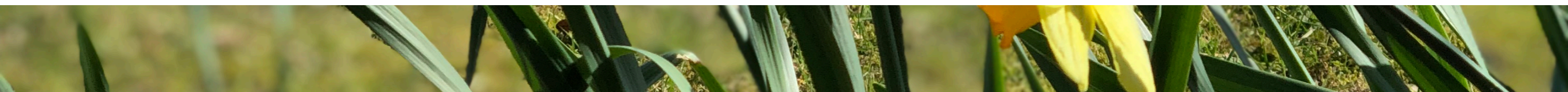# METACOGNITION

From Singapore to Swaledale
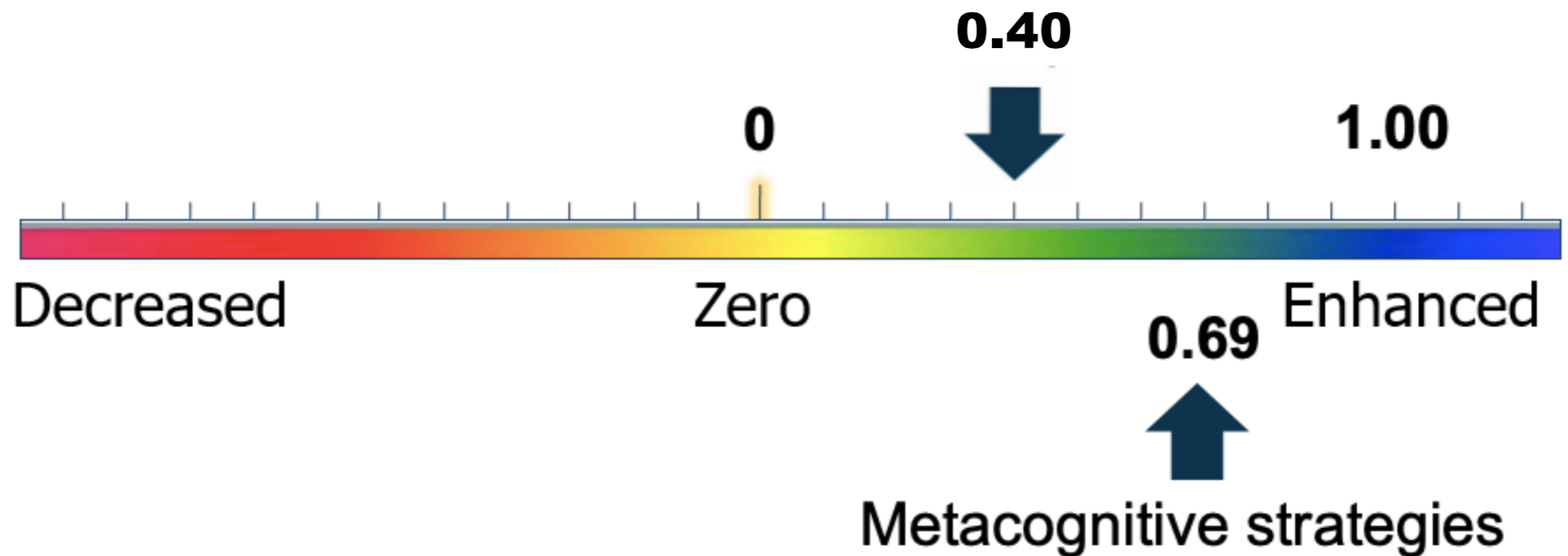
Craig Parkinson

COGNITION OR METACOGNITION?

➤ Cognition allows us to **make progress** through the development of task-related skills

➤ Metacognition allows us to **control progress** through the self-management of learning skills

Metacognitive strategies — effect size

0.40

0   1.00

Decreased   Zero   Enhanced

0.69

Metacognitive strategies

From Visible Learning: John Hattie (2009)

The Triple A model - Developing Autonomy
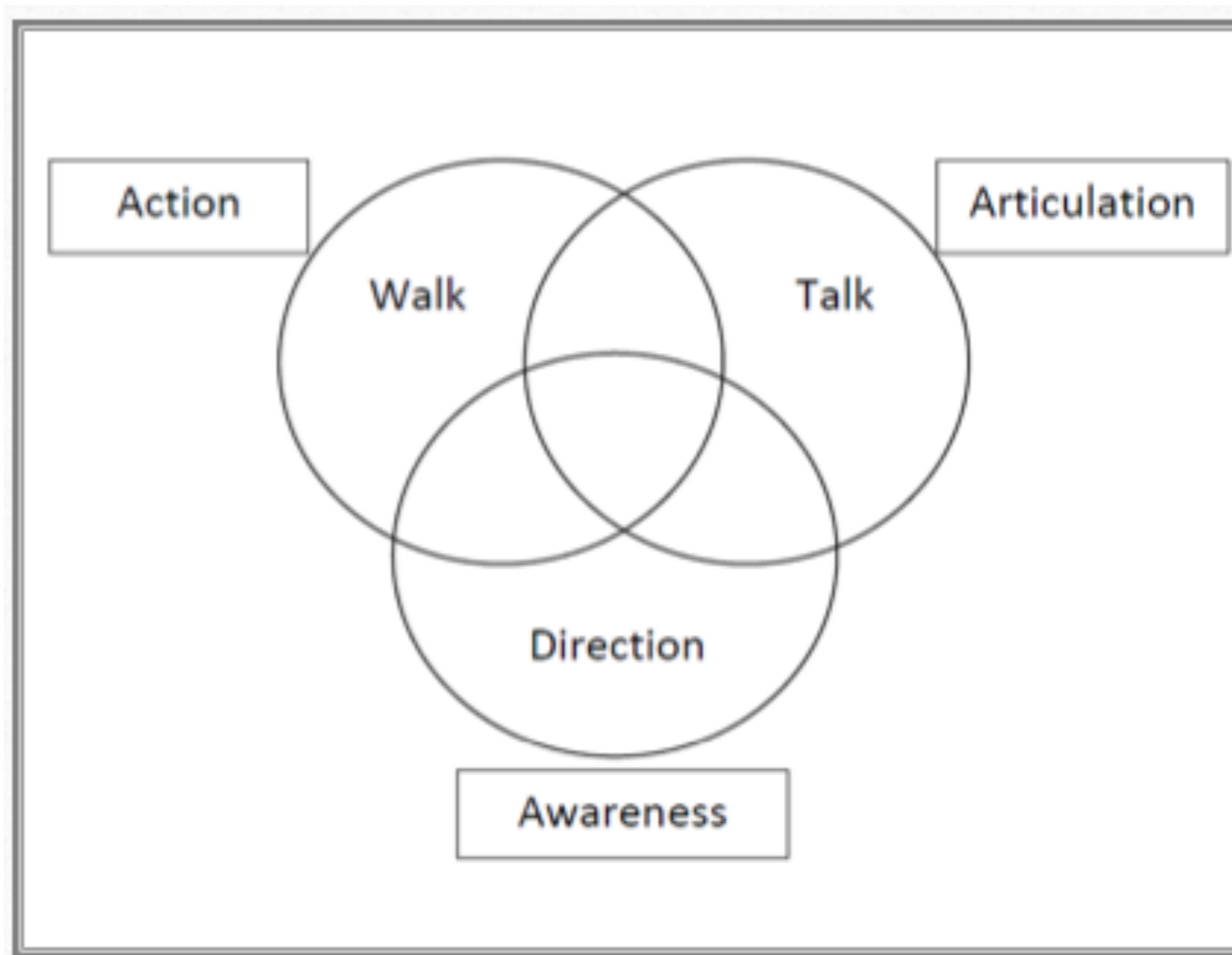
EMOTION: ACTING, CAME IN TOOTING. META-INCOGNITO.

3-2-1 BRIDGING ACTIVITY

3 things you already know about Metacognition
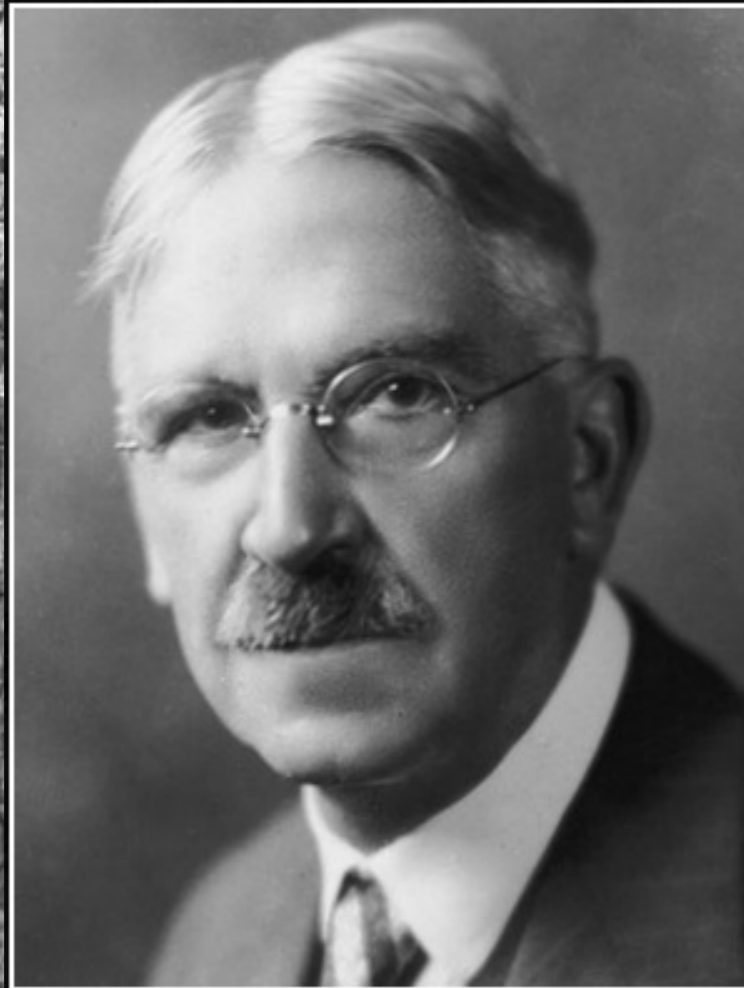
2 questions you have about Metacognition

How much?

1 analogy you have for Metacognition

How well?

How much?

How well?

Metacognition is like _____ because _____

We do not learn from experience...we learn from reflecting on experience.

— John Dewey —

AZ QUOTES

BRIDGING ACTIVITY

Purpose: To reflect on how our thinking has changed

http://www.pz.harvard.edu/resources/3-2-1-bridge

SINGAPORE SUCCESS – DESIGNED IN THE UK, BUILT BY EXPERTS

3 MATHEMATICS FRAMEWORK

This framework shows the underlying principles of an effective mathematics programme that is applicable to all levels, from the primary to A-levels. It sets the direction for the teaching, learning, and assessment of mathematics.
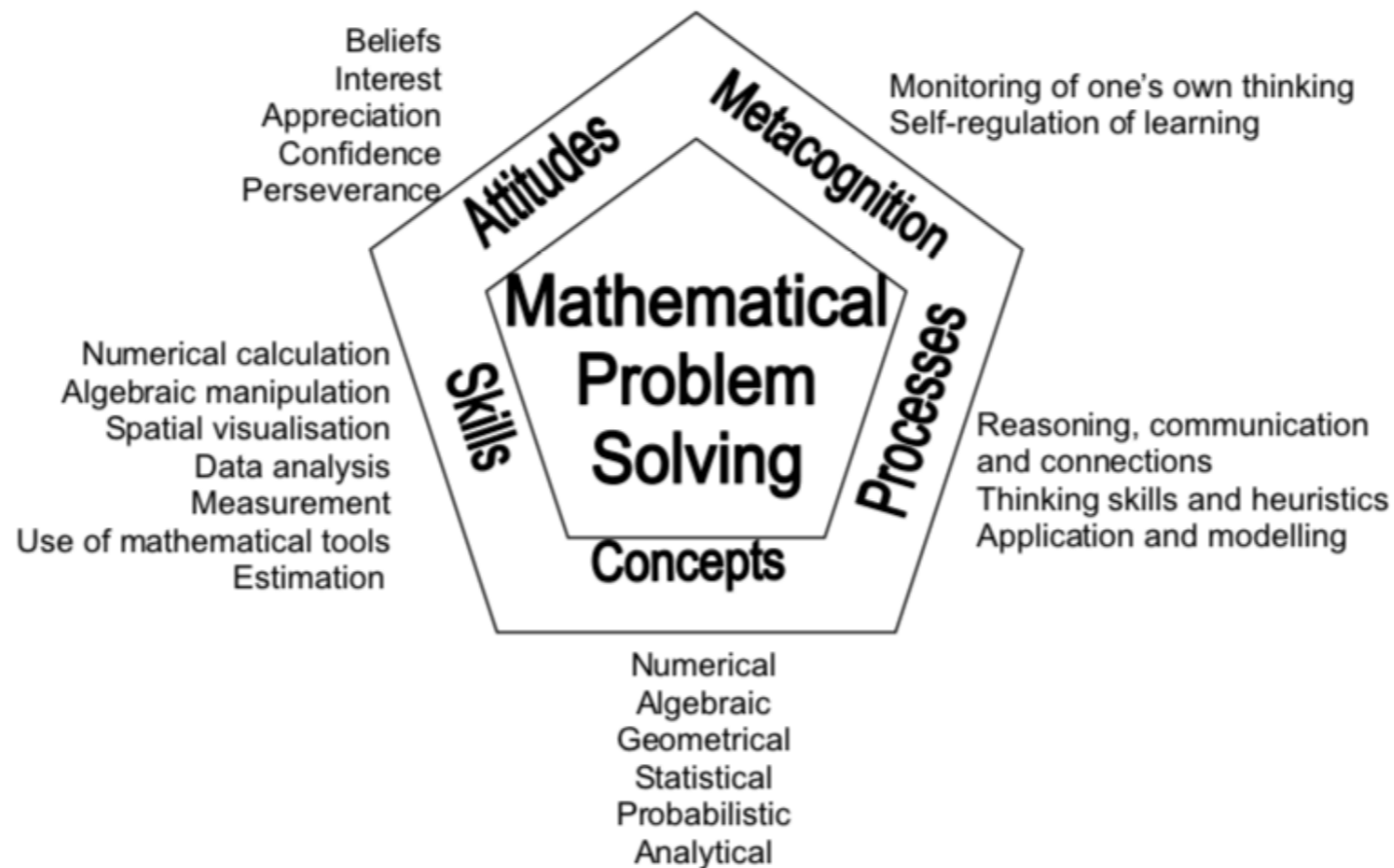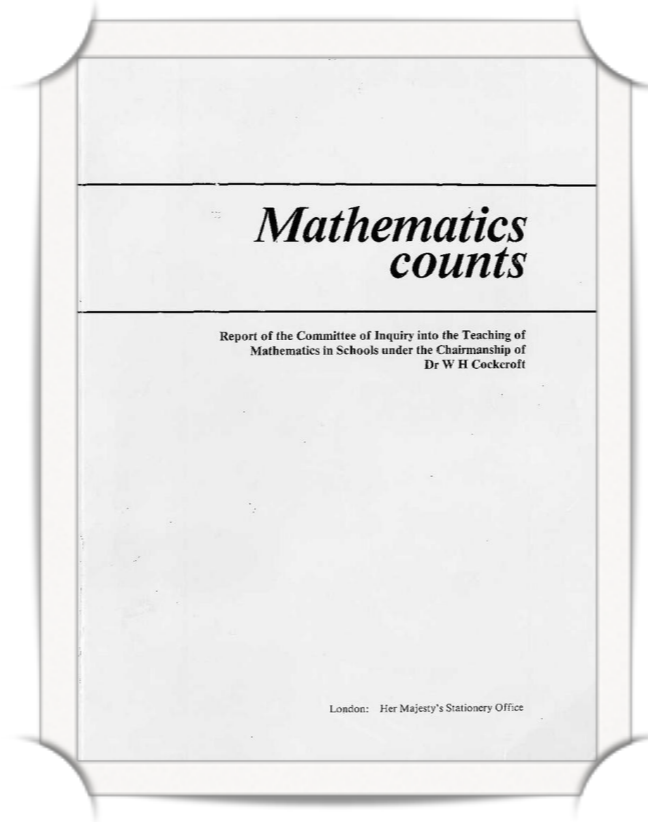
SINGAPOREAN SUCCESS

➤ Successfully used research to improve Mathematics teaching

➤ Applied the same principles to English teaching

➤ Then successfully applied the same principles to Science teaching

➤ Now have "Thinking Schools"

➤ "Teach Less, Learn More"

➤ Near and Far Transfer - Theory of identical elements (Thorndike and Woodworth)

"

Problem solving must be at the heart of Mathematics teaching.

Mathematics counts

Report of the Committee of Inquiry into the Teaching of
Mathematics in Schools under the Chairmanship of
Dr W H Cockcroft

London: Her Majesty's Stationery Office

-Dr WH Cockroft

"

Better to solve one problem five ways than solve five problems using one method"

MATHEMATICAL DISCOVERY
On Understanding, Learning, and Teaching Problem Solving

GEORGE POLYA

Combined Edition
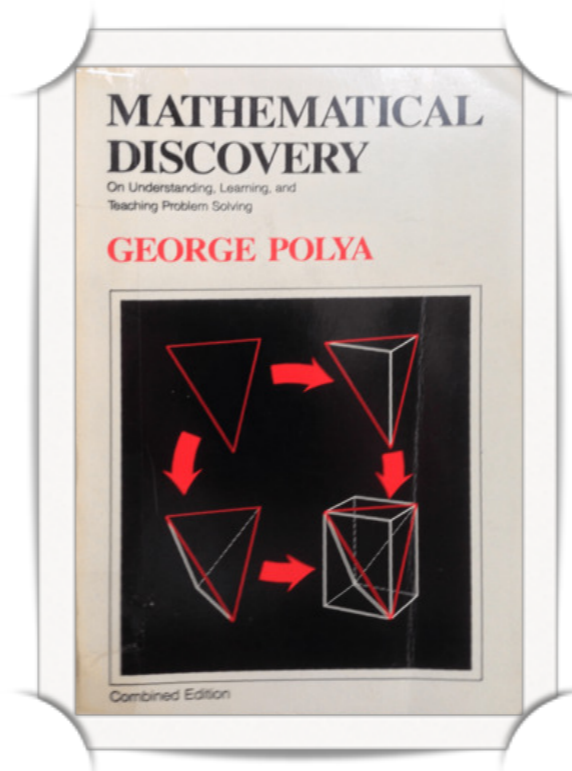
-Professor G Pólya

THINKING FAST AND SLOW – DANIEL KAHNEMAN

System 1	System 2
Fast	Slow
Unconscious	Conscious
Automatic	Effortful
Everyday Decisions	Complex Decisions
Error prone	Reliable
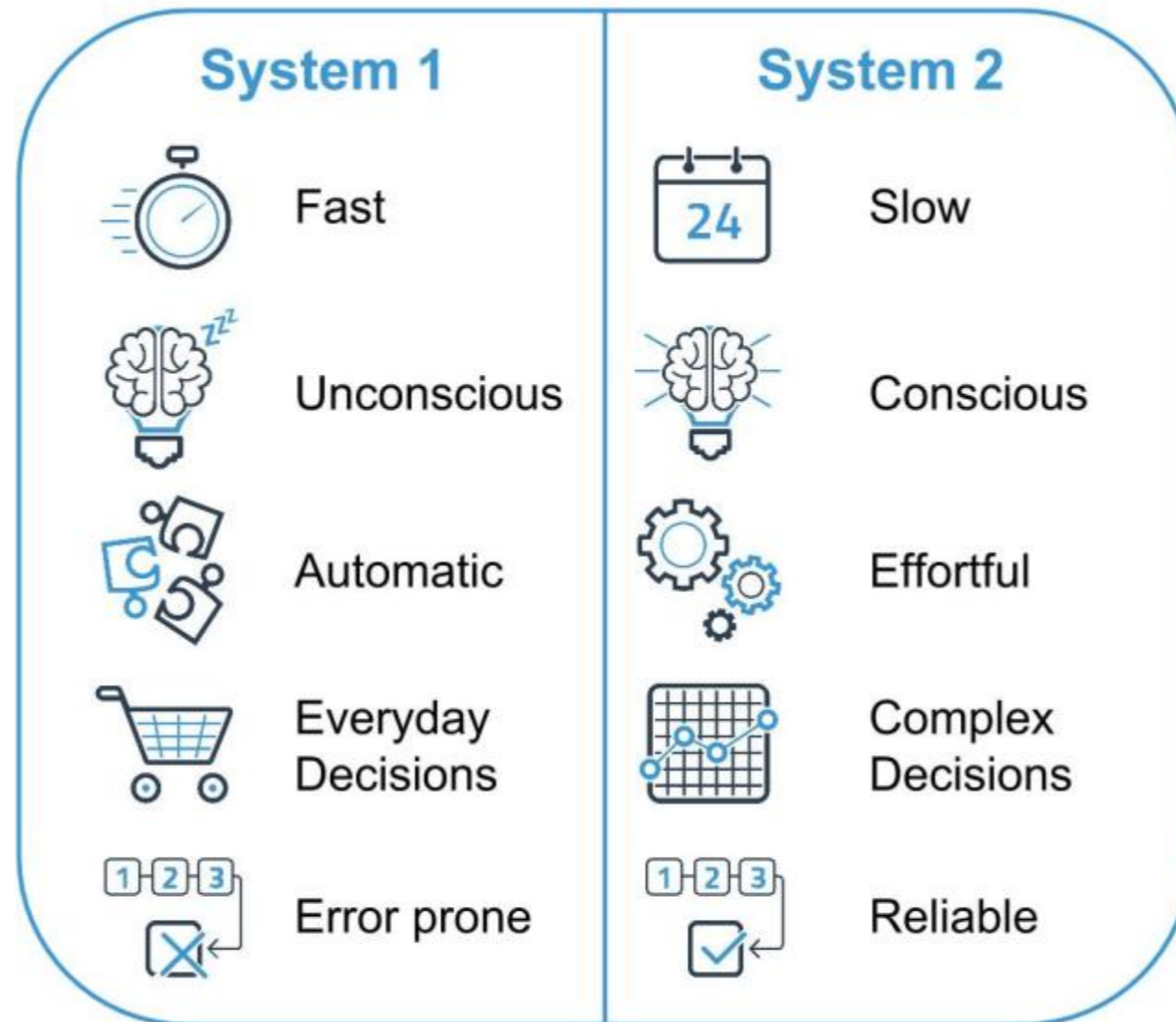
A bat and ball, when bought together, cost £1.10. The bat is £1 more than the ball.

How much is the ball?

When I'm learning it's like I'm a river flowing: I can't be stopped.

At my old school, teachers were beavers, blocking the flow.

Now I have a choice of paths for which way I want to learn: The path that is blocked is the least fun and the one that is flowing is the most fun.

And most of the time, the flowing path is the best.

RIVER SWALE

"STILL WATERS RUN DEEP"

METACOGNITION RUBRIC – PERKINS (1992)

| Tacit Learners	Aware Learners	Strategic Learners	Reflective Learners
Are unaware of their metacognitive knowledge. They do not think about any particular strategies for learning and merely accept if they know something or not.	Know about some of the kinds of thinking that they do such as generating ideas, finding evidence etc. However, thinking is not necessarily deliberate or planned.	Organise their thinking by using problem-solving, grouping and classifying, evidence-seeking and decision-making etc. They know and apply the strategies that help them learn.	Are not only strategic about their thinking but they also reflect upon their learning while it is happening, considering the success or not of any strategies they are using and then revising them as appropriate.
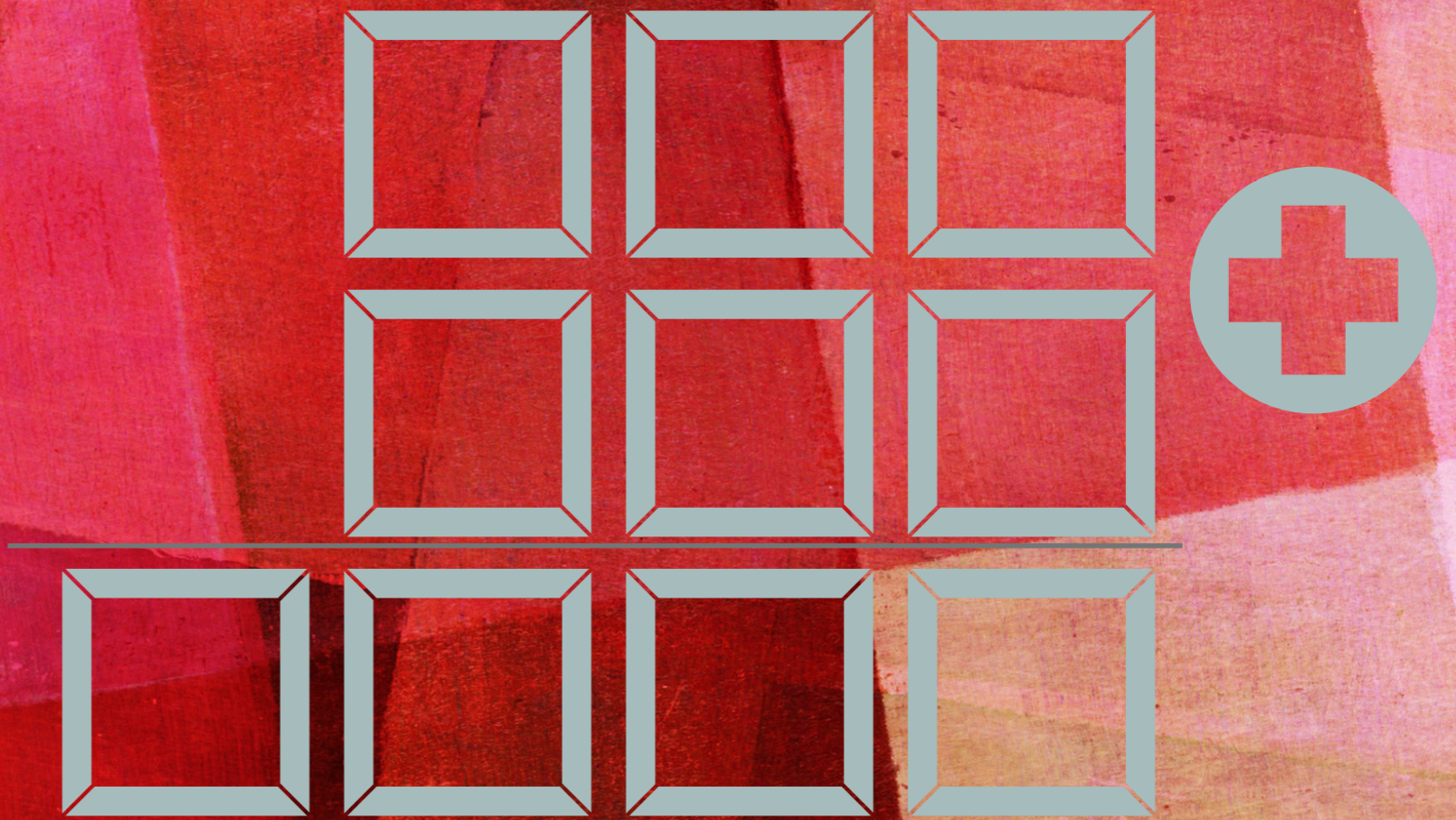
YOUR CHALLENGE: ATTEND TO YOUR THINKING

Low floor - high ceiling activities

One solution:

What do you notice?

Is there another solution?

$$
\begin{array}{ccc}
3 & 4 & 2 \\
7 & 5 & 6 \\
\hline
1 & 0 & 9 & 8
\end{array}
$$

+
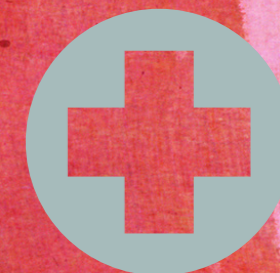
YOUR CHALLENGE:
ATTEND TO YOUR THINKING

Low floor - high ceiling activities

# MATHEMATICAL METACOGNITION THROUGH PROBLEM SOLVING

➤ Try to solve it yourself first through **collaboration**

➤ Find many ways to solve the problem through **communication**

➤ Compare and contrast through **critiquing**

➤ Choose and use through developing **confidence**

➤ Reflect through Journalling

We do not learn from experience...we learn from reflecting on experience.
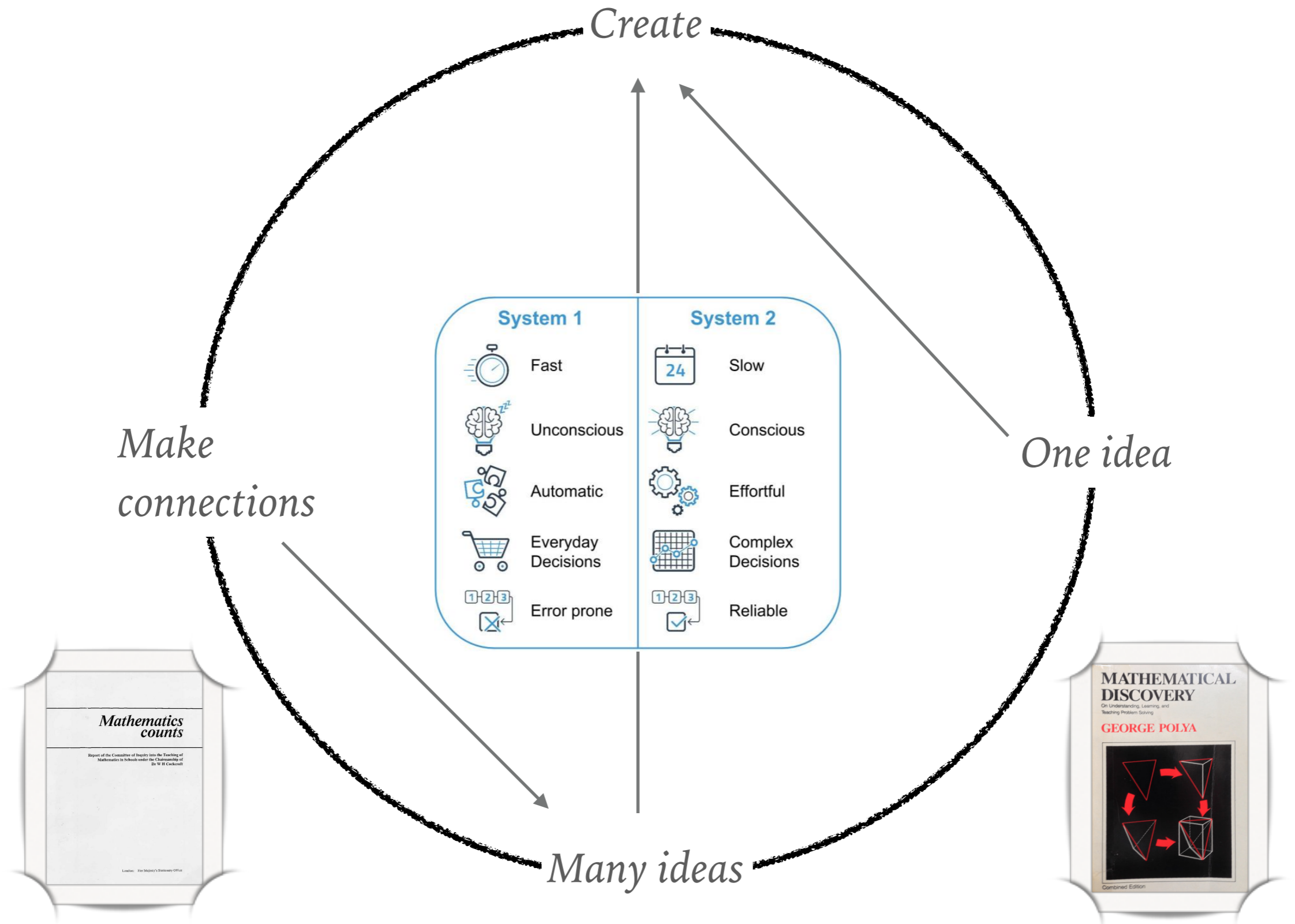
— *John Dewey* —

CREATE THIS SHAPE

➤ Find many ways to calculate its area.

➤ 5 minutes

➤ Then we will review

➤ Lots of specific examples

➤ Create a general rule

5cm

5cm

4cm

8cm

a

b

h

b

a
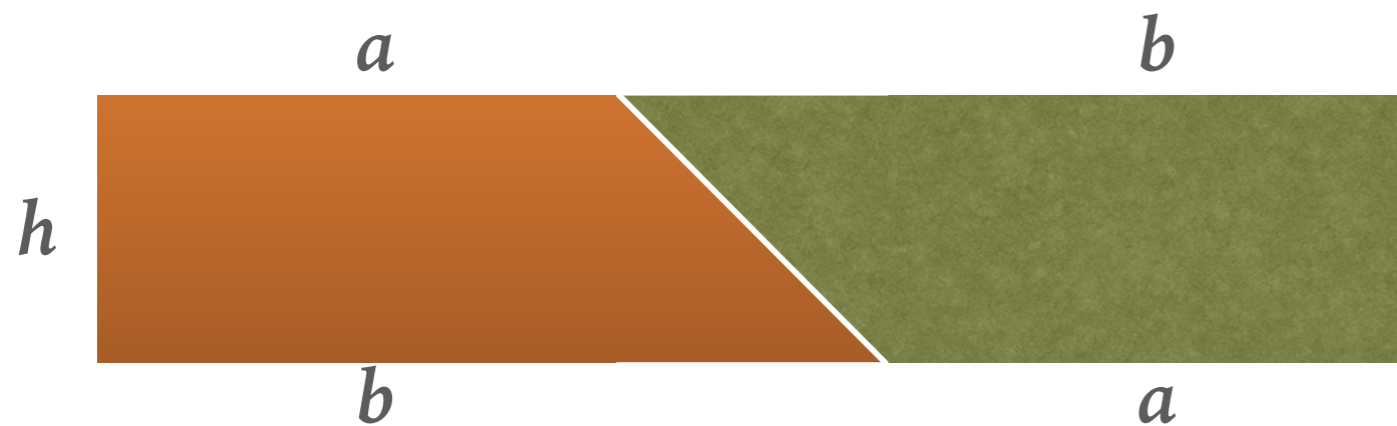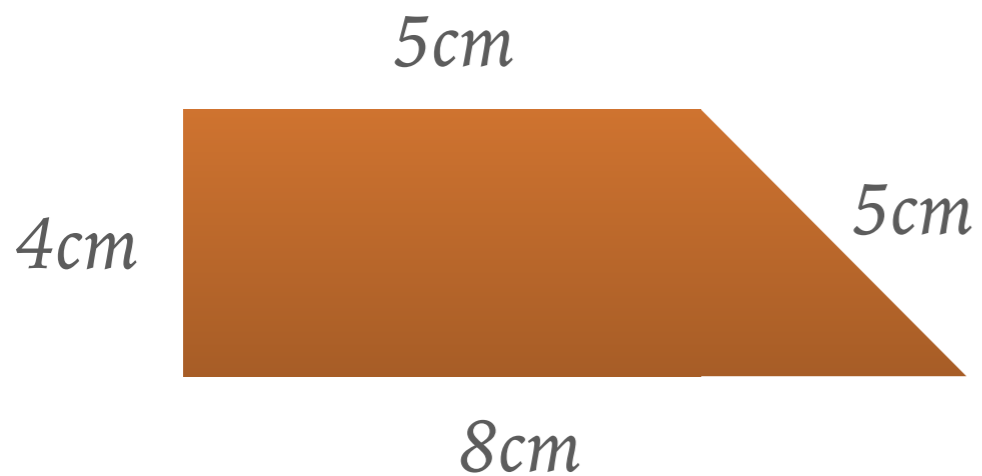
$$\frac{(a+b)h}{2}$$

SOLO TAXONOMY – LEARNER NOT TEACHER FOCUSSED

3-2-1 BRIDGING ACTIVITY

3 things you already know about Metacognition

2 questions you have about Metacognition

How much?

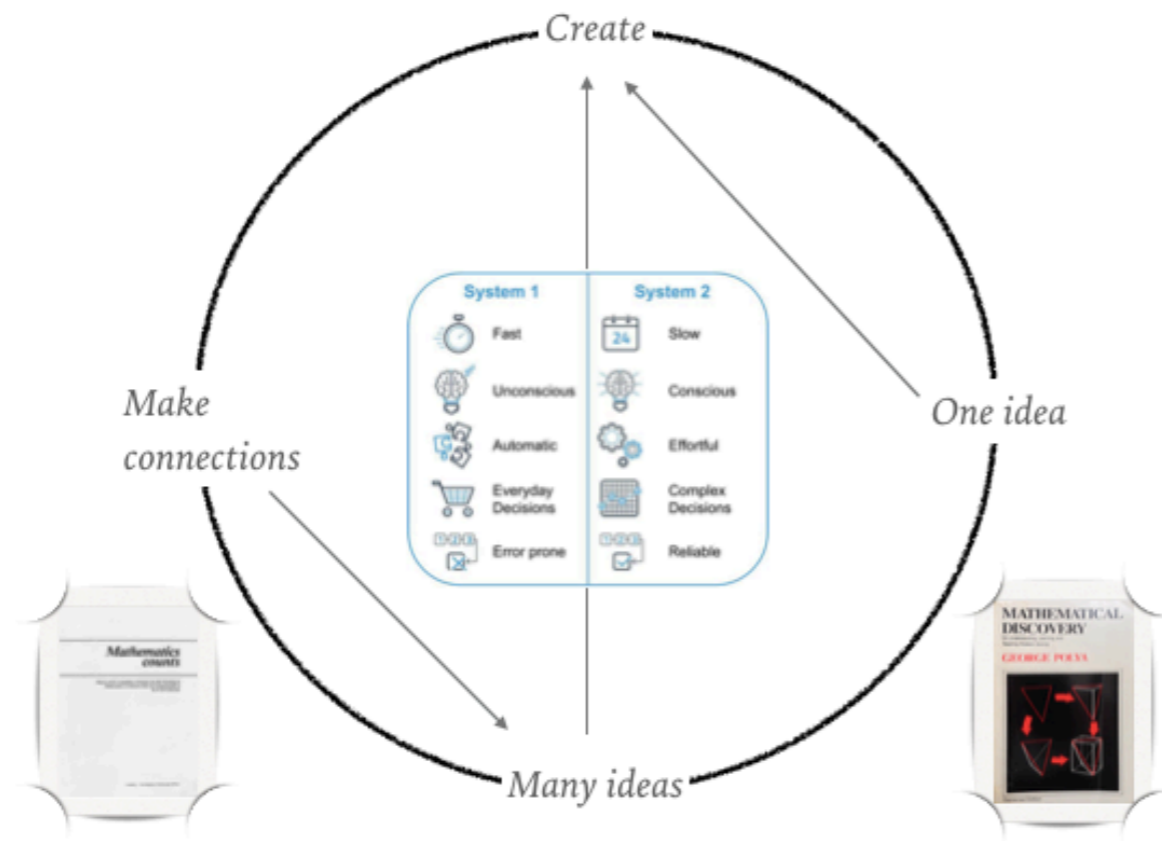*1 analogy you have for Metacognition*

How well?

Metacognition is like _____ *because* _____

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Now I have a choice of paths for which way I want to learn:
The path that is blocked is the least fun and the one that is flowing
is the most fun.
And most of the time, the flowing path is the best.

Create

Make
connections

One idea

Many ideas

System 1		System 2	
	Fast		Slow
	Unconscious		Conscious
	Automatic		Effortful
	Everyday Decisions		Complex Decisions
	Error prone		Reliable

Mathematics counts

MATHEMATICAL DISCOVERY
GEORGE POLYA

RIVER SWALE

"STILL WATERS RUN DEEP"

©SWJuk (2017)

THANK YOU

- ➤ cparkinson535@icloud.com

- ➤ @cparkinson535

- ➤ Maths - No Problem! trainer https://mathsnoproblem.com

- ➤ Visible Learning Plus Consultant - https://osiriseducational.co.uk/visiblelearningplus/

Metacognition d=0.69

Researched by
- #Newell (1990) *Chiu (1998)
- △ Schraw et al (2006)
- △ Kuhn + Dean (2004)
- △ Paris + Winograd (1990)
- @ Cross + Paris (1988)
- @ Flavell (1979)

moves from — cognition (task related, making progress) — toward — M.C. (self management, controlling progress)

consists of
- Self @
  - Declarative — limitations
  - Procedural — Which strategies
  - Conditional — When & how to use strategies
  - M.C. Knowledge
- M.C. regulation
  - Planning
  - Monitoring [task performance]
  - Evaluating

from mentoring to coaching — coached teachers develop better M.C. learners.

Moves from Q.C to Q.A. of learning

Benefits
- Teacher
- Learner
  - increased autonomy leads to increased motivation leads to increased outcomes

Teachable through *
- Subjects — See: Singapore Ministry of Education.
- Modelling
  - [reflection process]
  - Triple A
    - → Action
    - Articulation → Awareness
  - Solo Taxonomy [learning process]
    - I III ⬡ ⬡

@cparkin535