# Fostering metacognition and self-regulation through the Victorian Curriculum: F-10

Monica Bini, VCAA Capabilities Curriculum Manager

Crystal Afitu, VCAA F-10 Mathematics Curriculum Manager

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VICTORIA
State Government

# Acknowledgment of Country

*We are all joining today's session from across Victoria and I would like to acknowledge the traditional custodians of the many lands across Victoria on which each of you are living, learning and working from today.*

*For myself and those of us in the metropolitan area, we acknowledge the traditional custodians of the Kulin Nations.*

*When acknowledging country, we recognise Aboriginal and Torres Strait Islander people's spiritual and cultural connection to country.*

*We acknowledge the continued care of the lands and waterways over generations and celebrate the continuation of a living culture that has a unique role in this region.*

*And as we share of our knowledge in teaching and learning, may we pay our respects to Elders past, present and emerging, for they hold the memories, traditions, culture and hopes of all Aboriginal and Torres Strait Islander peoples across the nation, and hope they will walk with us on our journey.*
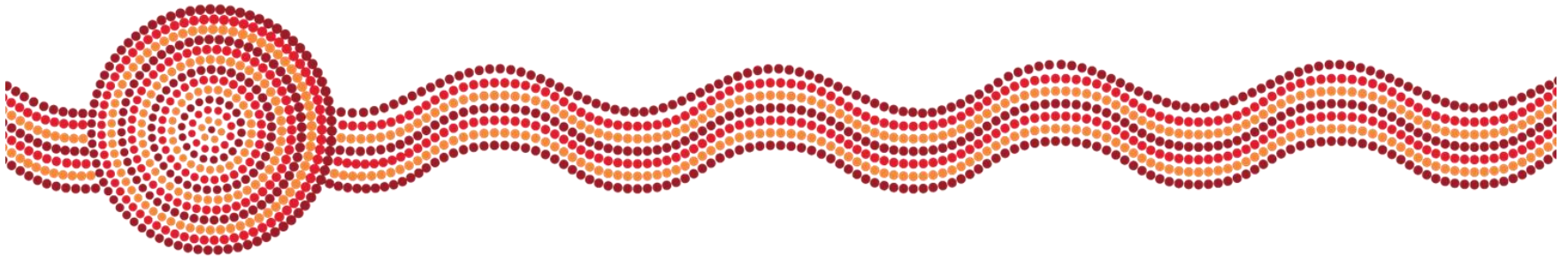
# Objectives

**To gain insight into:**

**how Personal and Social Capability and Critical and Creative Thinking can support metacognition and self-regulated learning**

# Outline of session

**Part One: Overview**

- **What is metacognition and self-regulated learning?**
- **What are some of the key drivers for improvement?**

**Part Two:**

- **Explicit teaching based on Victorian Curriculum: F-10**
- **Assessment**

# Metacognition – what is it?

understanding of thinking processes and

an ability to <span style="color:red">manage</span> and apply these <span style="color:red">intentionally</span>

# Self-regulated learning – what is it?

- **Awareness of own strengths and weaknesses as a learner**

- **Purposeful selection, application and evaluation of**
  - Learning strategies
  - motivational strategies that support learning

**Source: Metacognition and self-regulated learning Guidance Report at evidenceforlearning.org.au**

# Worthwhile focus?



**High impact, very low cost, based on extensive evidence**

Metacognition and self-regulation approaches have consistently high levels of impact.

Average cost: $ $ $ $ $

Evidence security: 🔒🔒🔒🔒🔓

Months' impact: +7

**Source: evidenceforlearning.org.au**

# Some key drivers

1. **Understanding and skills of the teacher**

2. **Explicit teaching of relevant strategies**

3. **Effective pedagogy:**

   – Modelling and scaffolding

   – Appropriate level of challenge for students

   – Classroom climate

**Source:** Evidence for Learning Guidance Report – Metacognition and Self-regulated learning

# Linking Metacognition to the Victorian Curriculum: F-10
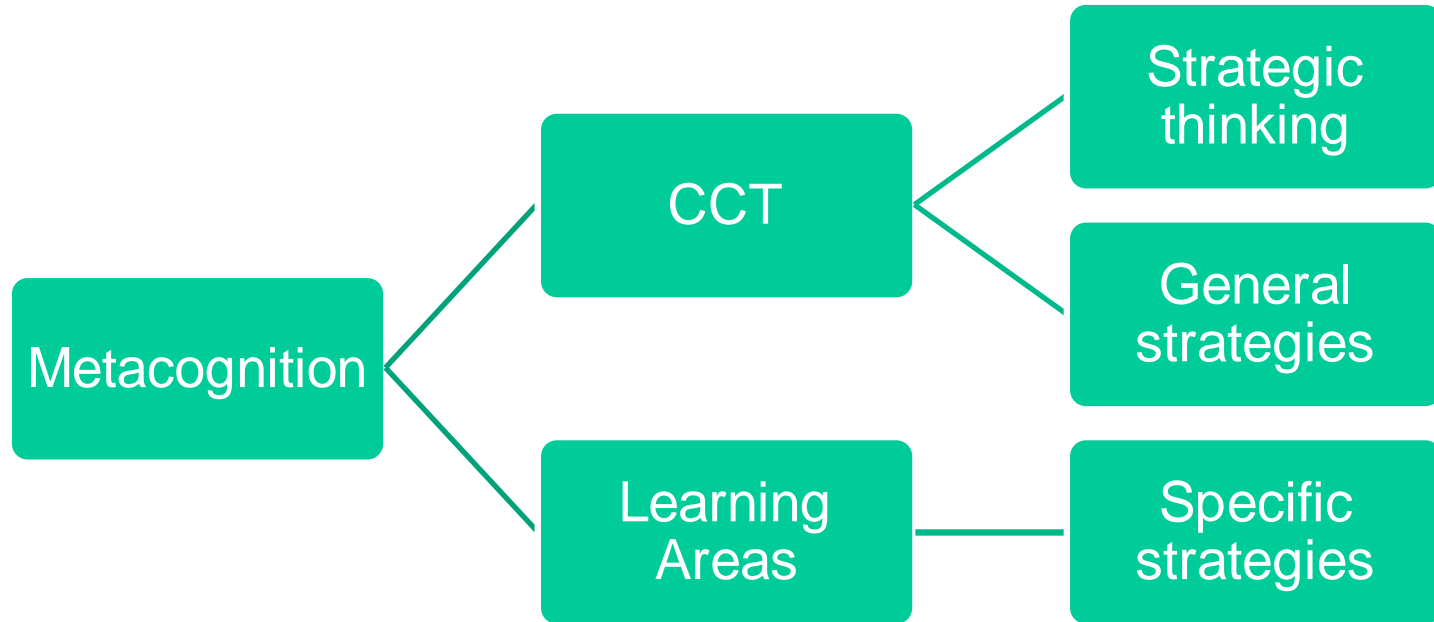
# Linking to the Victorian Curriculum: F-10

| Self-regulated learning | | |
|---|---|---|
| **CCT**<br>General strategies | **Personal and Social Capability**<br>Effective learning dispositions | **Learning Areas**<br>Specific strategies<br>Dispositions in context |

# Explicitly teaching metacognition

To manage and apply thinking processes intentionally:

Do I know how the strategy works?

Can I think of a range of uses for this strategy?

Am I aware of what the strengths and limitations of this strategy are?

Can I  select a strategy purposefully?

# Explicitly teaching metacognition

## Can I select a strategy purposefully?

– What do I want to achieve?

  – Clarity, accuracy, precision, depth, coherence, breadth?

  (see Peter Ellerton's Critical Thinking Matrix at https://criticalthinking.org.au/critical-thinking-matrix/)

– Will the thinking process help to get me there?

# Example (CCT: Levels 5 and 6)

| Content Description | Achievement standard (extract) |
|---|---|
| Investigate how ideas and problems can be disaggregated into smaller elements or ideas, how criteria can be used to identify gaps in existing knowledge, and assess and test ideas and proposals (VCCCTM031) | Students disaggregate ideas and problems into smaller elements or ideas, develop criteria to assess and test thinking, and identify and seek out new relevant information as required. |

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VICTORIA State Government

# Disaggregation as a strategy

- **Why** is this done/what is the value of doing this?
- **How** is it done?
- **When** should it be done? What kind of problems?
- What are the limitations of it? How do we **evaluate** it?

Taught in and through relevant learning areas

Goal is that students can independently think of this as a strategy when faced with a problem.

# Mathematics example

**Disaggregating and using criteria in Mathematics**

**Computational Thinking** in Mathematics encourages students to develop strategies to assist with problem solving as they progress through the Victorian Curriculum.

It consists of

- Decomposition
- Pattern Recognition
- Abstraction
- Algorithms

# —COMPUTATIONAL THINKING—
# IN THE VICTORIAN CURRICULUM
## DIGITAL TECHNOLOGIES AND MATHEMATICS

**BREAK THE PROBLEM DOWN INTO MODULES AND SOLVE**
Define simple problems to deliver solutions. Define and decompose real-world problems to develop a software solution.

PROBLEM
MODULES
1
2
1.1
1.2
2.1
2.2
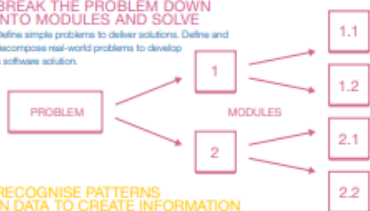
## DECOMPOSITION
Breaking a complex problem down into simpler, less complex components

**PIGEONHOLE PRINCIPLE**
The pigeonhole principle is a simple but powerful counting idea in mathematics. It states that when we have more objects (pigeons) than containers (holes) then at least one container must contain more than one object. This image illustrates this principle for the case of ten pigeons and nine holes.

**PROBLEM**
Consider the list of two-digit numbers (10, 11, 12 ... 97, 98, 99). Numbers are selected randomly, with repetition allowed. What is the minimum number of selections required to ensure that at least three of the selected numbers have the same first digit?

**RECOGNISE PATTERNS IN DATA TO CREATE INFORMATION**
Water storage and use. Daily water storage levels as a percentage of capacity.

49.8%

## PATTERN RECOGNITION
Classifying patterns in data and organising data logically Representation and interpretation

## ABSTRACTION
Removing non-essential information and focusing on principal structure only

**FOCUS ON SPECIFIC DETAILS OF A PROBLEM**
Draw a simple diagram of home network devices connecting to the internet via a wireless router.

## ALGORITHMS
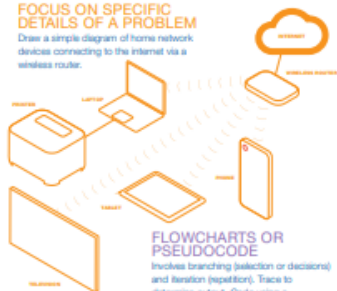A sequence of instructions that can be performed

**HONEYCOMB PATTERN**
Space-filling patterns with hexagons occur in bees' honeycomb and also tiling patterns on building surfaces. These patterns are called hexagonal tessellations or hexagonal tilings. Geometry and drawing software can be used to produce a hexagon and a honeycomb pattern.

To download this poster, go to vcaa.vic.edu.au

Read the numbers $m$ and $n$. Subtract $n$ from $m$. Record that a subtraction has taken place. If the answer is greater than $n$, repeat the process subtracting $n$ from the answer.

If the answer is less than $n$, record the answer as the remainder. Record the total number of times a subtraction has taken place: this as the number of times $n$ goes into $m$.

For example, let $m$ = 23 and $n$ = 4. The result of dividing 23 by 4 is 5 with remainder 3.

**FLOWCHARTS OR PSEUDOCODE**
Involves branching (selection or decisions) and iteration (repetition). Trace to determine output. Code using a general-purpose programming language.

If ... then
If ... then ... else
Case if
Repeat ... until
For ... do

**DIVISION AS A REPEATED SUBTRACTION**
Multiplication of positive integers can be considered as repeated addition. In a similar way division of a positive integer by a smaller positive integer can be considered as repeated subtraction.

23

| 19 | 15 | 11 | 7 | 3 |
|----|----|----|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 |

$m \div n$

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VICTORIA State Government

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VICTORIA State Government

# Decomposition

- **Problem Solving Strategies**
  - Foundation Mathematics " ..  estimate the size of these sets, and use counting **strategies** to solve problems that involve comparing, "
  - Level 7 Mathematics "Multiply and divide fractions and decimals using efficient written **strategies** and digital technologies"
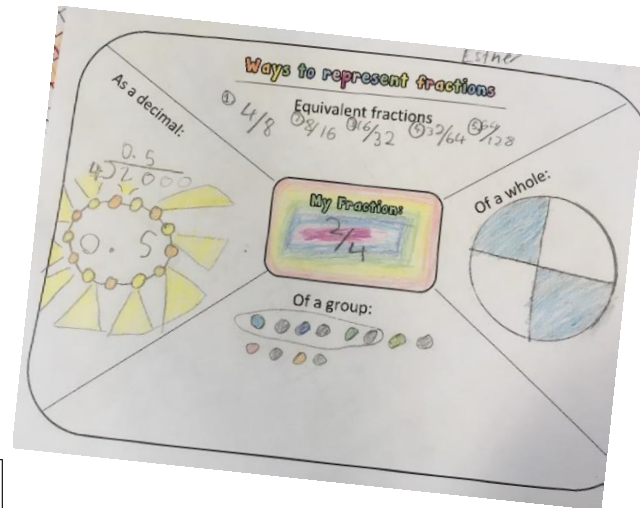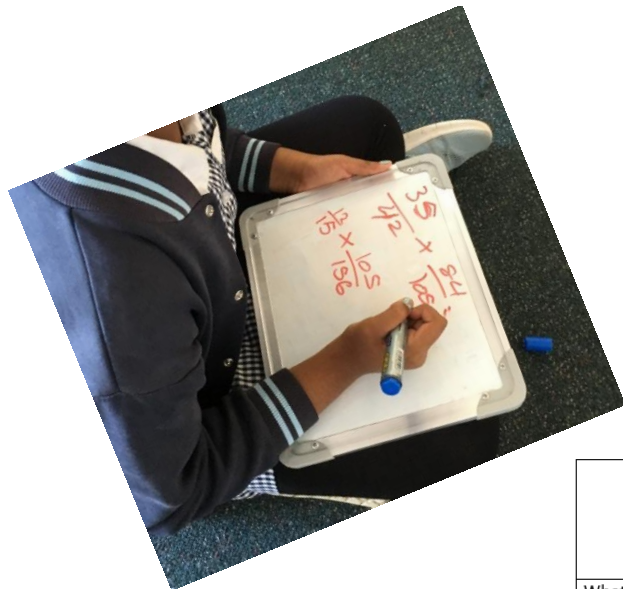
| K | W | L |
|---|---|---|
| What I know… | What I wonder… | What I have learned… |
| | | |

# Self-regulated learning

**Building self-awareness: My strengths and weaknesses as learner**

**Developing learning strategies that I manage and can use**

**Strategies to motivate my learning**

# Personal and Social Capability

**Knowledge and skills associated with developing:**

- A realistic sense of their personal strengths and personal characteristics

- A capacity to interpret their own emotional states, needs and perspectives.

- Skills to work independently and conscientiously, delaying gratification and persevering in the face of setbacks and frustrations.

# Examples (Levels 5 and 6)

| Content Description | Achievement standard |
|---|---|
| Describe what it means to be confident, adaptable and persistent and why these attributes are important in dealing with new or challenging situations (VCPSCSE027) | They describe the influence that personal qualities and strengths have on achieving success |
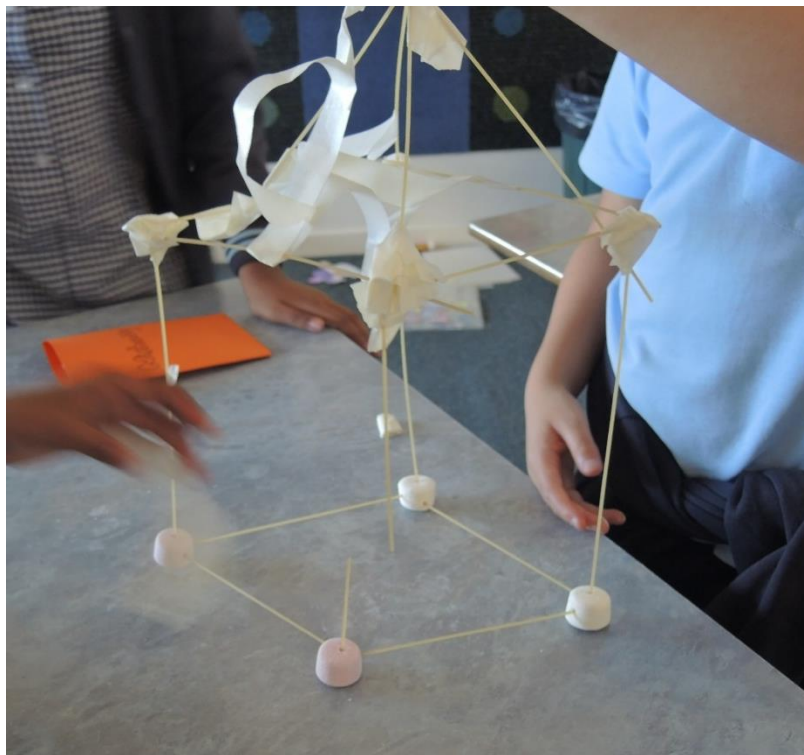
# Explicitly teaching self-regulated learning

| Motivational and Learning strategies | Dispositions |
|---|---|
| Why is this done/what is its value?<br>How is it done?<br>When should it be done?<br>What are its limitations?<br>How do we evaluate outcomes? | What does it mean?<br>What is its value?<br>What are its limitations?<br>What are some protective factors that will influence development of this disposition? |

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VICTORIA State Government

# Self-regulated learning in Mathematics
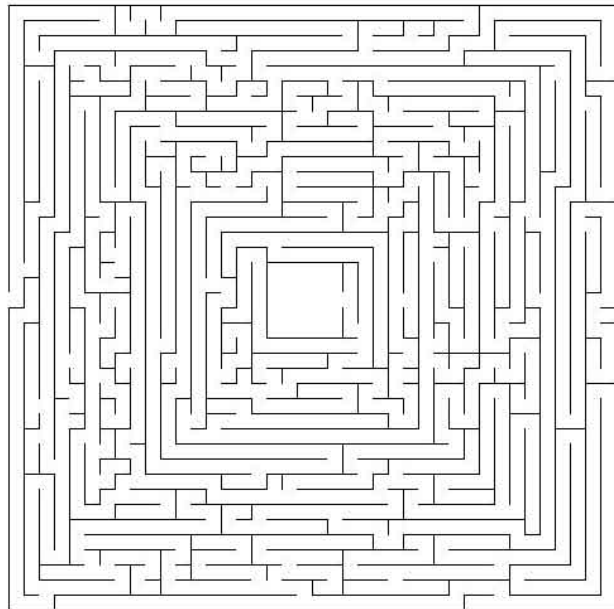
# The role of challenge

- Demonstrates usefulness of strategies

- Motivating

- Enables development of skills in metacognition and self-regulation

# Assessment

- **At the basis of assessment is shared language – explicit teaching enables assessment to occur.**

- **Use the achievement standards for CCT and Personal and Social Capability to plan a gradual development of skills and to assess students**

# Metacognition

- **Do I have a breadth and depth of understanding of metacognitive strategies?**

- **Can I select strategies to manage and reflect on mine and others' thinking?**

# Example assessment methods

- **Reflecting on how a metacognitive strategy or tool was used/should be used – how it assists thinking**

- **Identifying their own examples of where metacognitive strategies might be useful**

**Note: Assess through practical contexts where level of challenge high enough to require metacognition**

# Written reflection

- **Students taught to write reflections in their maths books**

- **Reflect on difficulty of the task, what they learnt or practised and how they know; and effectiveness of methods**

- **Stems used as prompts – I learnt… I was practicing… I prefer… because…**

**Left (student mathematics work):**

42 × 35 = 1,470.

Area model

|     | × 40 | 2 |
|-----|------|---|
| 30  | 1200 | 60 |
| 5   | 200  | 10 |

1200
+ 200
60
10
1470

Lattice

42 × 35 = 1 470

Algorithm

42 × 35 = 1 470.

H T O
ᴵ4 2
× 3 5
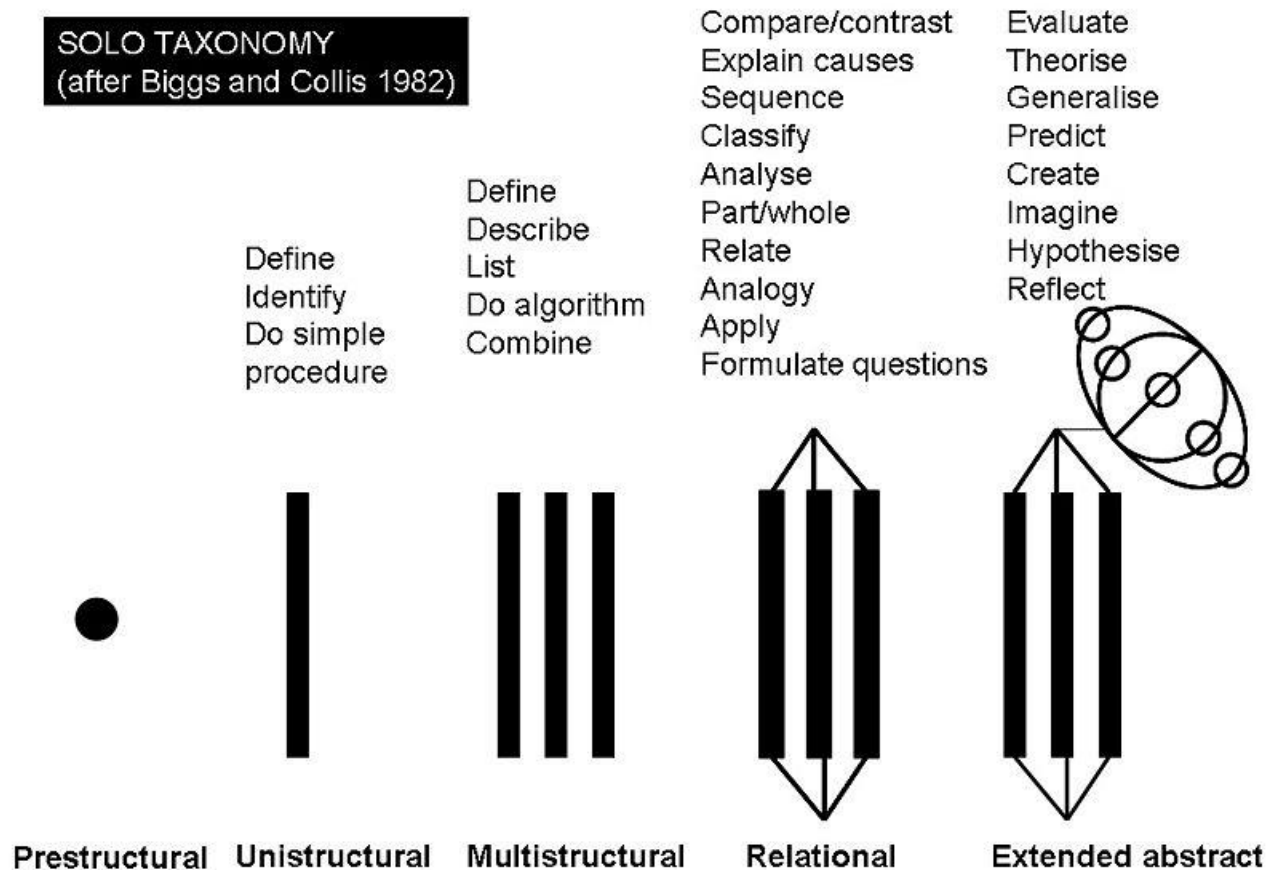2 1 0
1 2 6 0
1 4 7 0

64
273

**Right (student reflection):**

I believe that the the Lattice method for multiplication is the most effective because it is clear, organised, and easy to get the hang of and I can make it work for multiplying decimals. The answer also is also clear to read as well.

I find the Area Model method harder than the Lattice Method, because even though they appear similar, the Area Model method still requires you to perform multiplication and addition while the Lattice method only requires you to perform multi addition

I also find the Algorithm method harder than the Lattice method because at times, you have to try and keep track of traid trading a whole lot of numbers to when using the Algorithm method.

extended abstract

My mistake!

① relational. b/c you are comparing and contrasting. Also justifying.

② Moving into extended abstract b/c you are evaluating.

SOLO taxonomy can be used to write tiered success criteria.

Teaching kids to use it for their own self-assessment



SOLO TAXONOMY
(after Biggs and Collis 1982)

Define
Identify
Do simple procedure

Define
Describe
List
Do algorithm
Combine

Compare/contrast
Explain causes
Sequence
Classify
Analyse
Part/whole
Relate
Analogy
Apply
Formulate questions

Evaluate
Theorise
Generalise
Predict
Create
Imagine
Hypothesise
Reflect

**Prestructural**  **Unistructural**  **Multistructural**  **Relational**  **Extended abstract**

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VICTORIA State Government

# Further reading

- **Pam Hook (HookED) has a guide to using SOLO Taxonomy for metacognition and self regulated learning at**

- **http://pamhook.com/mediawiki/images/d/dc/SOLO_Taxonomy%2C_Metacognition_and_HOT_Maps.pdf**

# Assessment of Personal and Social Capability

- **Introduced through a learning area such as Health and Physical Education and assessed against the Personal and Social Capability Achievement Standards.**

- **Programs shared across the school to enable application of learning in a range of learning areas**

| Achievement Standard | Explicitly Introduced in HPE | Applied in other Learning Areas |
|---|---|---|
| They describe the influence that personal qualities and strengths have on achieving success (5 and 6)<br><br>They reflect on strategies to cope with difficult situations and are able to justify their choice of strategy demonstrating knowledge of resilience and adaptability.(7 and 8) | Know meaning and value of confidence, adaptability and persistence in the context of HPE and in general<br><br>Learn strategies to cope with challenging situations in HPE context and recognise these are useful in general | Should already recognise the value of these qualities and strategies in general<br><br>Learn how to adapt and persist in the context of other learning area challenges<br><br>Qualitative feedback given by student and teacher using language shared across learning areas |

# Planning
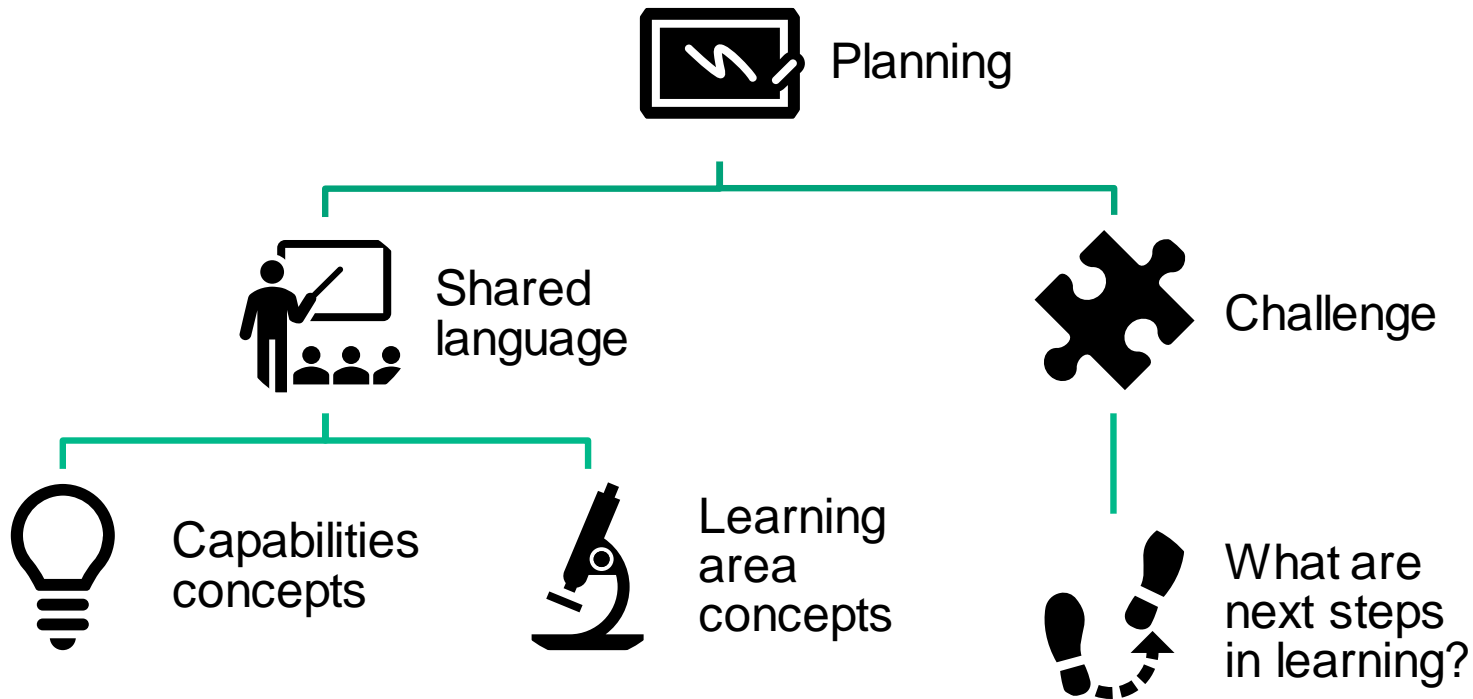
# Questions?

# Contact

Monica Bini:

(03) 90321693

monica.bini@education.vic.gov.au