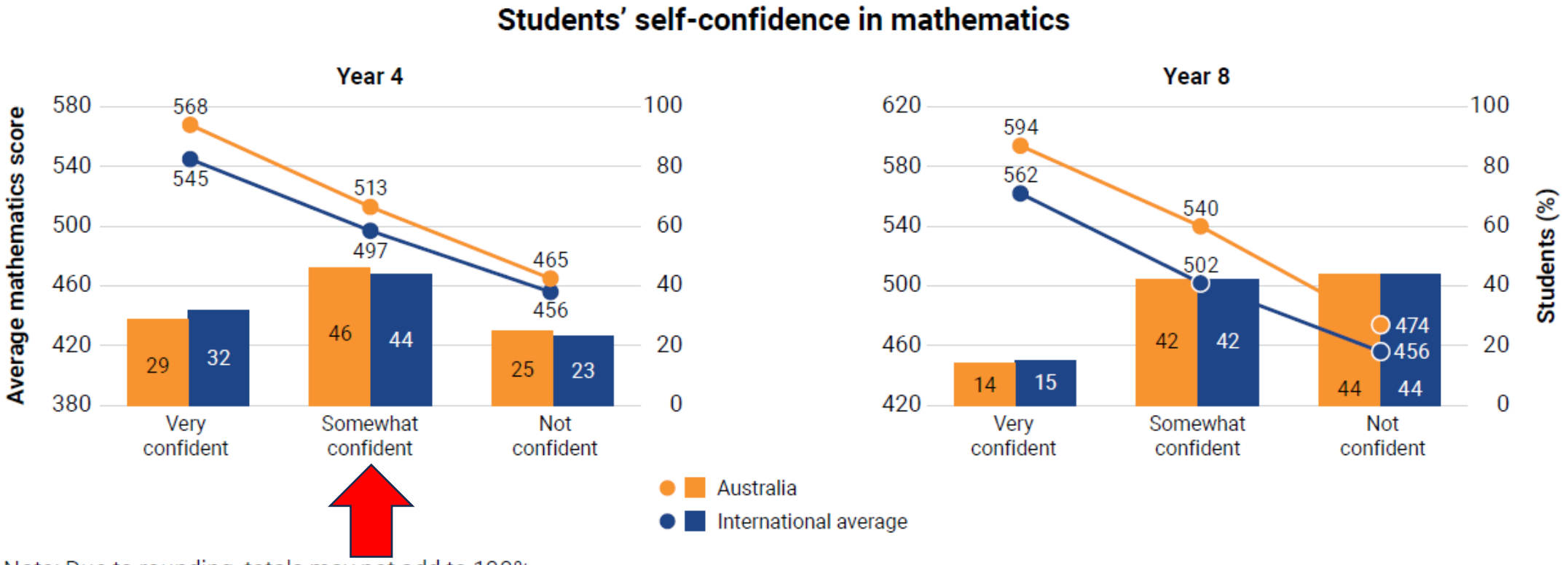
If you like math, do you perform better?



Note: Due to rounding, totals may not add to 100%.

Source: S. Thomson, N. Wernert, S. Buckley, S. Rodrigues, E. O'Grady, and M. Schmid, "TIMSS 2019," Melbourne, 2021. Accessed: Sep. 15, 2024. [Online].

What about if you're confident?



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When was the last time…

1) y = mx + c
2) Rise over the run
3) 1, 2, 3, 4, 5, …
4) Jenny has 5 apples, and Jo has 2 apples, So, what is the airspeed velocity of an unladen swallow?
5) $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$
6) Interest rate and lenders mortgage insurance
7) Compound Interest
8) Balancing your budget

Activity 1 - Four 4's (Group or Individual)

Can you find every number between 1 and 20 using only four 4's and any operation?

Going beyond

Can you find more than one way top make each number with four 4's?

Can you go beyond 20?

Can you use four 4's to find negative integers?

Reference: **Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages and Innovative Teaching**
Jo Boaler, John Wiley & Sons, 12 Oct 2015

Materials

Choose a Learner Persona or make your own!

Reflect on your own learner Persona when you were working through Activity 1

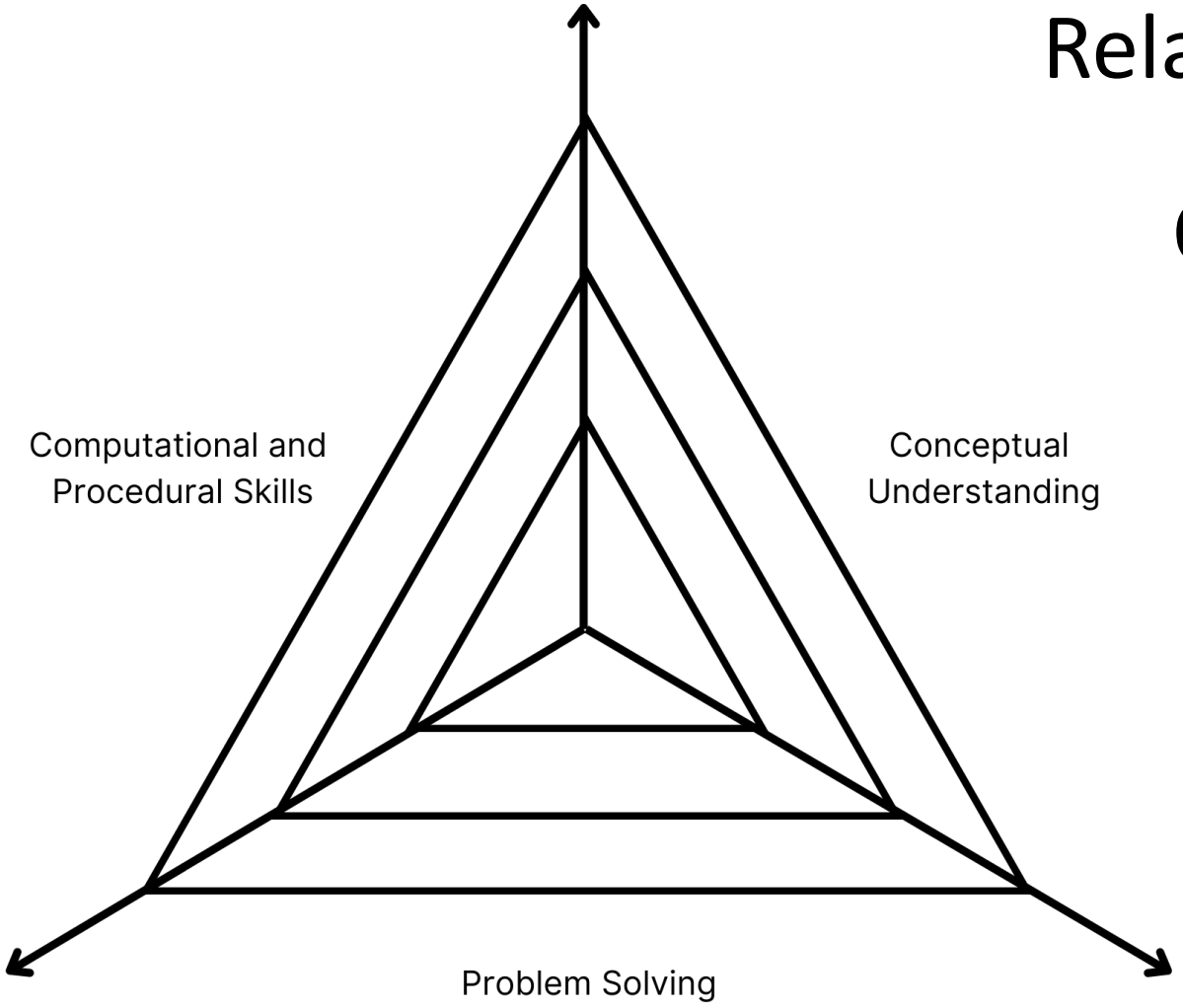
https://drive.google.com/drive/folders/1O4_Xx5V6fwrL7r_i-CLcW1V4nq9e_rkW?usp=sharing

How is mindset influenced?

Speed

Memory Recall

Repetition



Relationships

Questions

Concepts

Perfect vs Plausible answer?

Promote growth mindset

Visualise numbers as quantities, rather than just symbols or abstractions

Compare numbers in terms of magnitude, size, and relative difference

Estimate quantities with a range of accuracy

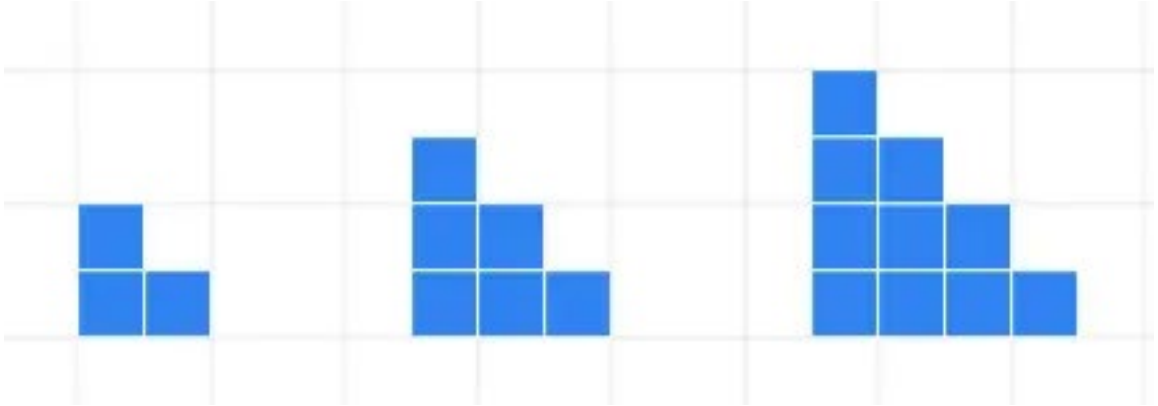
Represent numbers in various forms (words, digits, fractions etc.)

Reason about numbers, using relationships and patterns

Jo Boaler (Mathematical Mindsets)

Activity 2 – Relationships (Group?)

How would you describe the following pattern?



Going Beyond

How would the pattern change if you moved to the right?

What about the left?

Can you generalise your description if the grid is inversed?

Reference: **Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages and Innovative Teaching**
Jo Boaler, John Wiley & Sons, 12 Oct 2015

Your turn - Rich Mathematical Tasks

1. Can you open the task to encourage **multiple methods, pathways, and representations?**
2. Can you make it an **inquiry task**?
3. Can you ask the **problem before** teaching the method?
4. Can you add a **visual** component?
5. Can you make the problem **low floor and high ceiling**?
6. Can you add the requirement to **convince and reason**?

Materials

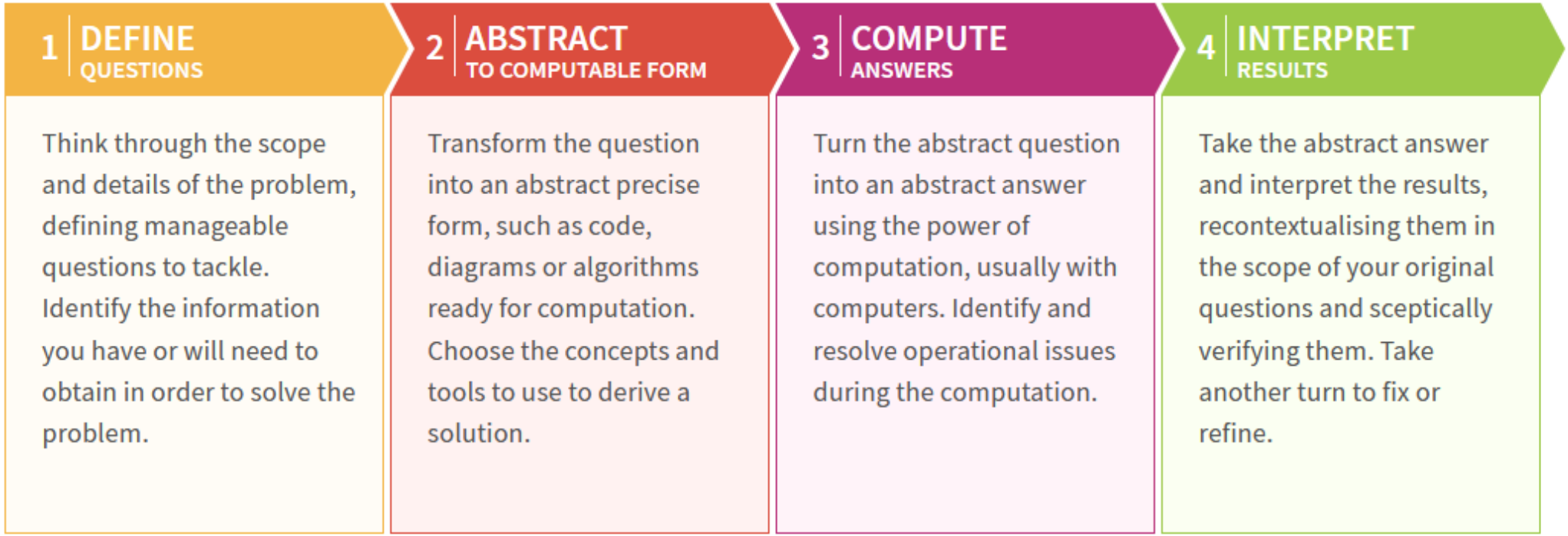
Refer to the following:

1) Framework Blank

2) Phrase Guide

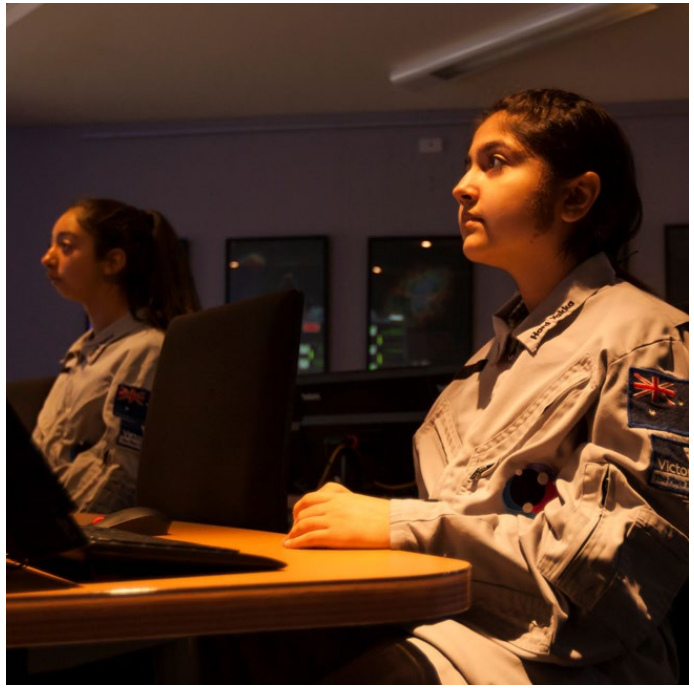
https://drive.google.com/drive/folders/1O4_Xx5V6fwrL7r_i-CLcW1V4nq9e_rkW?usp=sharing

Computational Thinking



Source: https://www.wolfram.com/wolfram-u/courses/computational-thinking/ (accessed 5th Dec 2024)

Activity 3 – Problem Red Planet




PROBLEM:
RED PLANET

Intern Induction Day

Mission Control

0830 – Registration/Clearances
0900 – Tour of Facilities
1030 – Meet Mission Director
1100 – Roles/Responsibilities
1300 – Lunch
1400 – Networking Opportunity

Tech Support

0830 – Registration
0900 – Role Specific
1000 – Coding Workshop
1200 – Orbital Mechanics
1300 – Lunch
1400 – Networking Opportunity

Tech Support!

The astronaut needs water to drink, grow food and run equipment. The astronaut has full water tanks, however the equipment that recycles the water (the water recycler) is functioning well below optimal capacity so the water will run out eventually. How many Sols before the astronaut's water runs out?

Do you know how long a Sol is? Ask the astronaut.

Compute – Trinket.io

Number Sense

How can you trust a number?

How many decimal places??

Moving between units

Is the answer plausible?

Do we understand the problem enough?

Assessment

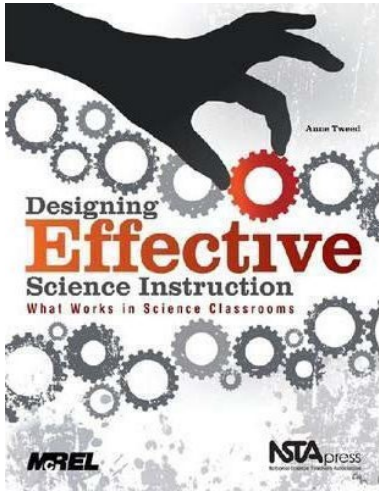
- multiply and divide fractions and decimals using efficient mental and written strategies, and digital tools
- VC2M7N05

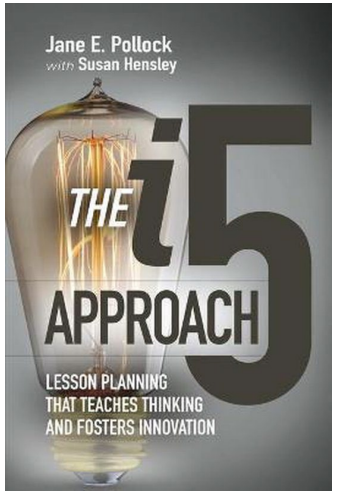
- compare, order and solve problems involving addition and subtraction of integers
- VC2M7N08

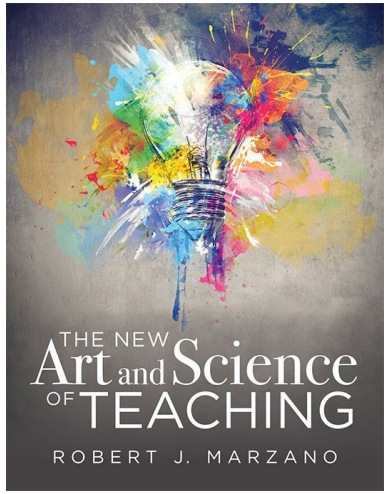
- manipulate formulas involving several variables using digital tools, and describe the effect of systematic variation in the values of the variables
- VC2M7A06

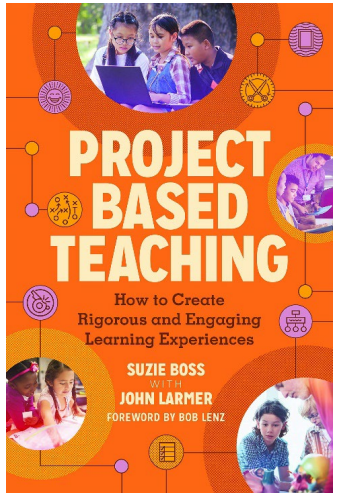
- recognise and use variables to represent everyday formulas algebraically and substitute values into formulas to determine an unknown
- VC2M7A01

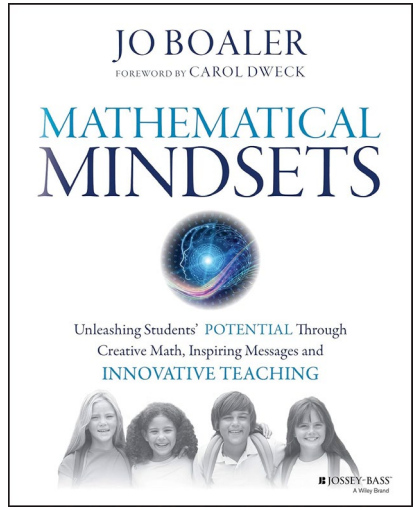
Literature

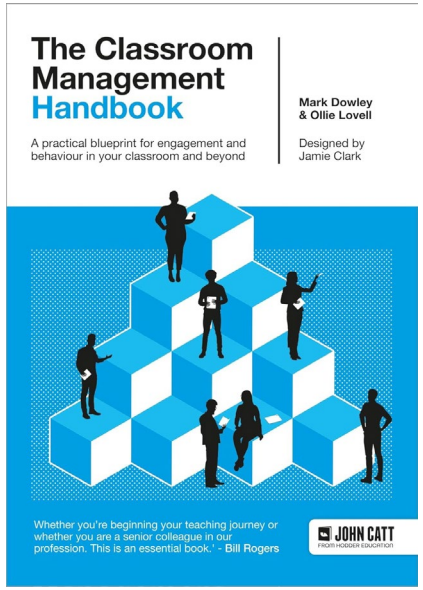

Designing
Effective
Science Instruction
What Works in Science Classrooms
McREL
NSTA press

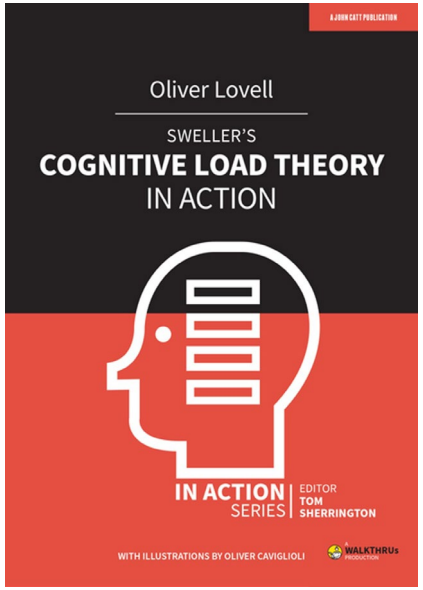

Jane E. Pollock
with Susan Hensley
THE i5
APPROACH
LESSON PLANNING
THAT TEACHES THINKING
AND FOSTERS INNOVATION


THE NEW
Art and Science
OF TEACHING
ROBERT J. MARZANO


PROJECT
BASED
TEACHING
How to Create
Rigorous and Engaging
Learning Experiences
SUZIE BOSS
WITH
JOHN LARMER
FOREWORD BY BOB LENZ


JO BOALER
FOREWORD BY CAROL DWECK
MATHEMATICAL
MINDSETS
Unleashing Students' POTENTIAL Through
Creative Math, Inspiring Messages and
INNOVATIVE TEACHING
JOSSEY-BASS


The Classroom
Management
Handbook
A practical blueprint for engagement and
behaviour in your classroom and beyond
Mark Dowley
& Ollie Lovell
Designed by
Jamie Clark
Whether you're beginning your teaching journey or
whether you are a senior colleague in our
profession. This is an essential book.' - Bill Rogers
JOHN CATT


A JOHN CATT PUBLICATION
Oliver Lovell
SWELLER'S
COGNITIVE LOAD THEORY
IN ACTION
IN ACTION
SERIES
EDITOR
TOM
SHERRINGTON
WITH ILLUSTRATIONS BY OLIVER CAVIGLIOLI
WALKTHRUs

Conclusions and Resources

https://www.youcubed.org/
https://hgse.balancedassessment.org/
https://mathforums.com/
https://www.mathshell.com/
https://blog.mrmeyer.com/
https://estimation180.com/
https://www.visualpatterns.org/
https://numberstrings.com/
https://www.wolframalpha.com/problem-generator/

Survey

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Event App

App Download Instructions

Step 1: Download the App 'Arinex One' from the App Store or Google Play

App Store

Google Play

Step 2: Enter Event Code: **mav**

Step 3: Enter the email you registered with

Step 4: Enter the Passcode you receive via email and click 'Verify'. Please be sure to check your Junk Mail for the email, or see the Registration Desk if you require further assistance.

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Be in it to WIN!