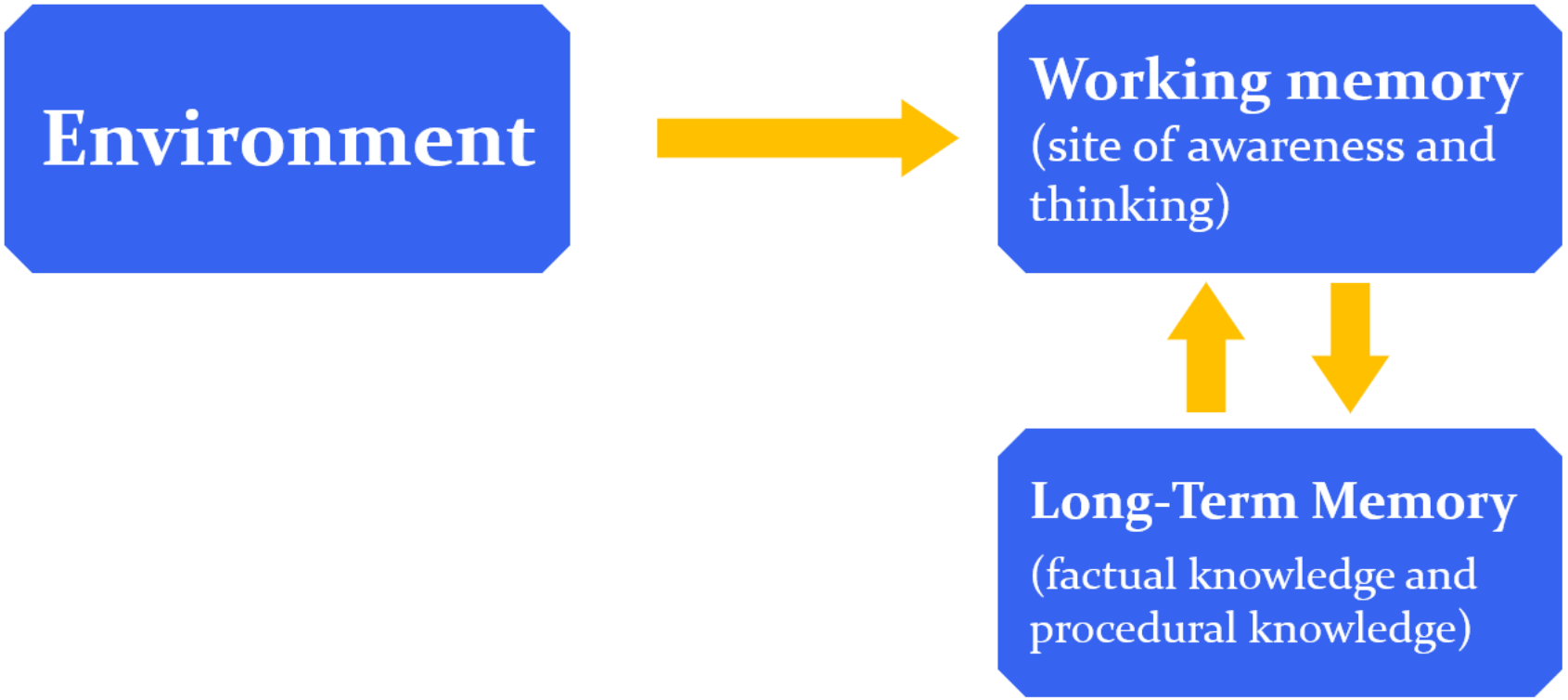
The simple model of the mind



Reflect: What is the role of the working and long-term memory in the process of learning? What happens when the working memory becomes ‘overloaded’?

Avoiding working memory overload

Facilitator Name

@TeachFirst @teachfirstuk

Seminar norms

Throughout the seminar, please:

- Be present
- Be proactive
- Critique with kindness

Seminar objectives

By the end of this seminar, you will:

- be able to articulate the role of the working and long-term memory in the process of learning
- be able to pair appropriate graphical representations with verbal explanations to avoid overloading the working memory
- reflect on your use of worked and partially completed examples to avoid overloading the working memory

Related ECF statements

Learn that…	Learn how to…
How Pupils Learn (TS2 – Promote good progress)	
2.4 Working memory is where information that is being actively processed is held, but its capacity is limited and can be overloaded. **2.9** Worked examples that take pupils through each step of a new process are also likely to support pupils to learn.	**Avoid overloading working memory, by:** • breaking complex material into smaller steps (e.g., using partially completed examples to focus pupils on the specific steps).
Classroom Practice (TS4 – Plan and teach well structured lessons)	
	Make good use of expositions, by: • combining a verbal explanation with a relevant graphical representation of the same concept or process, where appropriate.

Overloading the working memory

$$105 \div 7 =$$

Discuss:

1. What barriers did you face with this calculation?
2. What steps did you take to arrive at your answer? Which steps were more automatic than others?
3. What barriers might pupil with less expertise have in answering this calculation?

Key strategies

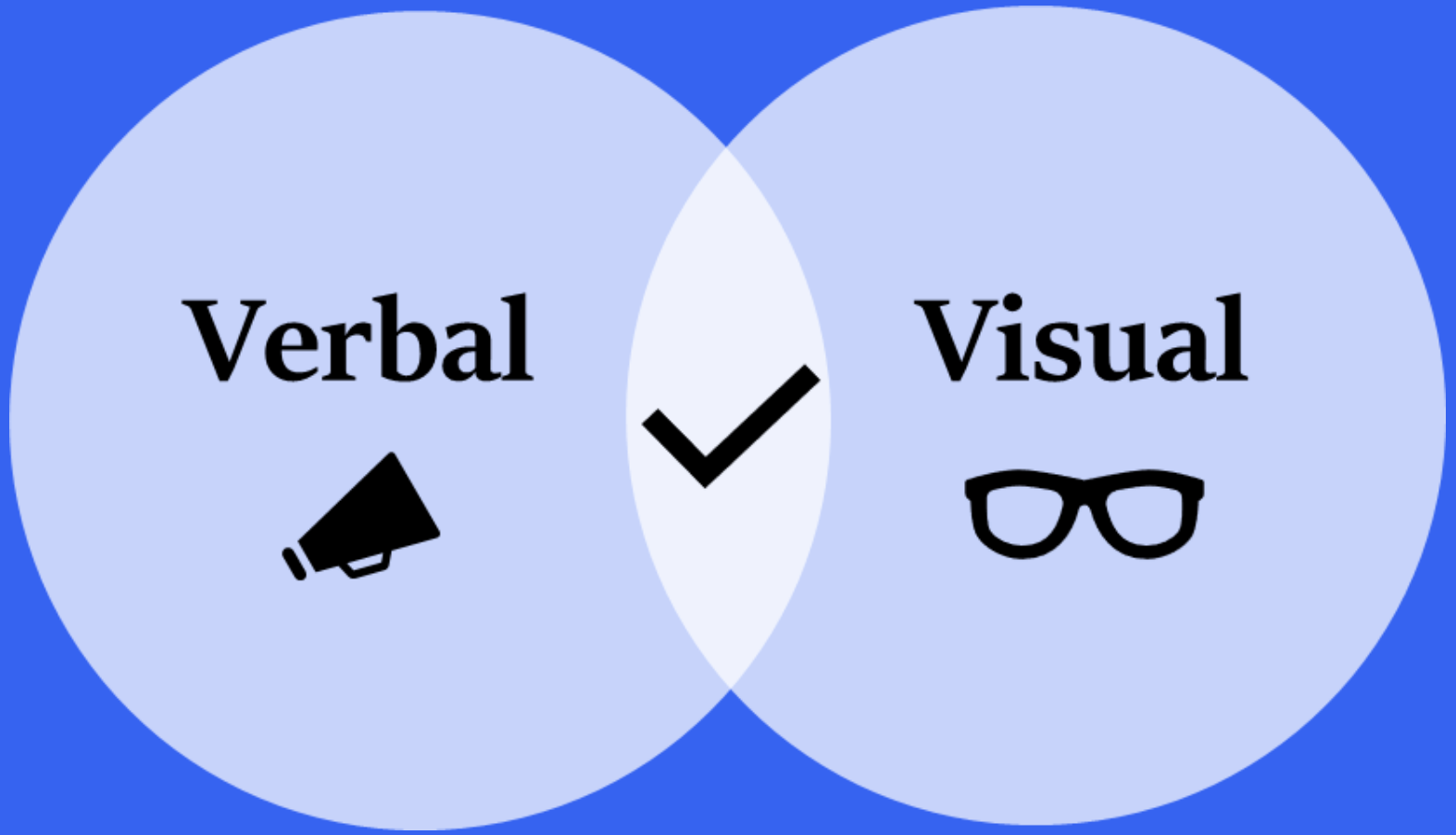
- Building on prior knowledge
- Breaking down complex tasks or ideas
- Combining verbal explanations and graphical representations
- Worked and partially completed examples

Overloading the working memory

"The key is to try to get students to **think about what we want them to remember.**"

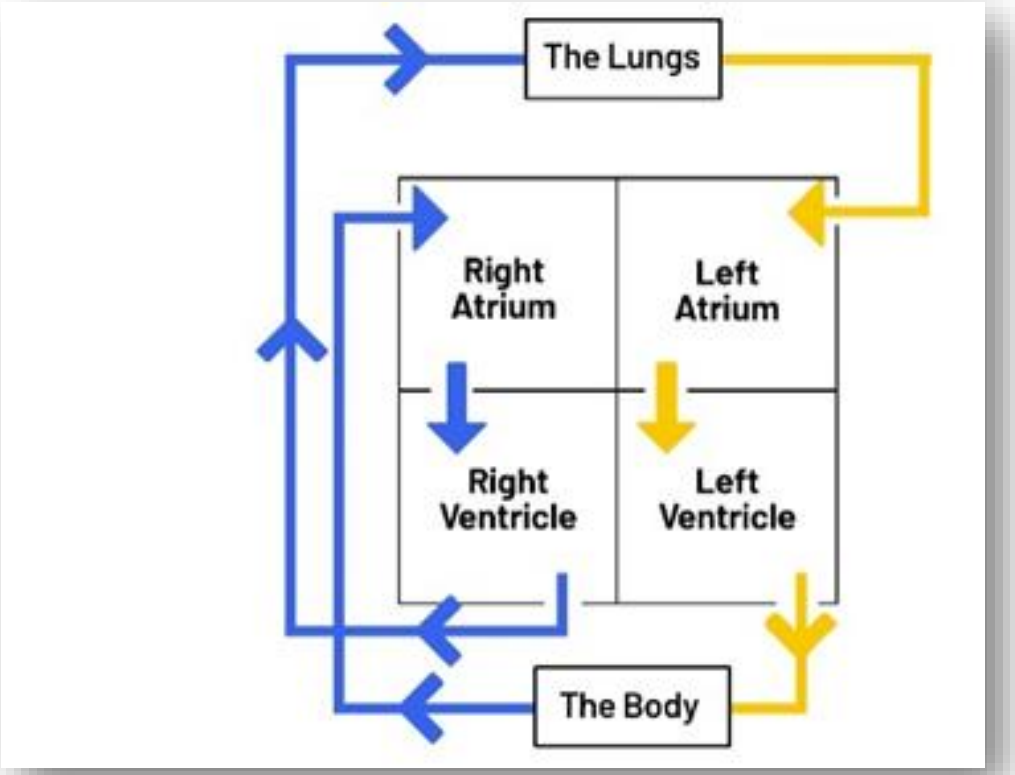
Benjamin Riley
Executive Director of Deans for Impact

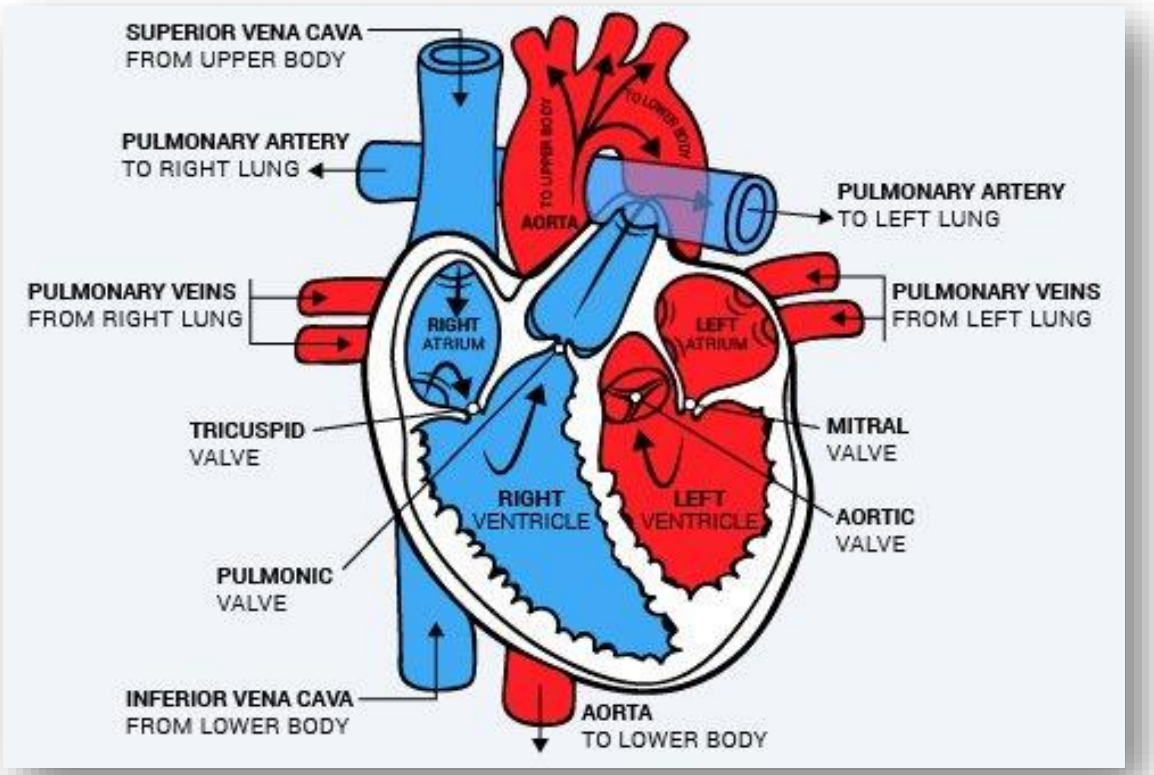
Overloading the working memory



Supporting the working memory

"The key is to try to get students to **think about what we want them to remember.**"



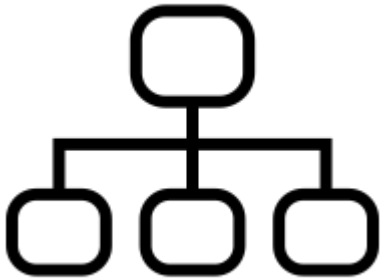


Combining verbal explanations and graphical representations

Discuss:

- Why did you select the graphical representation that you used?
- How did it effectively support your verbal explanation?
- How did it reduce the load placed on the working memory?

Graphical representations

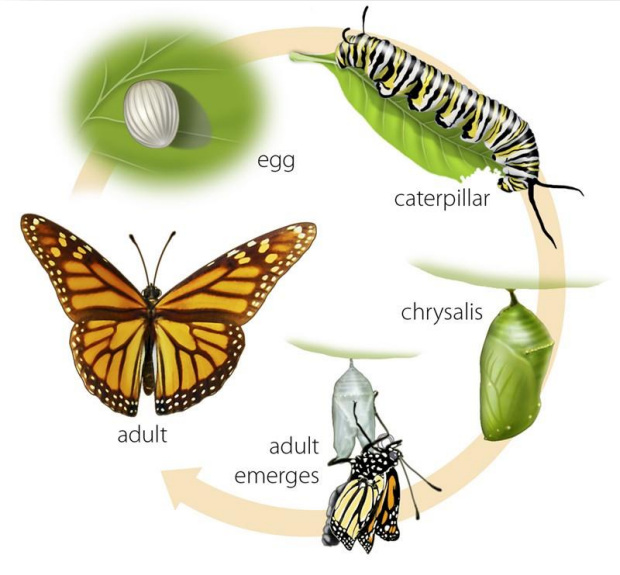


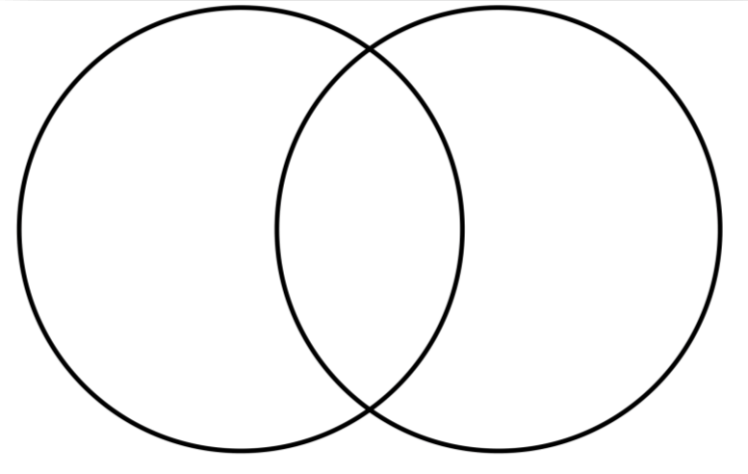
Graphic Organisers

Diagrams

Drawings

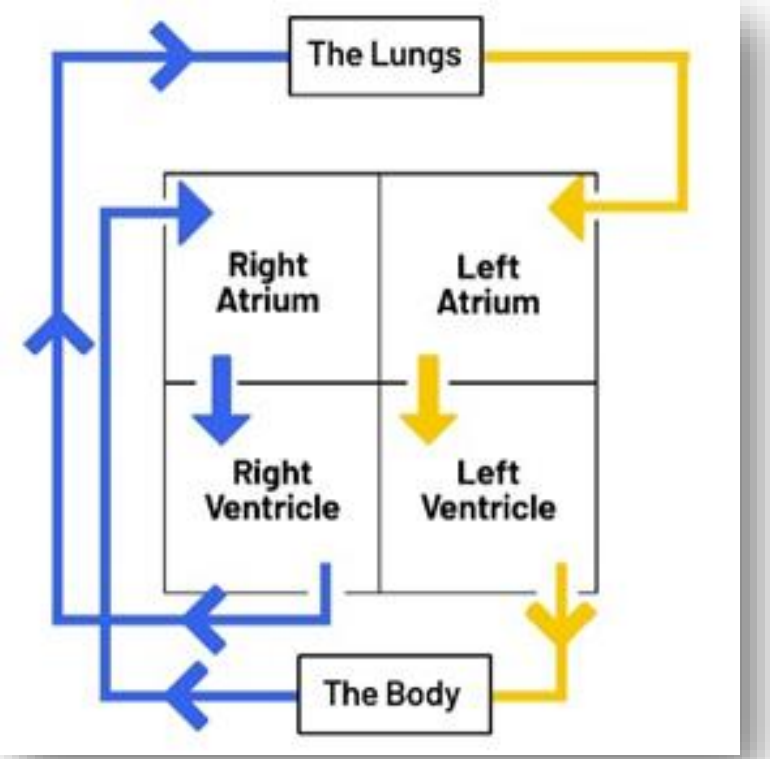
Graphic organisers

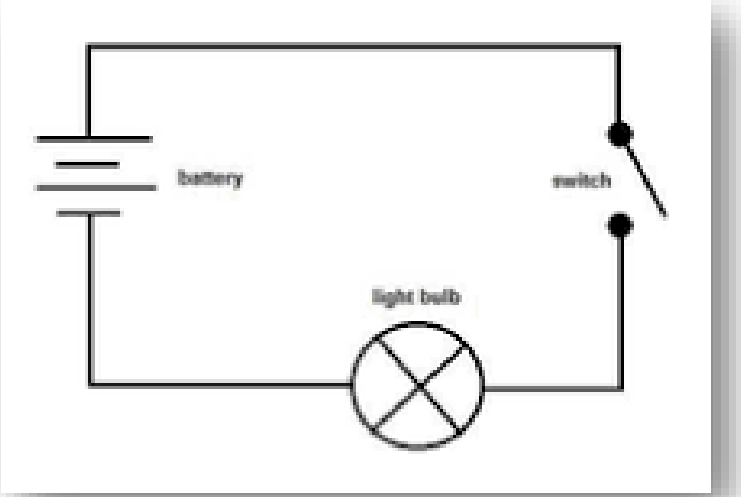


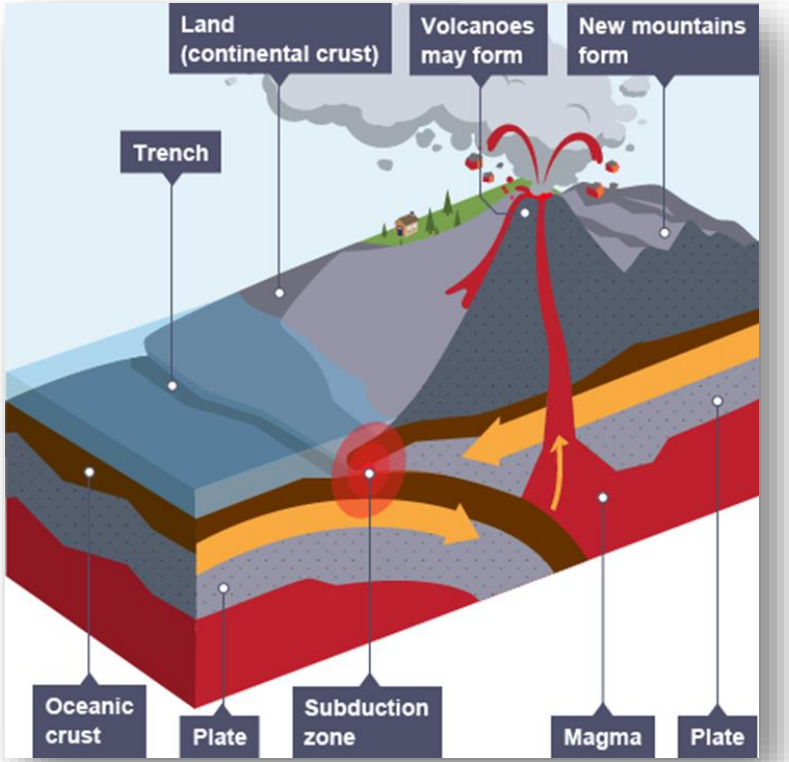


Consider: When and how have you used graphic organisers?

Diagrams

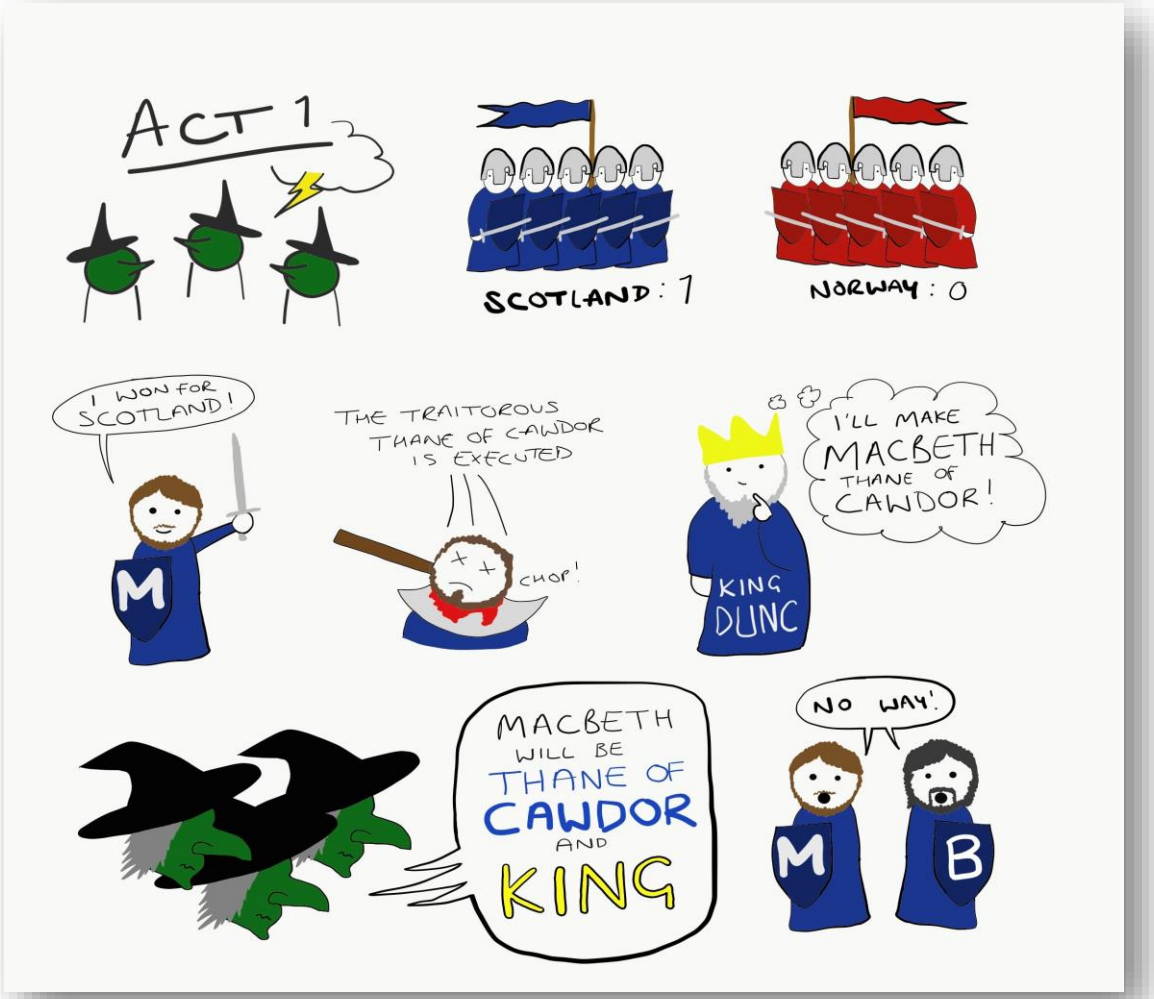

The Lungs
Right Atrium
Left Atrium
Right Ventricle
Left Ventricle
The Body


battery
switch
light bulb


Land (continental crust)
Volcanoes may form
New mountains form
Trench
Oceanic crust
Plate
Subduction zone
Magma
Plate

Drawings


the states in the Italian Peninsula.
What do I care about Cavour resigning?
Once Napoleon III has achieved his goals, he ends the war, and Cavour gets very upset and resigns from his office.
from the Italian states.
Savoy
Lombardy
Venetia
Piedmont
Nice
Tuscany
Papal States
Naples
Sardinia
Sicily
Piedmont got bigger after the war by gaining Lombardy and the Duchies. France did not get Savoy and Nice because of the disagreement.


ACT 1
SCOTLAND : 1
NORWAY : 0
I WON FOR SCOTLAND!
M
THE TRAITOROUS THANE OF CAWDOR IS EXECUTED
CHOP!
KING DUNC
I'LL MAKE MACBETH THANE OF CAWDOR!
MACBETH WILL BE THANE OF CAWDOR AND KING
NO WAY!
M
B

Combining verbal explanations and graphical representations

Discuss: Think back to the example of combining verbal and graphical representations you discussed earlier in the seminar and consider the following questions:

1. Can you categorise the type of graphical representation you used? Would you use the same graphic again if teaching this topic? Why/why not?

2. How was the graphic structured to ensure that pupils were thinking about what you wanted them to remember?

3. Can you identify an upcoming lesson where you could include a verbal explanation and graphical representation?

Worked and partially-completed examples

Worked example

A worked example is a problem that has already been broken down and solved for the pupil, with every step fully explained and clearly shown.

Partially completed example

Partially completed examples are worked examples that have had some steps left blank for pupils to complete. They allow the teacher to direct the pupil to where the practice needs to take place and thinking needs to focus.

Reflect: Why is it important to step through all the processes for your pupils? How does this support the working memory?

Scenario: using a worked example

T: This question is asking us to draw the reaction between two atoms. Step 1 is to draw out the electron structure for each atom, but just the outer electrons (because the inner electrons aren't involved in the reaction, and so don't matter here). We know how to do this from last lesson.

(The teacher draws out the electron structures on the board, talking through how to do it)

T: The next step is to use arrows to show the transfer of electrons between the two atoms…

(The teacher talks through every subsequent step, modelling their thought process as they go, until the problem is fully solved)

T: Let's look at this second example. What's the first thing I do…Sarah?

S: Draw out the electron structure for each atom, but only the outer electrons.

(The teacher questions class at each subsequent step until the second example is complete)

T: Now I want you all to try this third example on your own so I can check how well you understand how to do this kind of problem.

Reflect and discuss: What makes an effective worked example?

Worked examples

Reflect and discuss:

1. How did your worked example build on prior knowledge?
2. How did you break the material down into the small steps?
3. How did you share every step of the example so there was no room for interpretation?
4. How did you facilitate pupil practice within the given timeframe??
5. Now you have shared a worked example, where and how could you now include an incorrect worked example that could highlight pupil misconceptions?

Success criteria:

- Build on prior knowledge
- Clear structure and reasoning behind the steps shown
- Take pupils through the problem to its logical conclusion, without any step being left to interpretation
- Teacher talks through their reasoning, sharing their expert thinking and understanding
- After studying a worked example, learners require practise on their own to provide them with feedback on whether they have learnt it or not

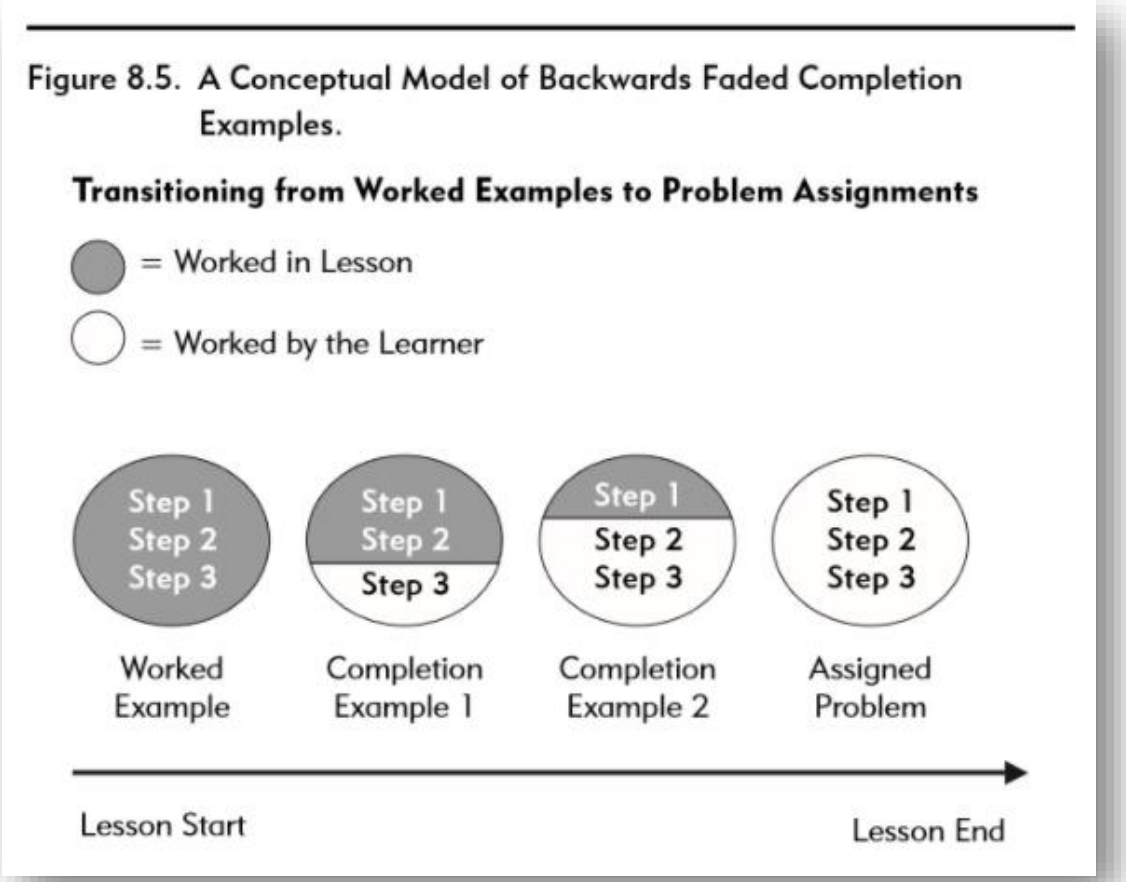
Partially completed examples

Calculate 171 ÷ 3

$$\begin{array}{r} 05\square \\ 3\overline{)\,1\,7^{2}1} \end{array}$$

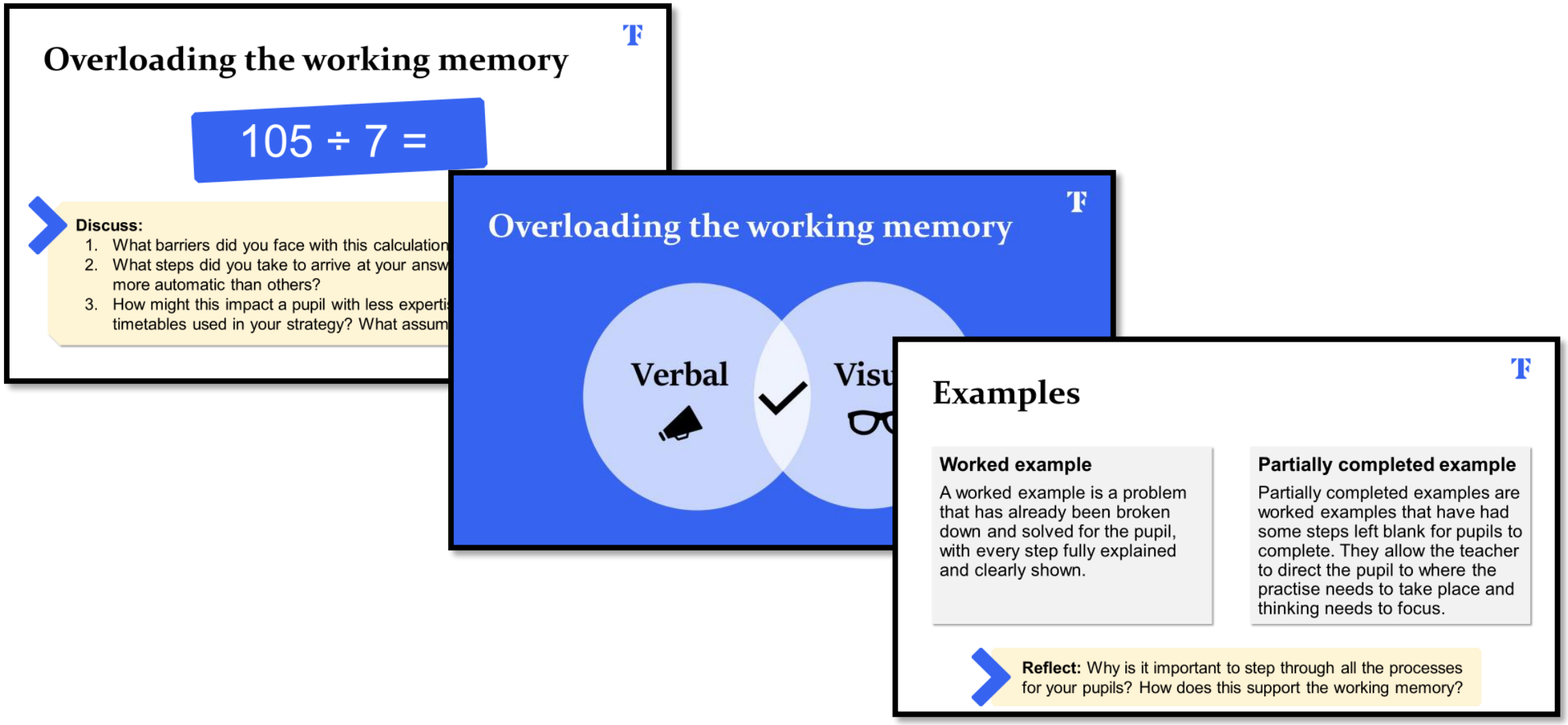
Discuss:

- Give an example of when you've implemented partially completed examples into you practice?
- Where could they be included in an upcoming lesson?



Clark et al . (2009), Efficiency In Learning: Evidence Based Guidelines To Manage Cognitive Load.

Summary


Overloading the working memory
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Overloading the working memory
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Teach First

Thank you.

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