METACOGNITION

QUESTIONING AND DISCUSSION

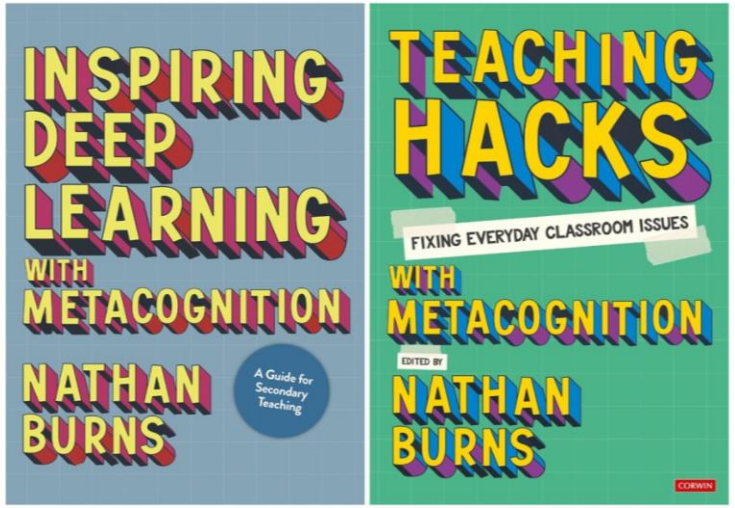
Contracting Session

- Ask questions at any time!

Mr Metacognition

Who Am I?

- Nathan Burns
- Former Head of Maths/Pastoral Lead/MAT Lead
- Metacognitive researcher and author
- Full time training provider and consultant



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Why Metacognition? The Headlines...

- Greatest positive attainment impact of any intervention (EEF, 2019)
- OFSTED (2018) suggested area of focus for high-quality CPD
- Benefits ALL students (regardless of: socio-economic status; prior attainment; sex; behaviour; SEN status; age) (many, many papers...)
- Free for schools to implement

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Anything Else?

- Works across phases (i.e. can be a focus for all)
- Works across curriculum areas (i.e. can be a whole school focus)
- Develops problem solving skills
- Increases revision effectiveness

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Write Time...

What is metacognition?

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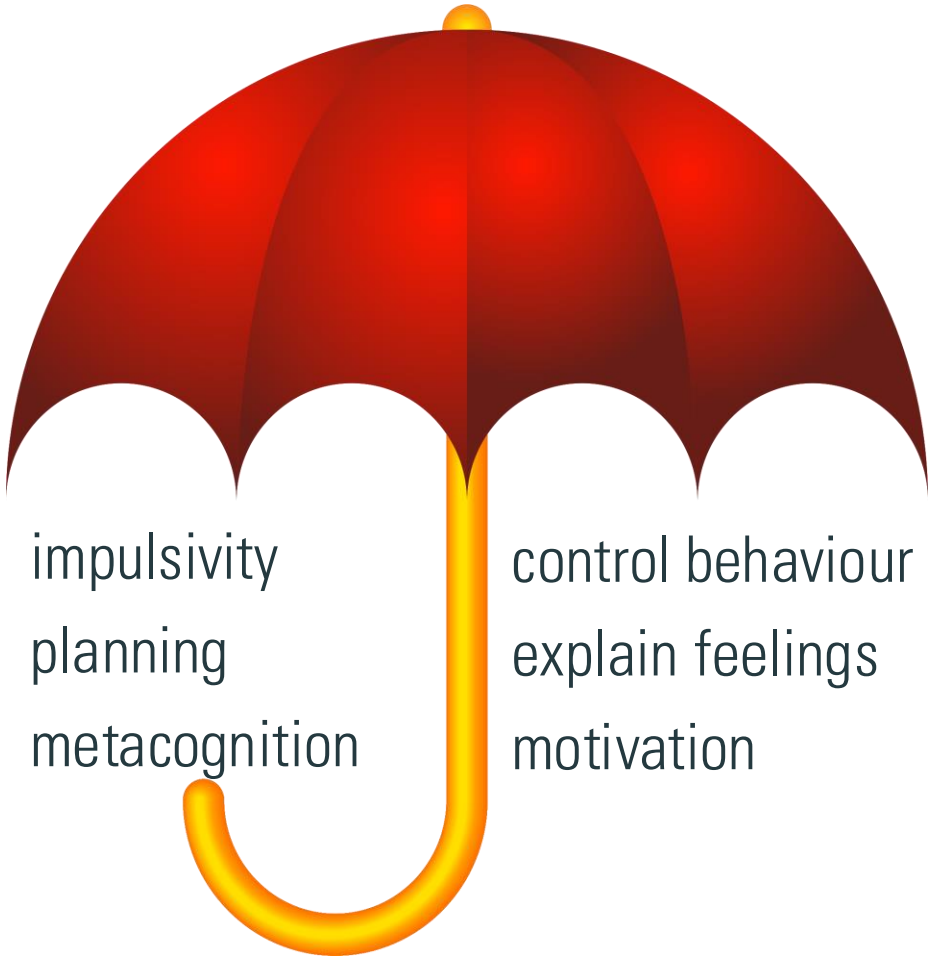
What Metacognition Isn't?

- Metacognition is not the same as self-regulation
- Self-regulation is an umbrella that cover learning habits AND behaviours



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What Metacognition Is?

- Flavell (1972): 'I am being metacognitive if I notice that I am having more trouble learning A than B; if it strikes me that I should double check C before accepting it as fact'
- Burns (2023): '[Metacognition is] the little voice inside your head that constantly evaluates and informs your decisions.

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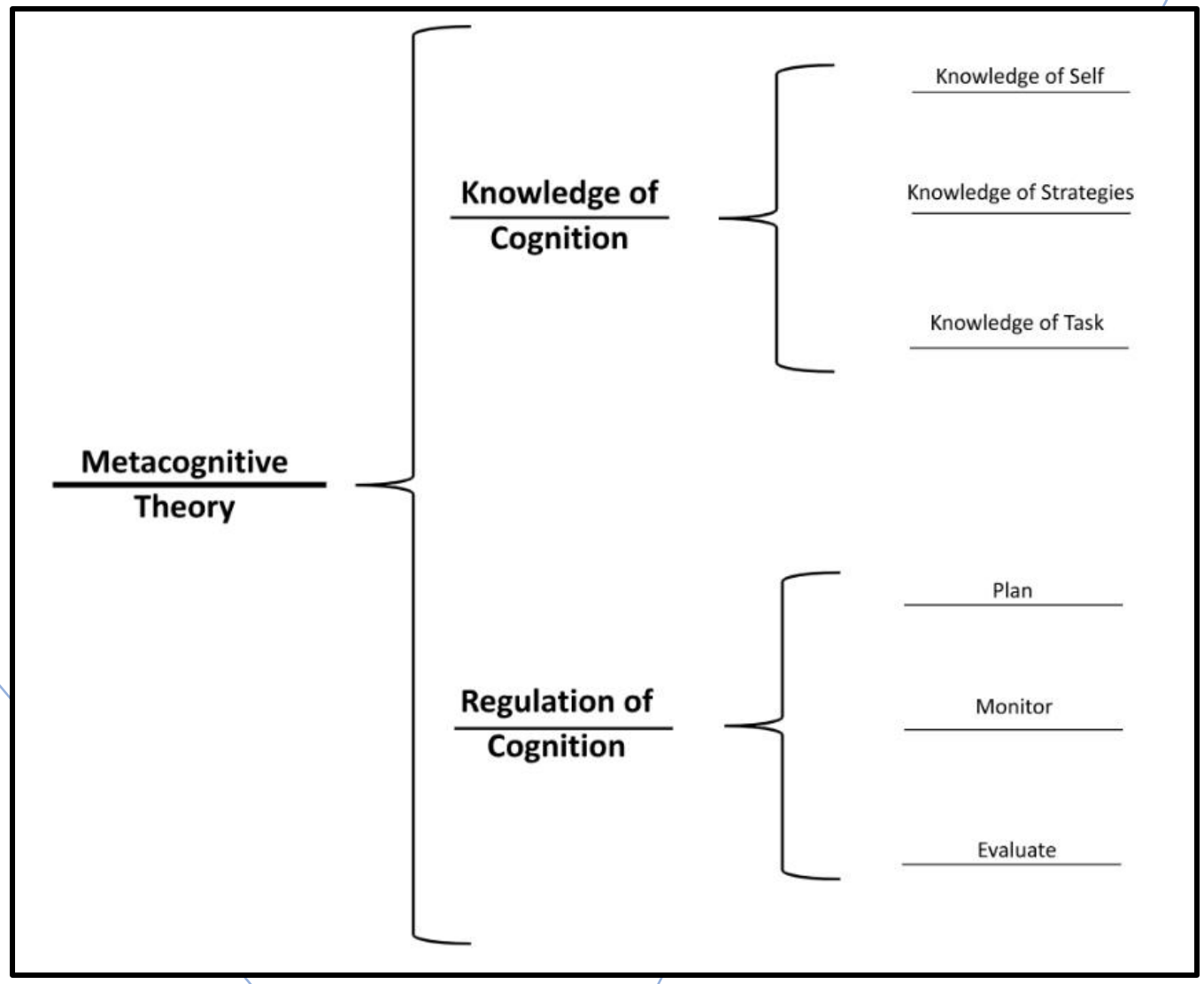

Knowledge Vs Regulation

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Knowledge Of Cognition

- Knowledge of task – knowledge of requirements to meet to fulfill task criteria
- Knowledge of self – knowledge of… knowledge
- Knowledge of strategies – knowledge of methods available to attempt a cognitive task

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Regulation Of Cognition

- Planning – an approach for the task
- Monitoring – staying on track for successful task completion
- Evaluation – review of the efficiency and effectiveness of approach and outcomes

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Levels Of Metacognition

- Metacognition is not a dichotomy
- We have Perkins' (1992) 4 levels: tacit; aware; strategic; reflective

Tacit – not aware of control of cognitive processes

Aware – aware of cognitive processes but don't actively engage with them

Strategic – begin to plan and evaluate cognitive action

Reflective – plan, monitor and evaluate cognitive action

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Developing Metacognitive Skills

- Metacognitive development must be within the context of content
- Metacognition needs to be development within the wider curriculum
- Metacognition needs to be embedded – not a bolt-on or an enrichment opportunity
- Metacognition should not be taught as a discrete lesson

But

- Metacognitive strategies ought to be taught explicitly within the context of content

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Write Time...

What makes a good question?

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A 'Good' Question

Provides us with information that we didn't otherwise have around student understanding...

OR

Provides a student with new information to help them more forward...

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Getting Questioning Spot On!

- Questioning is just like playing darts...
- So...
  - We need to plan out our questions
  - We need them to build (appropriately) in difficulty (GOLDILOCKS!)
  - They need to illuminate new information (for us, or student)

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Metacognition, Not Cognition

- Typically, we ask 'cognitive' questions
  - What do I do next?
  - What is the answer?
  - How much do you need to write?
- Instead, we need to direct *some* attention to metacognitive questions

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Connections

What?

- Utilise questioning to draw connections with previous tasks
  - Conceptual variation... 'What is the same'; 'what is different?'
- Can become embedded in every lesson

Why?

- Learn from previous experiences
  - (Both positive and negative)
- Develop student schema; draw links between ideas and learning episodes

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Example

$3 + 4 - 5$

$3 - 4 + 5$

$3 \times 4 + 5$

$3 + 4 \times 5$

What varies between each question?

How does this impact the resulting answer?

What mistakes may be made?

What could we do to make sure our answers are correct?

Craig Barton –
Variation Theory

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Example

Explain the formation of an ox-bow lake

as compared to...

Explain the formation of a waterfall

What is similar with these two questions?

How would your responses vary?

What did you learn from your previous response that must be included in your next response?

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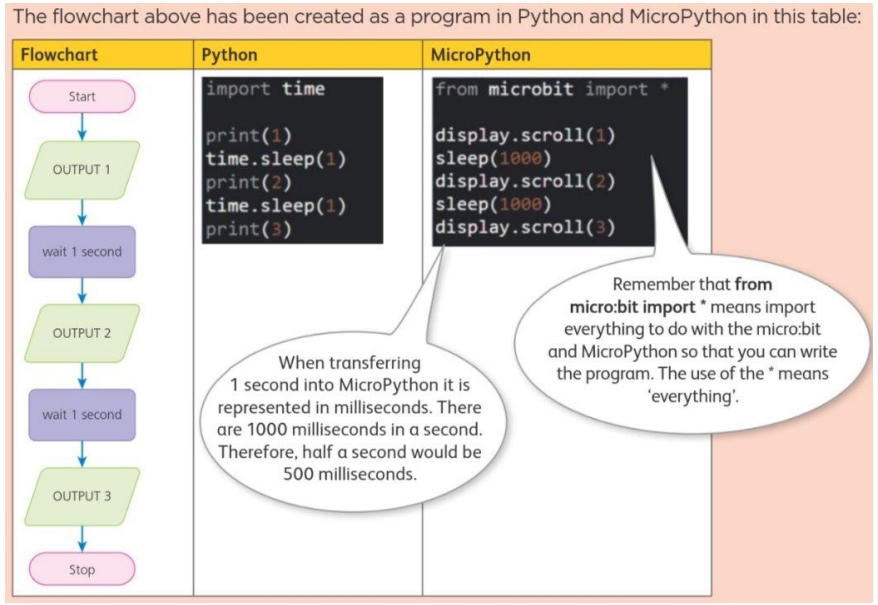
Example



Hodder – Cambridge International
Year 7 Computing Book

When might you use Python over MicroPython?

How does the userability compare?

How difficult is the programming for the two different systems?

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Strategy Comparison

What?

- Questioning around the relative strengths, weaknesses, appropriateness of alternative strategies.
- Potentially better once students have a better awareness of content and strategies available to them (cognitive load).
- Not appropriate where there is no reasonable alternative approach.

Why?

- Strengthen student knowledge of strategy appropriateness
- Improves problem solving and learner flexibility
- Deepens topic understanding

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Example

$$3(x - 5) = 17$$

Expand?

Don't expand?

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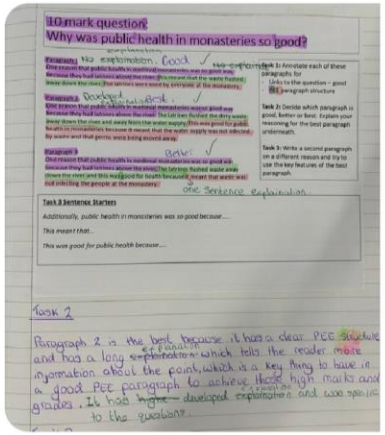
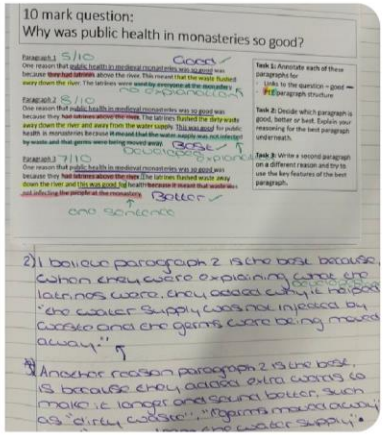
Example

Rachel Cliffe
@MrsRCliffe

Introduced a new exam question style to Year 10 through good, better, best paragraphs. Students had to identify the key features of the paragraph and then explain which one was the best and why, before writing the next paragraph for the question independently/ with scaffolds ✍️





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Comprehension

What?

- Comprehension - what is the task requirement?
    - How long do you have? What do you need to do? How do you know that? Does it matter what method you use? (etc.)

Why?

- Improved comprehension = improved planning
- Improved planning = improved outcomes
- Comprehension often the biggest barrier to task success

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Example

Which of the following achieved more in the 1960s and early 1970s:

- campaigns to improve the rights of African-Americans
- campaigns to improve the rights of women?

Explain your answer with reference to **both** bullet points.

[12 marks]

AQA Past Paper, 2023

How long do I have?

What are the key words? Why?

What is the key command word, and what does it mean?

What points must you make to hit the marking criteria?

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Comprehension

- What are the key words in the question? How do you know?
- What must be included within my answer? How do you know?
- If I have been provided with a table or graph, why may this be significant?
- Why have I been provided with an image?
- How does the number of marks available for this question link to the structure of answer that I need to provide?

Connection

- When have you seen a question or task like this before?
- What did you do well on when we had the similar task? Why did it go well?
- What did you struggle with when we had a similar task? Why do you think you struggled?
- What support may you need to be more successful this time around? Why will that help?
- What strategies did you use last time, and how well did they work? How do you know?

Strategies

- What are the strategies available to us?
- When would we usually use strategy *x*?
- What are the strengths and weaknesses of this strategy?
- Will this strategy always work, or is there a safer option?
- Did you consider how effective that strategy was last time that you used it?

Evaluation

- How successful were you in that task? How do you know?
- What went well in that task? How do you know?
- Where might you need greater support next time, and how will that help?
- What will you do differently next time?
- What will you do the same next time?

Supporting Effective Answers

- Consider the wait time that we provide students with
- Ensure a climate where verbal answers can be messy, incoherent and colloquial

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Silence = Good?

- Poor proxy for learning: silence = effective learning
- Demand for oracy high – a key focus for most (all?) schools?
- Metacognitive development is reliant upon verbal communication

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Discussion

- Discussion can be difficult – groups, behaviour, timings, evidencing learning…
- Metacognitive discussion requires two scaffolds:
  - Task understanding (e.g. time allotment; writing down or not?)
  - Cognitive understanding (*what* to discuss, with visible statements)

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Goal Free Problems

What?

- Provide students with a longer problem question, but remove the question/task element
- Allow students to recall as much information as they can.

Why?

- Superb retrieval task
- Removes the barrier of a 'question'
- Improves student confidence; show them what they can do

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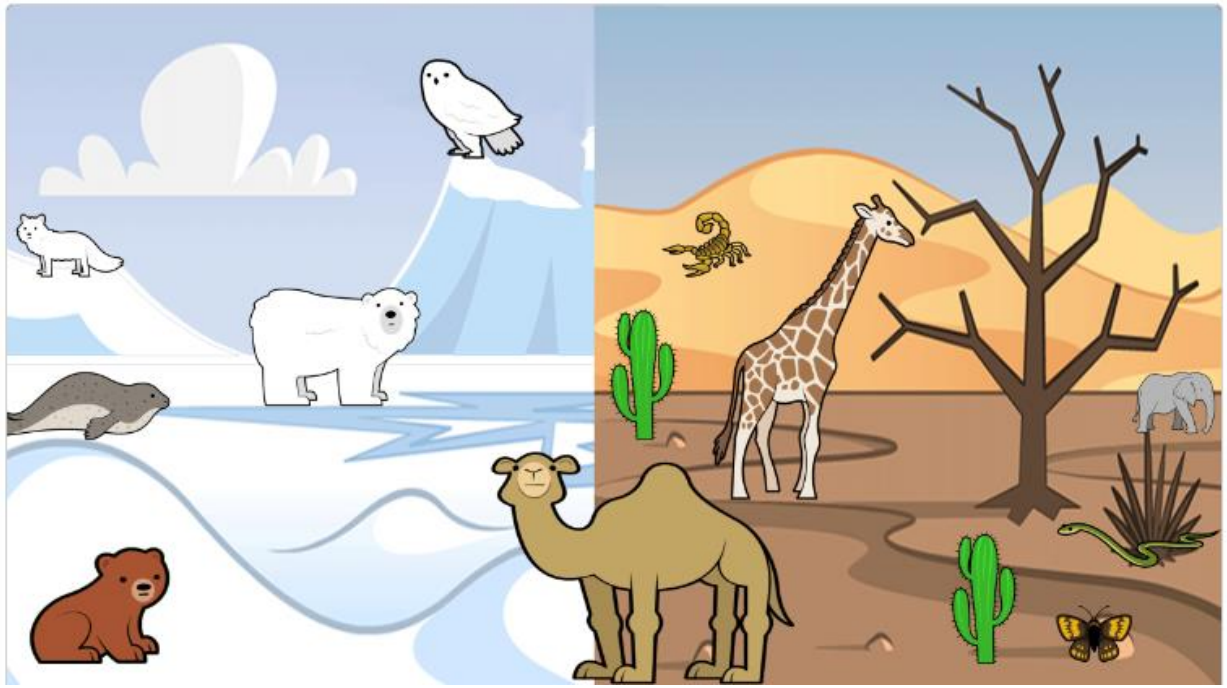
Example



What could a question be?

What can you deduce from the image?

What do you agree on? What do you disagree on?

What topic(s) may this link in to?

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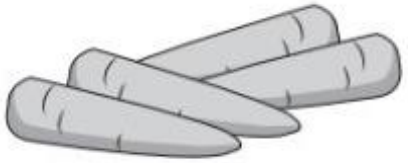
Example

potatoes
£1.50 per kg



carrots
£1.80 per kg

Jack buys $1\frac{1}{2}$ kg of potatoes and $\frac{1}{2}$ kg of carrots.

What can you calculate?

How many marks can you achieve?

List all potential questions

What units does the question link to?

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Example

An old man was clearly quite weird
He always dropped food in his beard
There was fried egg and jelly
My dear it was smelly
When it fell off everyone cheered.

What can you deduce?

What do you agree/disagree on?

What topic areas does this link with?

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Talking Heads (Concept Cartoons)

What?

- Provide students with a question and several different responses
- These can be alternative answers, or often, answers with varied depth
- Students need to identify correct answer/most detailed answer

Why?

- Force consideration of depth of answers
- Develop understanding of effective answers
- Discuss subtlety in response
- Tease out misconceptions

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Example

Define a rectangle

A square is a rectangle

A rectangle has two pairs of opposite parallel sides

A rectangle has two pairs of equal sides

A rectangle has four sides

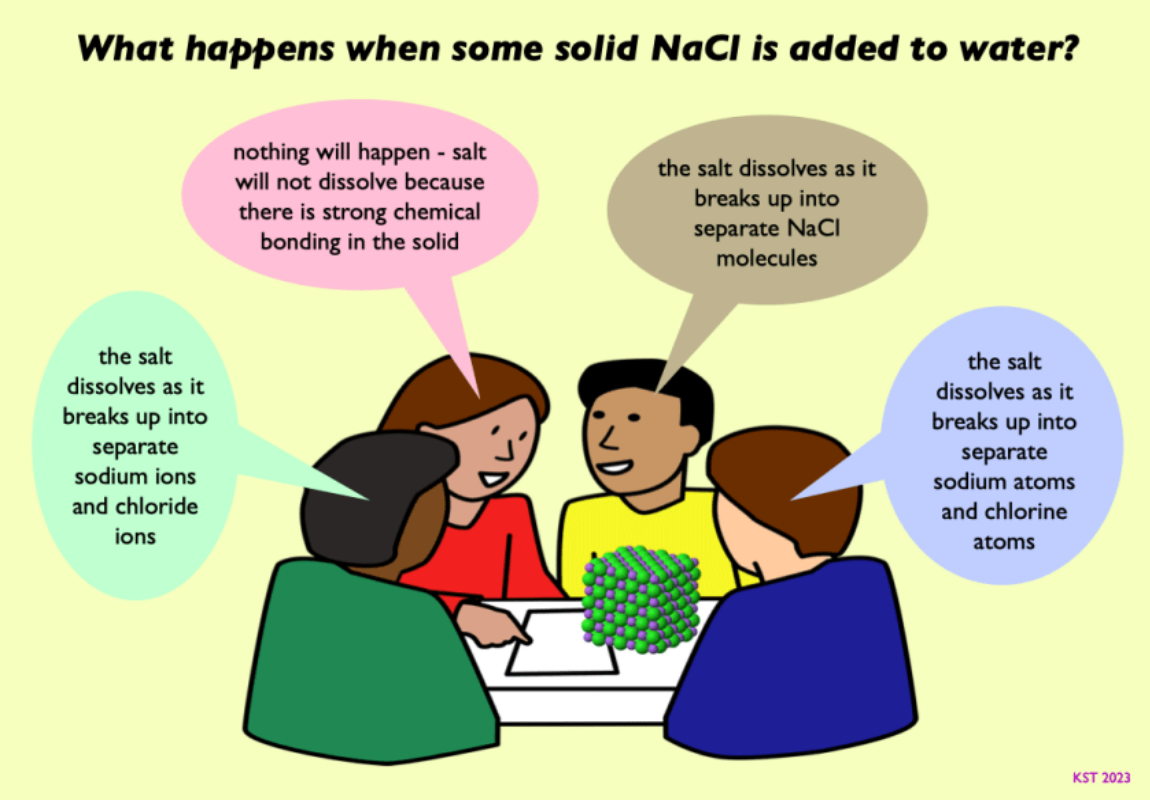
A rectangle has four sides, with two pairs of congruent parallel sides

A rectangle is a quadrilateral with four right-angles

A rectangle has parallel sides

A rectangle has parallel sides

Example



Science Education Research

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Misconception Discussion

What?

- Provide students with a misconception answer, or a range of answers containing at least one misconception
- Students need to identify the error, correct it, understand why it has come about

Why?

- Supports monitoring and evaluation abilities (i.e. identifying 'red flags')
- Significant subject knowledge benefits
- Develops students criticality

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Example

'Mr Woolaston's Mistakes'…

Four prompts:

1. What is the error?
2. What should I have done?
3. Why do you think I made the mistake?
4. Mistake or misconception?

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Ponder...

Any final questions?

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Stay In Touch!

Twitter: @MrMetacognition

BlueSky: @mrmetacognition.bsky.social

Email: mrmetacognition@gmail.com

LinkedIn: Nathan Burns

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