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Can a metacognitive approach help students to recall and retain key learning?

Jane Elsworth Director of Huntington Research School, York

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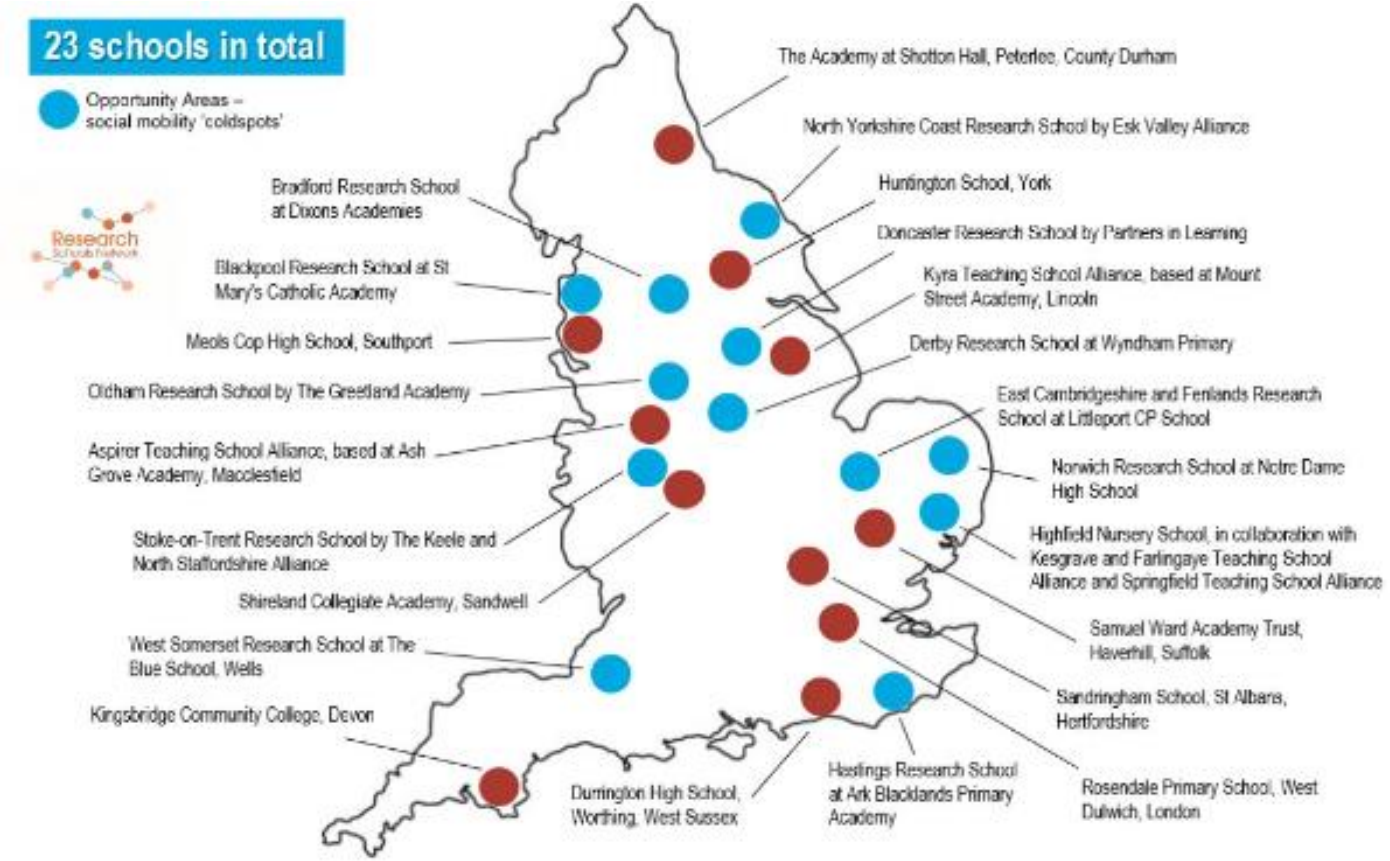

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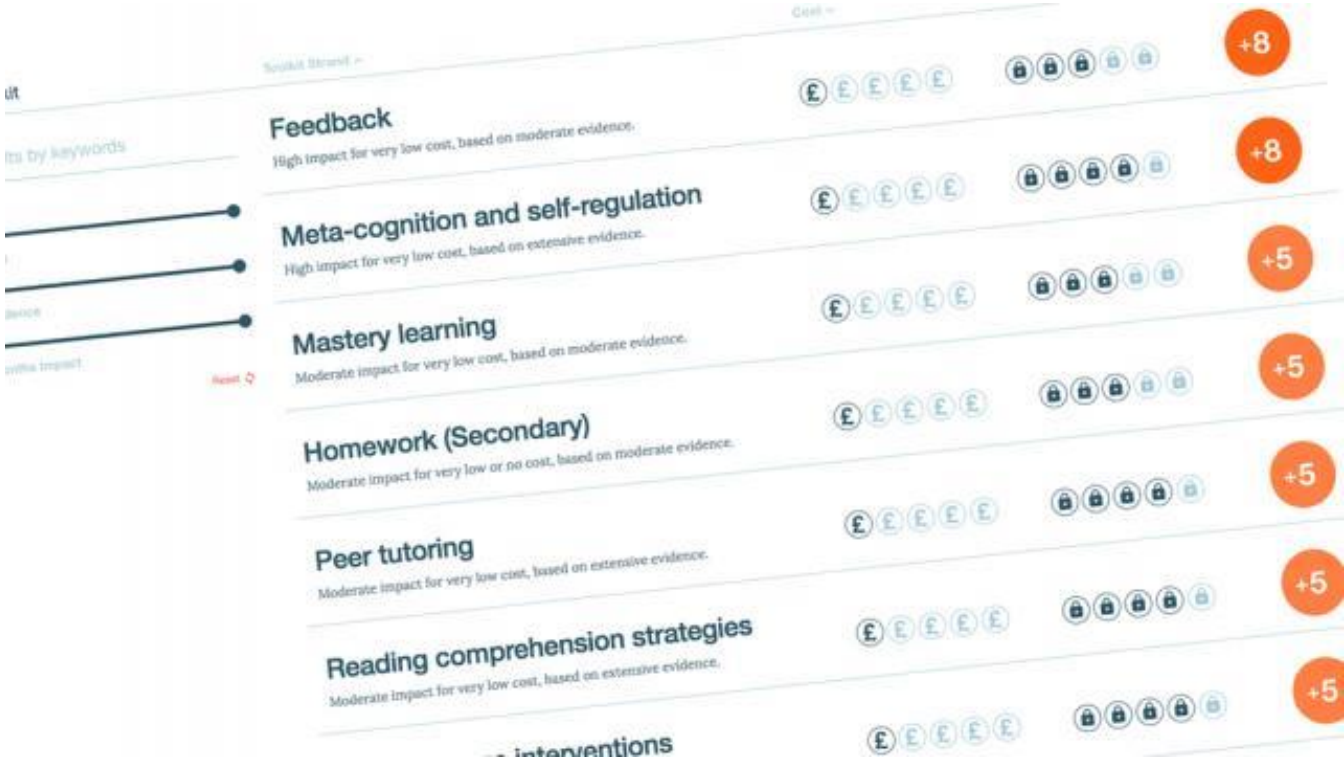
The EEF-Sutton Trust Teaching & Learning Toolkit

- Themes/areas are collated to provide an overview.
- The robustness of the evidence is rated through the padlock system – how much can you trust this evidence?
- Value for money
- Average number of months additional progress for children
- Helps you identify the ‘best bets’ for improving outcomes for children



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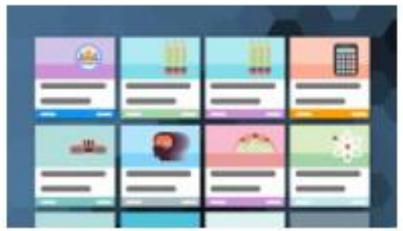
Practical Tools

Evidence-based resources to inform the practice of teachers and senior leaders.

View Practical Tools >

- Guidance Reports
- Promising Projects
- Families of Schools Database
- Assessing and Monitoring Pupil Progress
- DIY Evaluation Guide
- 5-step School Improvement Cycle
- Guide for governing boards



Guidance Reports

Clear and actionable recommendations for teachers on a range of high-priority issues, based on the best available evidence

Promising Projects

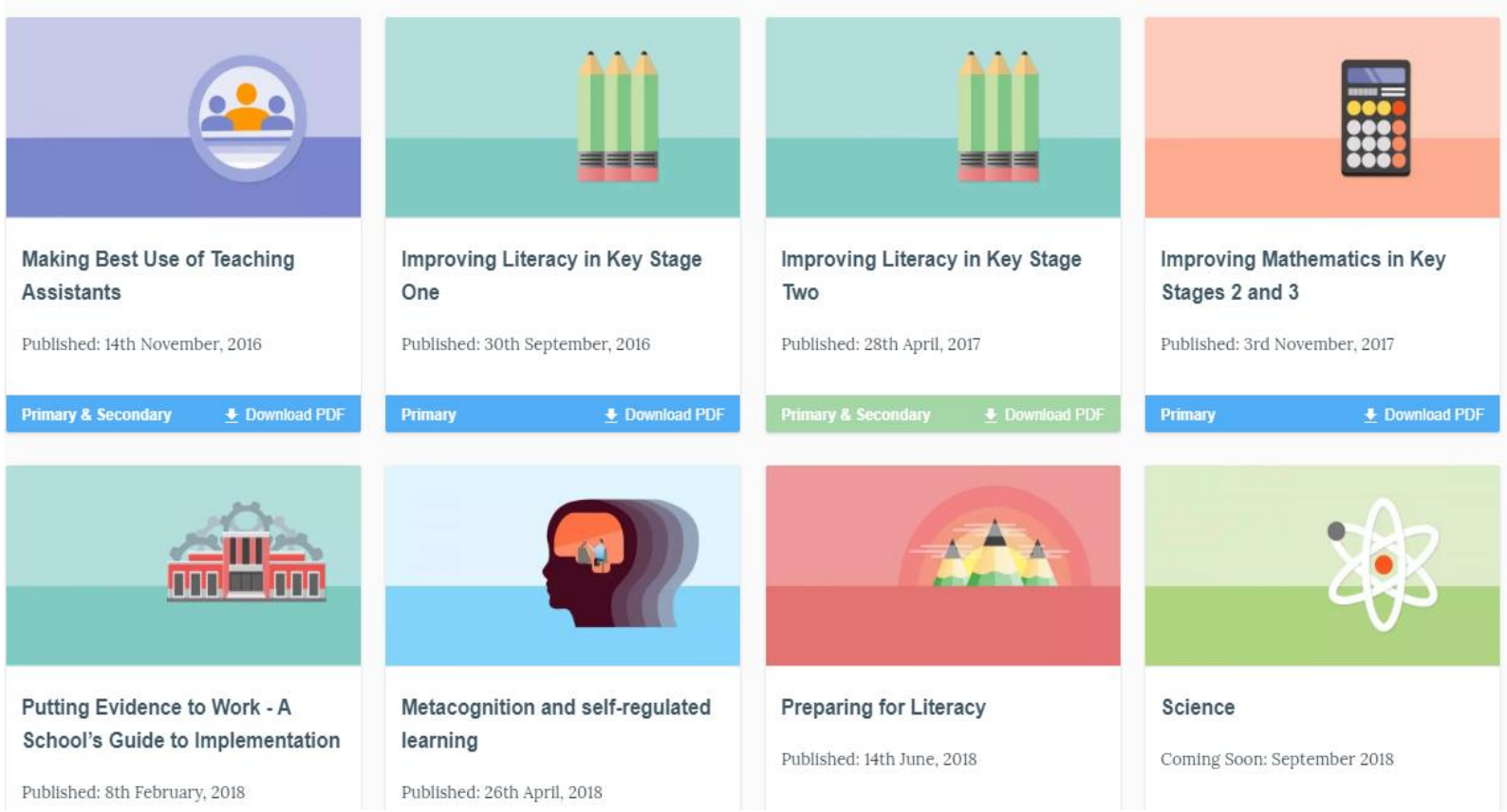
EEF-funded projects which have shown promising results when trialled

Families of Schools Database

Find out how your school compares to other, similar schools

EEF Guidance Reports

Clear and actionable recommendations for teachers, on a range of high-priority issues, based on the best available evidence



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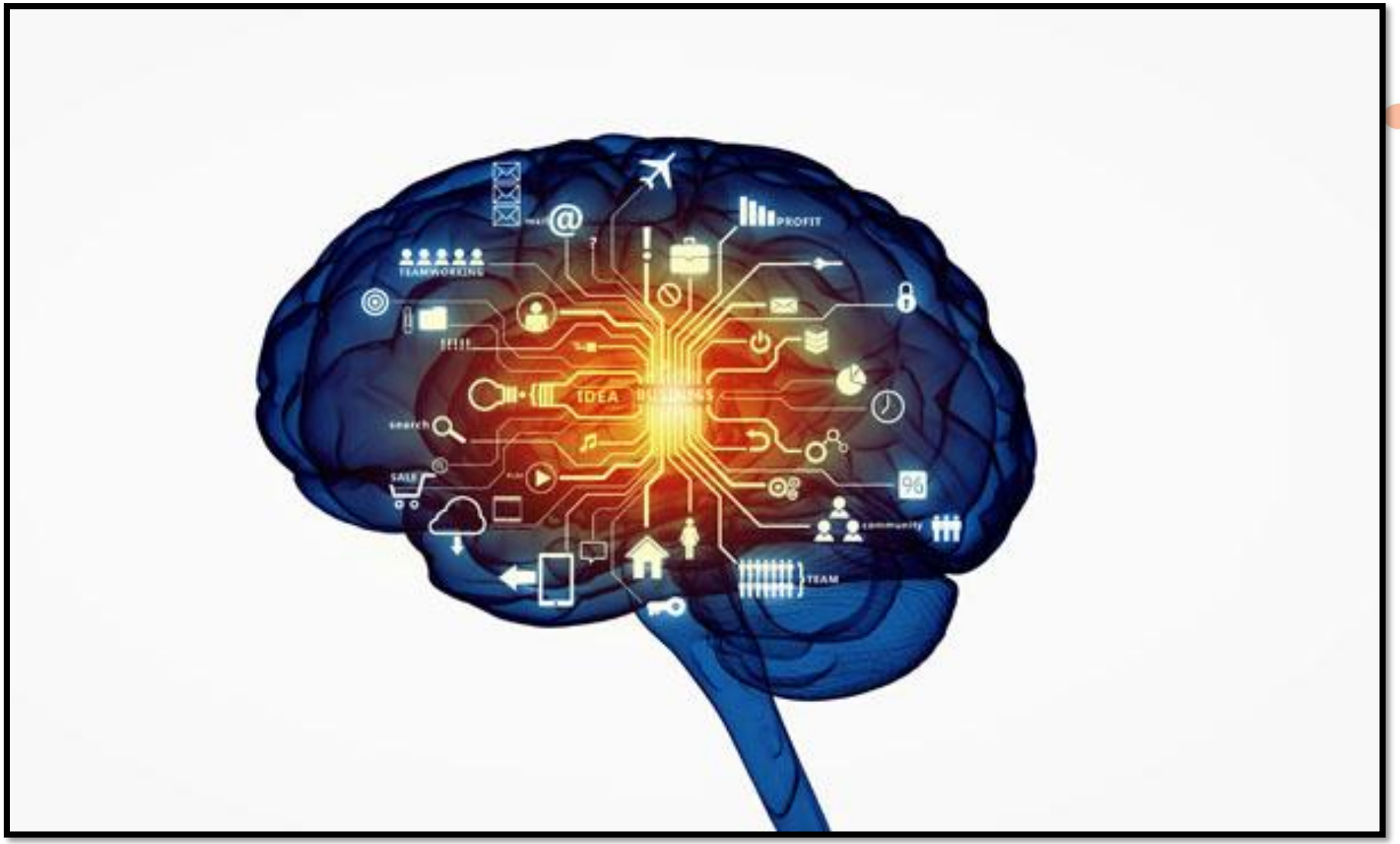
‘Thought occurs when you combine information in new ways, and successful thinking relies on **four** factors: information from the environment, facts in long-term memory, procedures in long-term memory, and space in working memory. If one of these factors is deficient, thinking will likely fail.’

Willingham (2009)



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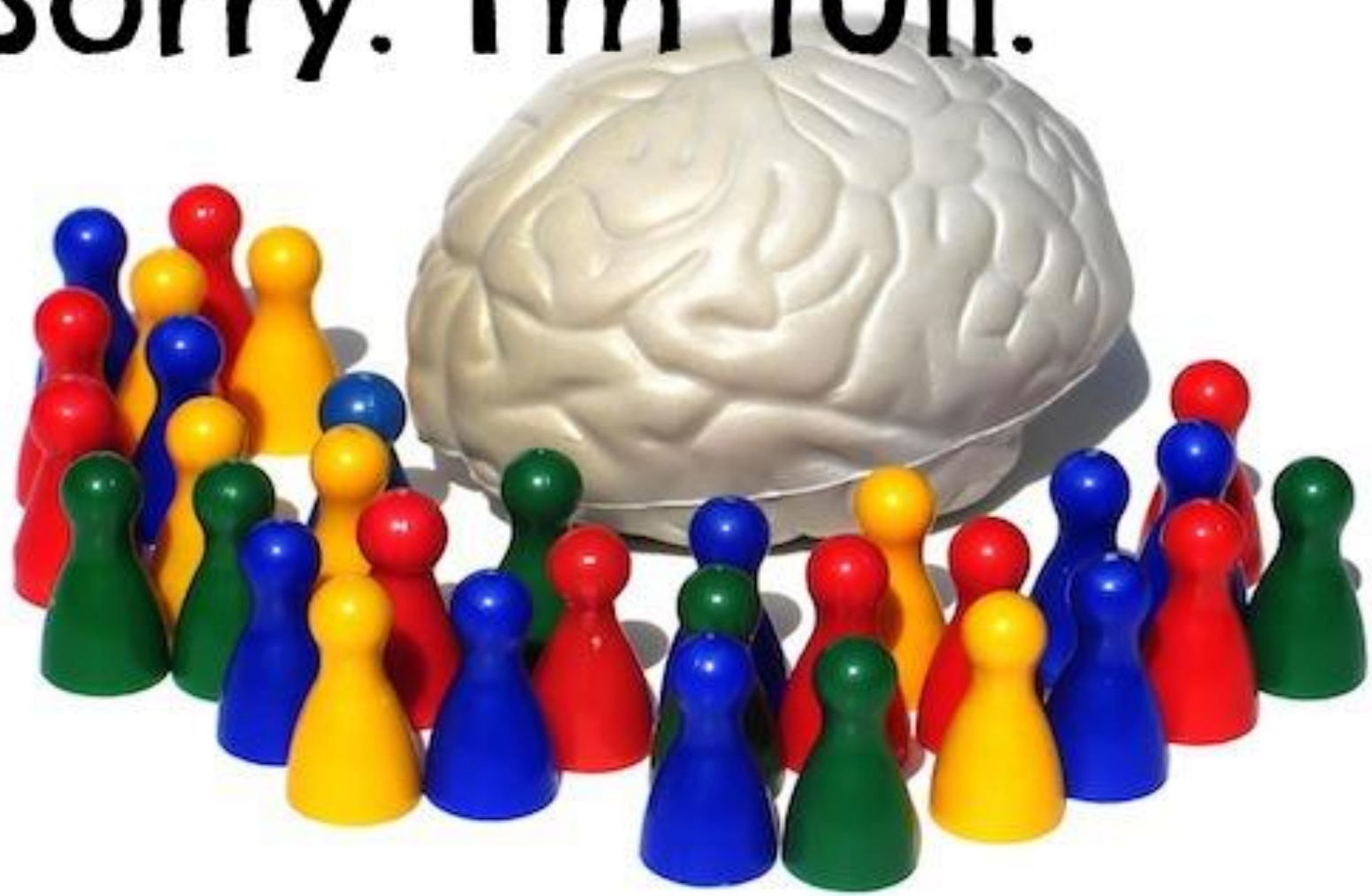
What are the main issues faced by your students in terms of memory?

Sorry. I'm full.



Us vs the machines

Just how do our memories compare to today's PCs?

SHORT-TERM MEMORY

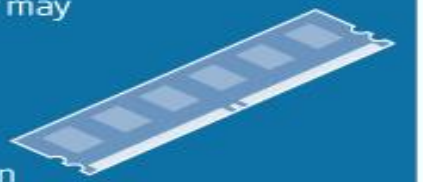
We can remember about

7 pieces of information

at any one time, be it shapes, names, colours or numbers

SHORT-TERM MEMORY

A mid-range computer may hold **6GB** in its random access memory (RAM), many million times more than human short-term memory



LONG-TERM MEMORY

If the brain processed binary information like a computer, with each synapse holding a single bit of information, we could store roughly

12,000GB

You could hold a 700-page book like *Moby Dick* nearly 10 million times, or 2.5 million songs

or

10m or **2.5m**

Speed and motivation are probably our biggest limits. Memorising a substantial work of literature word for word can take

years or even **decades**

LONG-TERM MEMORY

A computer hard drive stores data by magnetising sections of a ferromagnetic disk. On a computer with a

500GB

hard drive, you could store *Moby Dick* 400,000 times

400,000

A computer can lay down memories astonishingly quickly – absorbing *Moby Dick* in about

0.5 seconds

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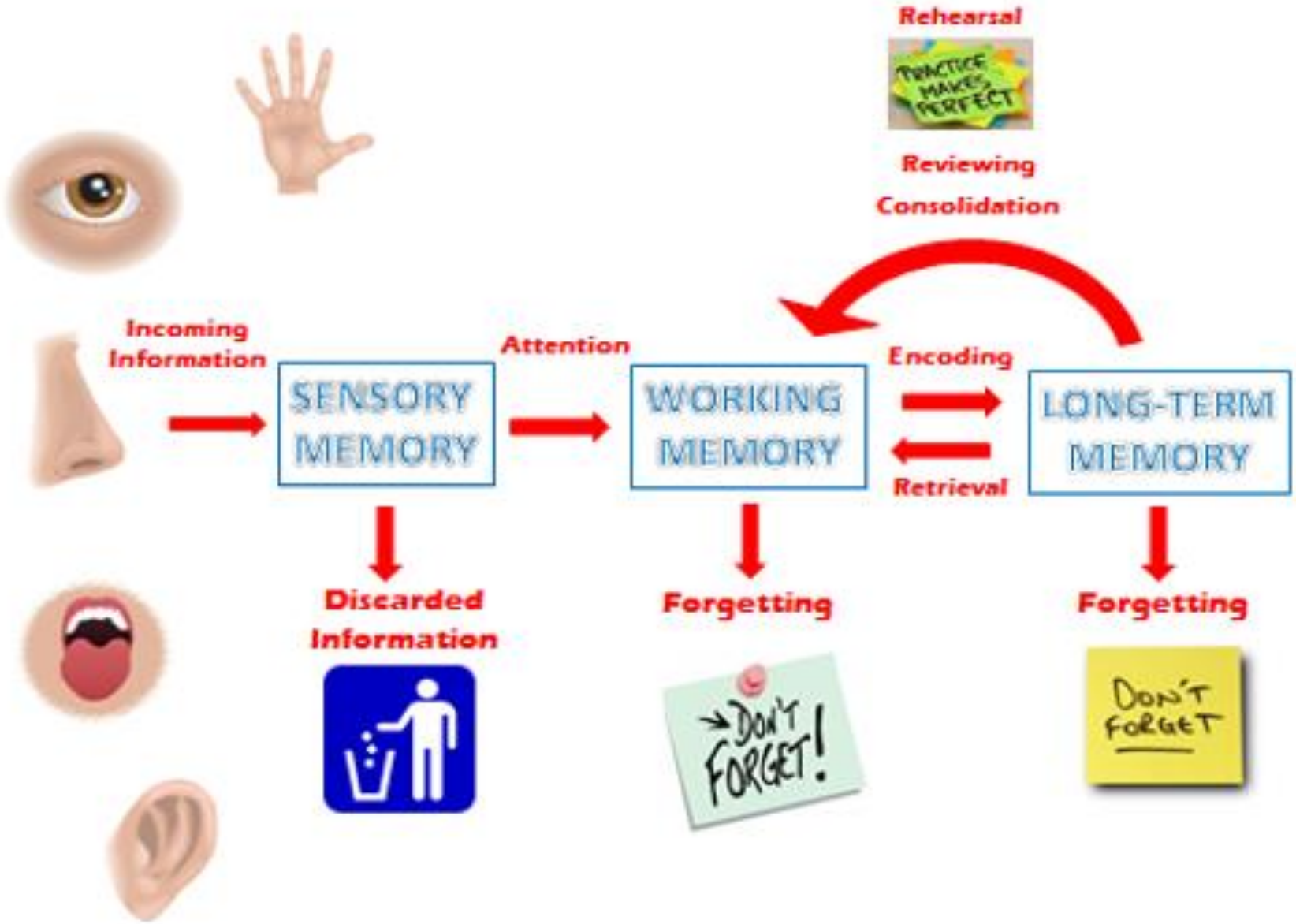
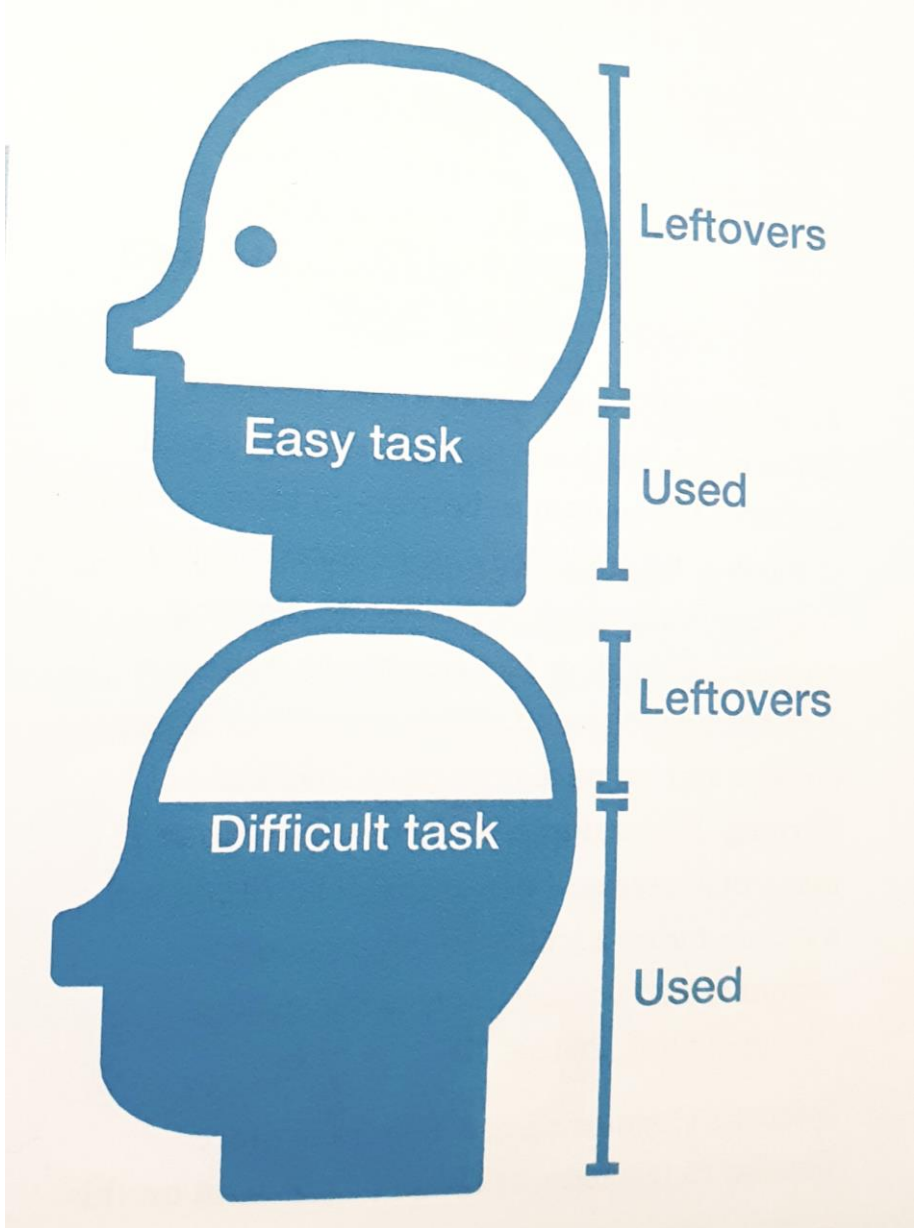
The multi-store model of memory (Atkinson & Shiffrin, 1968)


Rehearsal
PRACTICE MAKES PERFECT
Reviewing
Consolidation
Incoming Information
SENSORY MEMORY
Attention
WORKING MEMORY
Encoding
Retrieval
LONG-TERM MEMORY
Discarded Information
Forgetting
Forgetting
DON'T FORGET!
DON'T FORGET

Attention is typically thought of as a “limited capacity resource”

Moray (1967)



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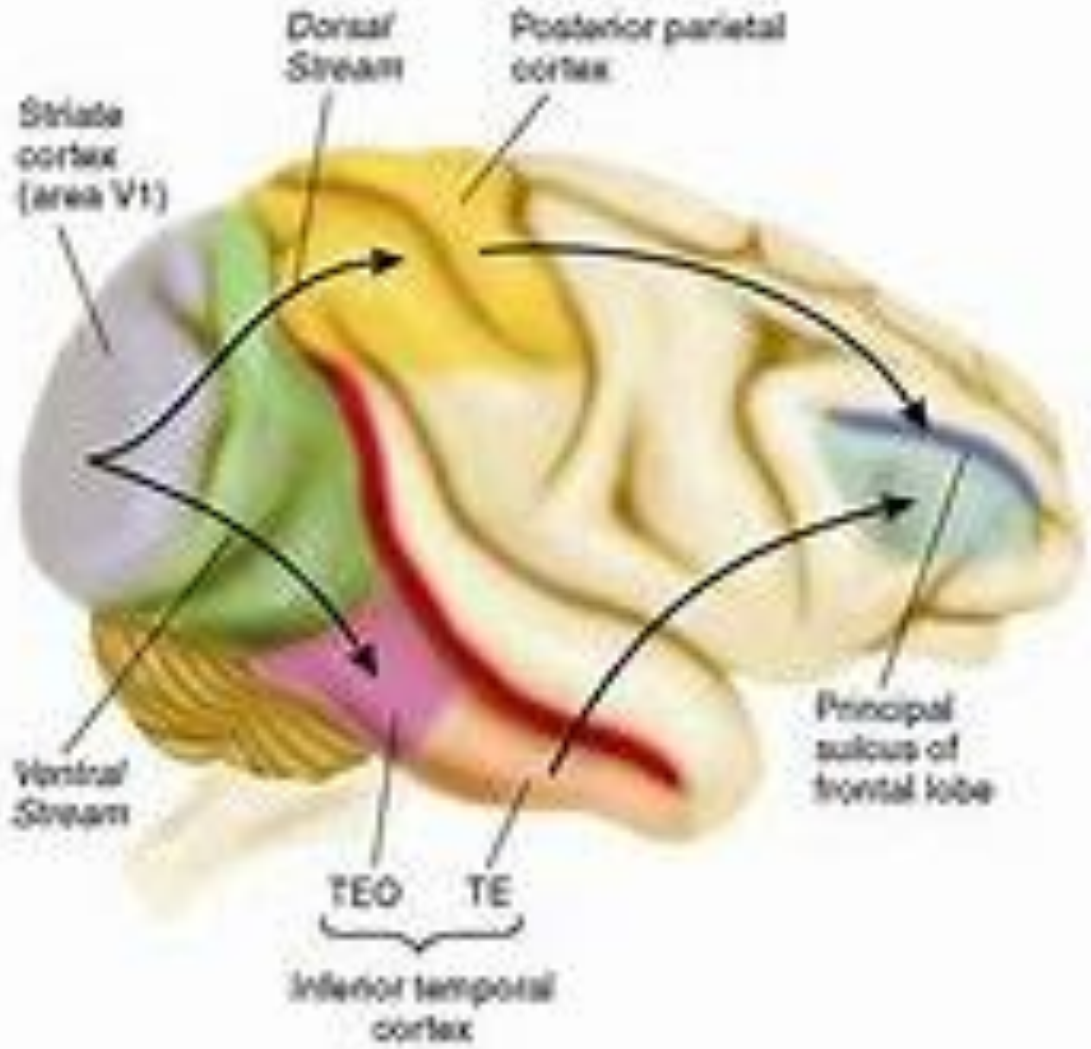
Working Memory



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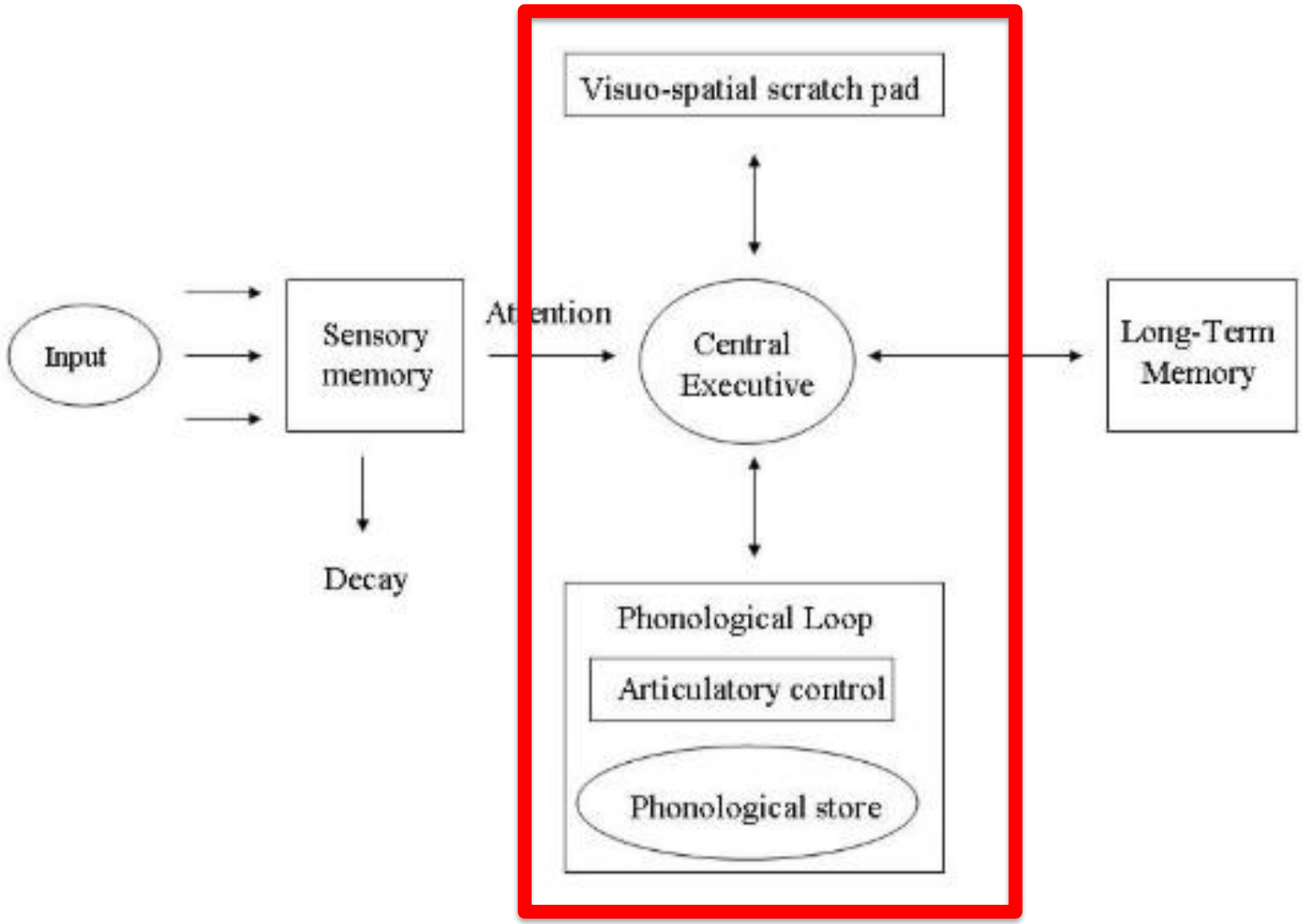
If working memory is overloaded, there is a greater risk the content being taught will not be understood by the learner, will be misinterpreted or confused, will not be effectively encoded in long-term memory, and that learning will be slowed down.

Martin (2016)

Working Memory Model (Baddeley and Hitch, 1974)



Which would you find harder?

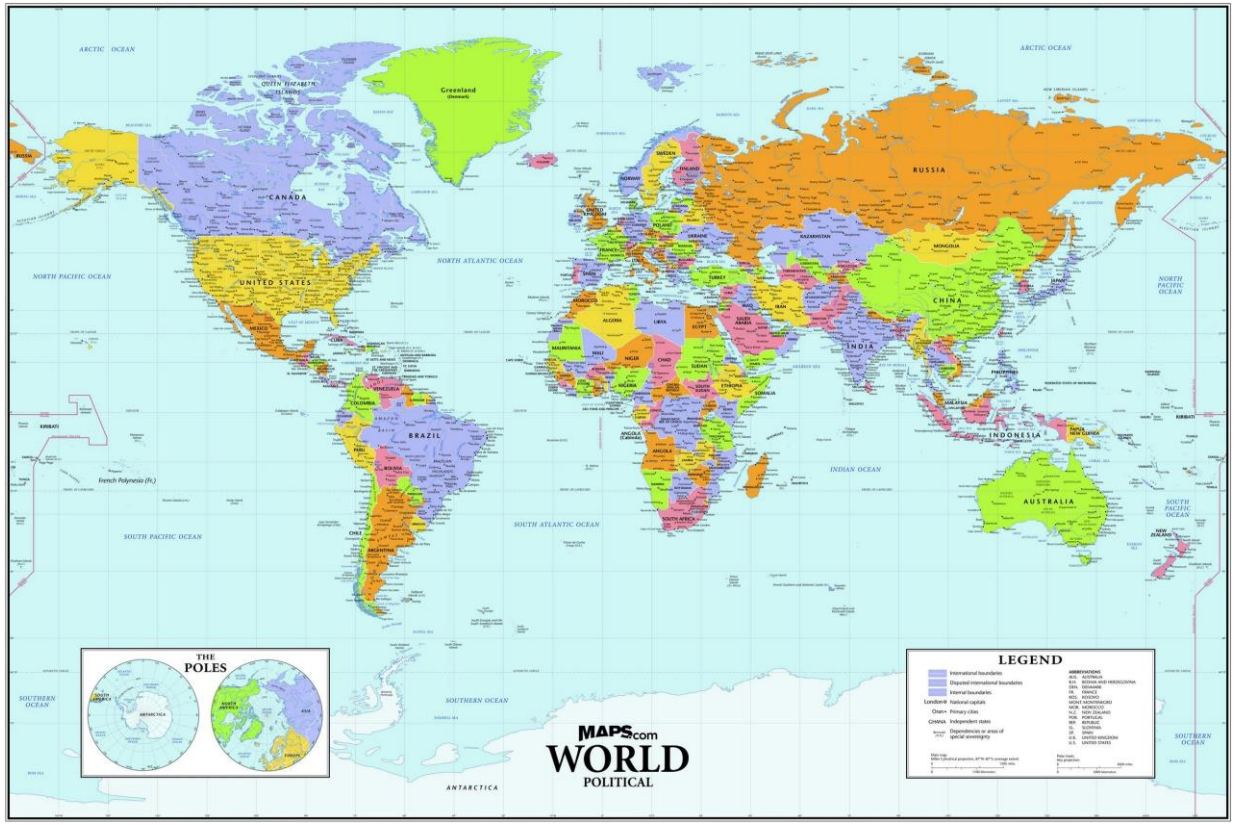
- Repeating “the the the” aloud whilst following a mobile stimulus with your eyes.

- Repeating “the the the” aloud and reading some text silently.

In the classroom:

- When explaining a new idea verbally to the class, draw a simple diagram on the board at the same time you are explaining it
- When discussing a sequence of events, space the events out as notes on the board, bullet point and draw simple diagrams that relate to each section
- Use flow diagrams to explain key processes.
- Summarise key ideas as a diagram, whilst they are being taught.

Long-term memory



‘A schema is an interconnected web of items and knowledge.’

David Didau

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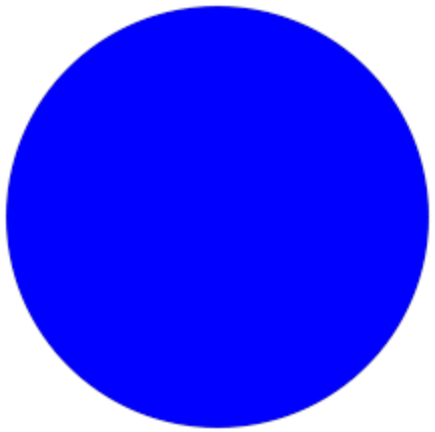

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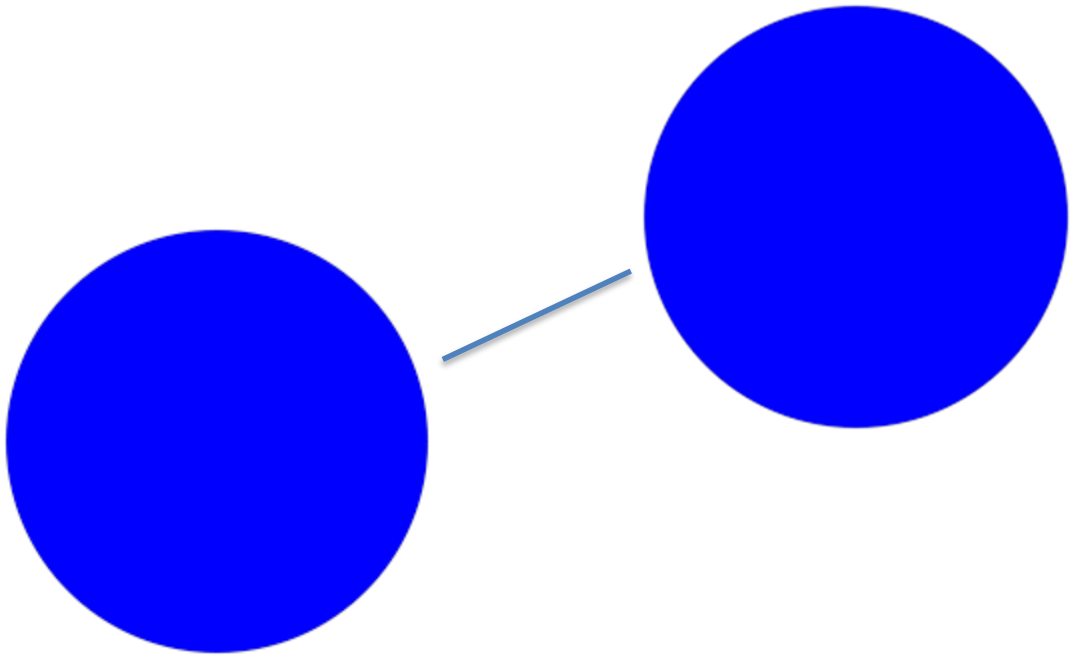

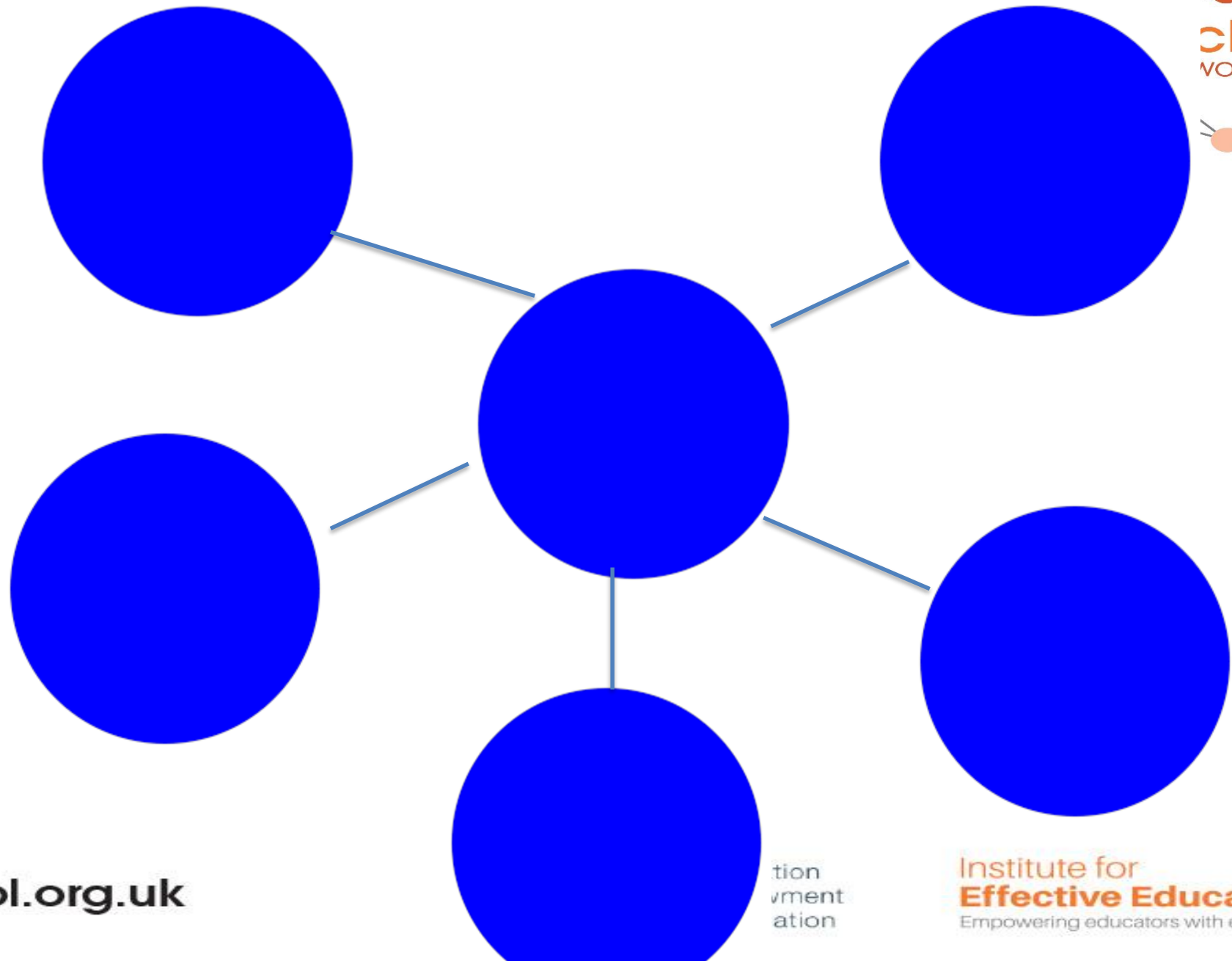

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Memorize this sequence

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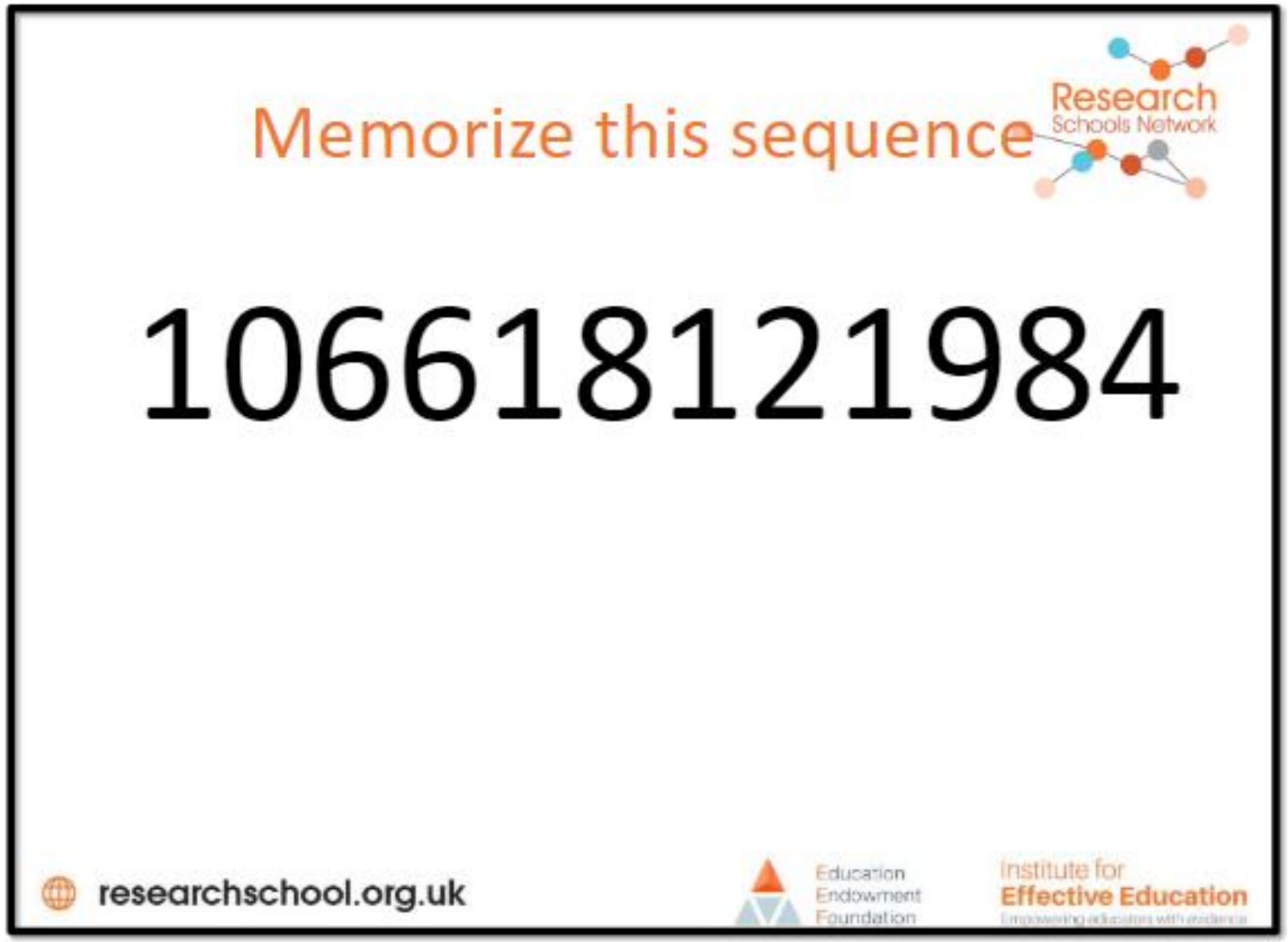

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METACOGNITION AND SELF-REGULATED LEARNING

Guidance Report

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Communication

Social cognition

Problem solving

‘Metacognition is about the ways learners monitor and purposefully direct their learning’

(EEF MC Guidance Report)

Attention

Memory

Self-control

Self-instruction

Writing

Reading comprehension

Personality development

Language acquisition

John Hattie

“Metacognition is one of the most effective teaching interventions. Teaching our students how to think about their own thinking and to go beyond the textbook content improves their learning outcomes.

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METACOGNITION AND SELF-REGULATED LEARNING

Summary of recommendations

1
Teachers should acquire the professional understanding and skills to develop their pupils' metacognitive knowledge

- Self-regulated learners are aware of their strengths and weaknesses, and can motivate themselves to engage in, and improve, their learning.
- Developing pupils' metacognitive knowledge of how they learn—their knowledge of **themselves as a learner**, of strategies, and of **tasks**—is an effective way of improving pupil outcomes.
- Teachers should support pupils to **plan, monitor**, and **evaluate** their learning.

2
Explicitly teach pupils metacognitive strategies, including how to plan, monitor, and evaluate their learning

- Explicit instruction in cognitive and metacognitive strategies can improve pupils' learning.
- While concepts like 'plan, monitor, evaluate' can be introduced generically, the strategies are mostly applied in relation to specific content and tasks, and are therefore best taught this way.
- A series of steps—beginning with **activating prior knowledge** and leading to **independent practice** before ending in **structured reflection**—can be applied to different subjects, ages and contents.

3
Model your own thinking to help pupils develop their metacognitive and cognitive skills

- Modelling by the teacher is a cornerstone of effective teaching; revealing the thought processes of an expert learner helps to develop pupils' metacognitive skills.
- Teachers should verbalise their metacognitive thinking *('What do I know about problems like this? What ways of solving them have I used before?')* as they approach and work through a task.
- Scaffolded tasks, like worked examples, allow pupils to develop their metacognitive and cognitive skills without placing too many demands on their mental resources.

4
Set an appropriate level of challenge to develop pupils' self-regulation and metacognition

- Challenge is crucial to allow pupils to develop and progress their knowledge of tasks, strategies, and of themselves as learners.
- However, challenge needs to be at an appropriate level.
- Pupils must have the motivation to accept the challenge.
- Tasks should not overload pupils' cognitive processes, particularly when they are expected to apply new strategies.

5
Promote and develop metacognitive talk in the classroom

- As well as explicit instruction and modelling, classroom dialogue can be used to develop metacognitive skills.
- Pupil-to-pupil and pupil-teacher talk can help to build knowledge and understanding of cognitive and metacognitive strategies.
- However, dialogue needs to be purposeful, with teachers guiding and supporting the conversation to ensure it is challenging and builds on prior subject knowledge.

6
Explicitly teach pupils how to organise and effectively manage their learning independently

- Teachers should explicitly support pupils to develop independent learning skills.
- Carefully designed **guided practice**, with support gradually withdrawn as the pupil becomes proficient, can allow pupils to develop skills and strategies before applying them in **independent practice**.
- Pupils will need timely, effective feedback and strategies to be able to judge accurately how effectively they are learning.
- Teachers should also support pupils' motivation to undertake the learning tasks.

7
Schools should support teachers to develop knowledge of these approaches and expect them to be applied appropriately

- Develop teachers' knowledge and understanding through high quality professional development and resources.
- Senior leaders should provide teachers with time and support to make sure approaches are implemented consistently.
- Teachers can use tools such as 'traces' and observation to assess pupils' use of self-regulated learning skills.
- Metacognition shouldn't be an 'extra' task for teachers to do but should be built into their teaching activities.

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Freya fiddled with her pencil case. Every Friday, she would experience a quiet dread when facing the weekly spelling test. This week, though, she felt more confident than before. After a couple of weeks characterised by annoying mistakes, she had worked hard in readiness for this week's test. She had devised two of her own mnemonics and she had practised her 'le' ending words, as well as 'surprise' with an 'r', repeatedly.

As Mr Thomas began the spelling test, Freya listened hard. She knew that sometimes she would feel a little pressure when her teacher moved quickly onto the next spelling, but that this week she would listen carefully and remember what she had practised.

One or two words were no doubt tricky, but Freya had weighed up her options each time and she was utterly confident of her success. Before Mr Thomas had a chance to cycle through the correct spellings, Freya sat up straight, with a smile lighting up her face, fuelled by quiet satisfaction. She had already thought about her new spelling routine and how she would stick to it next week too.

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Self-regulated learning:

1. **Cognition**
2. **Metacognition**
3. **Motivation**

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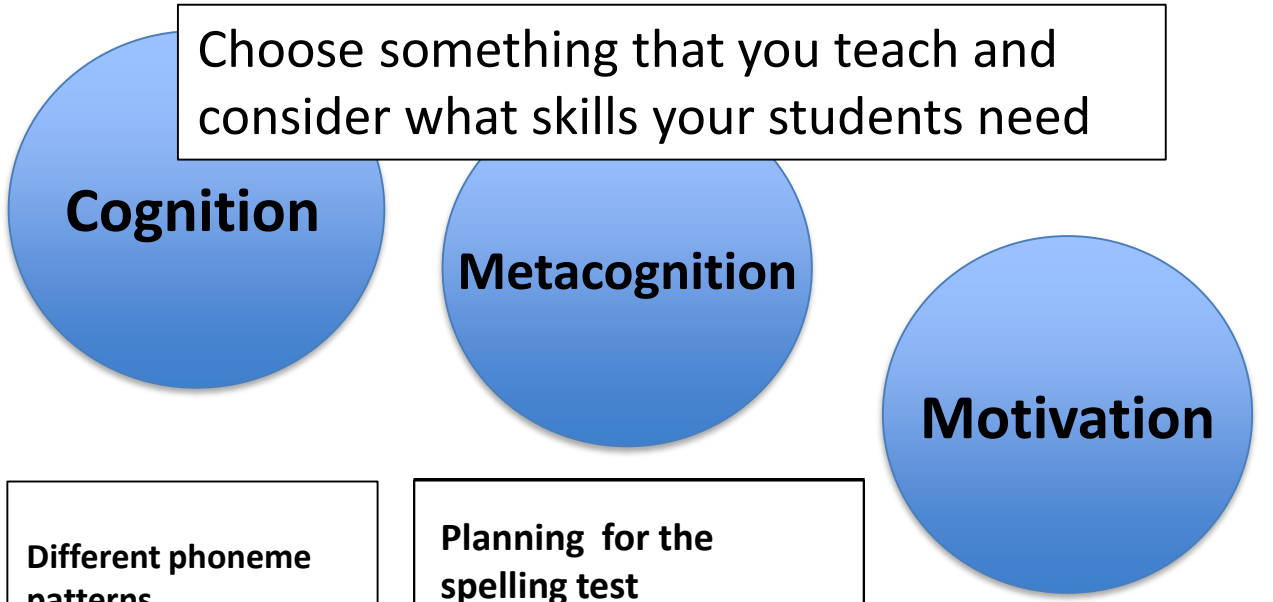
Choose something that you teach and consider what skills your students need



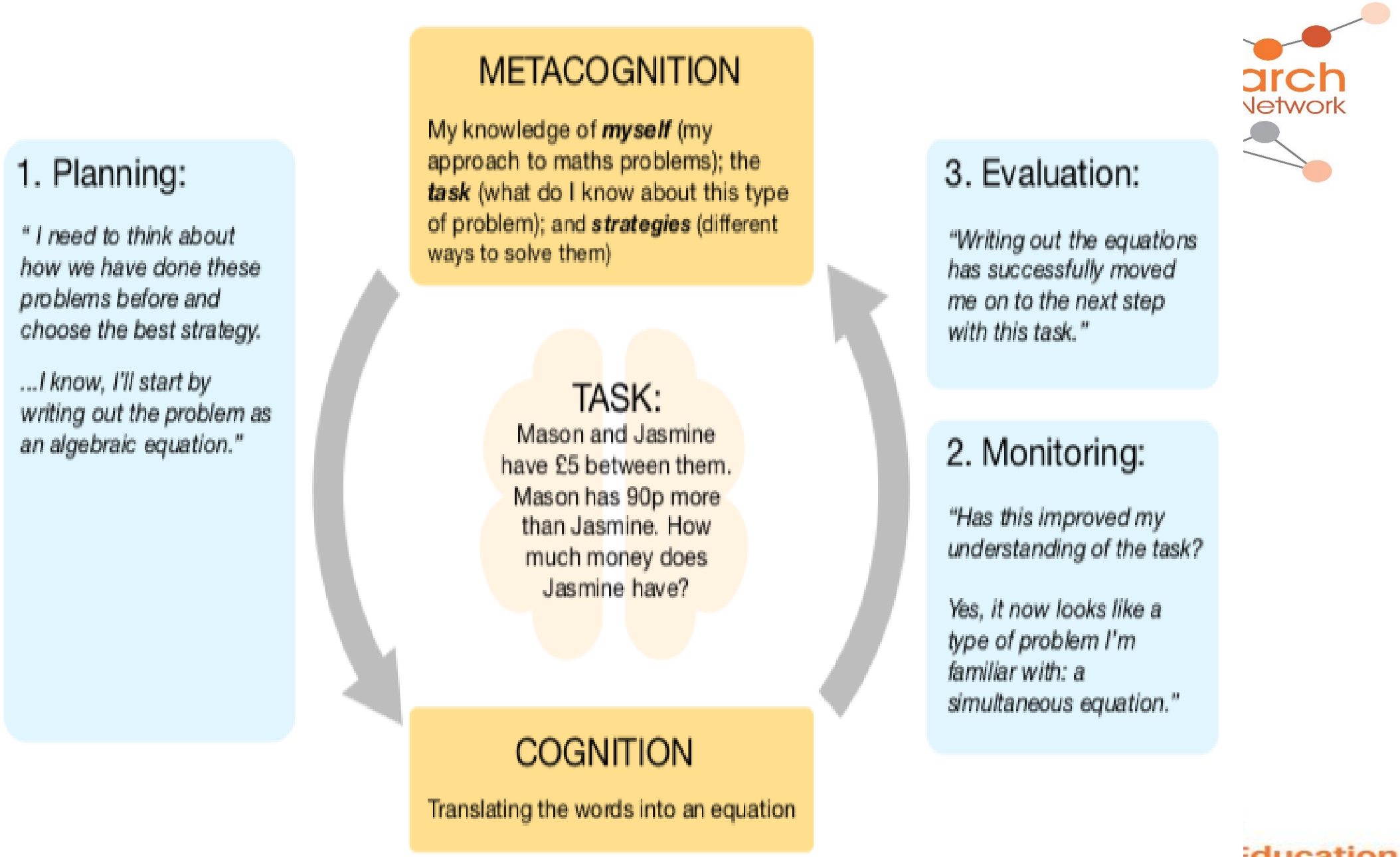
Different phoneme patterns

Mnemonics

Planning for the spelling test
Monitoring her own difficulties with time pressures during the test
Evaluating whether the strategy worked and whether to use it again

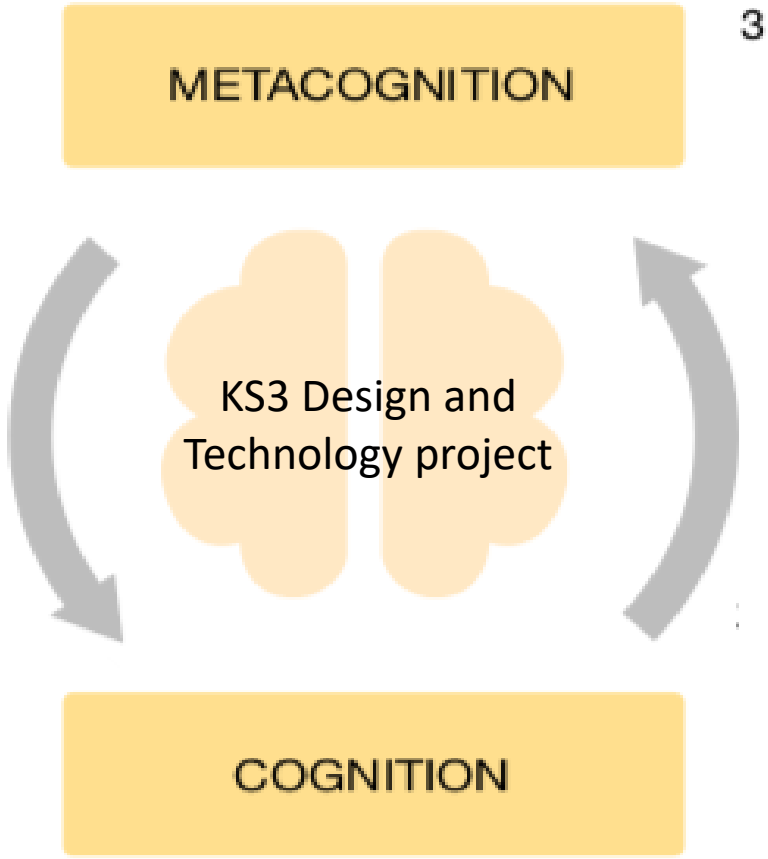
Engaging in repeated practice

Persevering during the challenge


METACOGNITION
My knowledge of myself (my approach to maths problems); the task (what do I know about this type of problem); and strategies (different ways to solve them)
1. Planning:
" I need to think about how we have done these problems before and choose the best strategy.
...I know, I'll start by writing out the problem as an algebraic equation."
TASK:
Mason and Jasmine have £5 between them. Mason has 90p more than Jasmine. How much money does Jasmine have?
3. Evaluation:
"Writing out the equations has successfully moved me on to the next step with this task."
2. Monitoring:
"Has this improved my understanding of the task?
Yes, it now looks like a type of problem I'm familiar with: a simultaneous equation."
COGNITION
Translating the words into an equation

1. Planning

- Produce a ‘plan of making’ to allow students to visualise the stages of making step-by-step;
- Generate a physical model of the final solution;
- Develop a ‘working drawing’ identifying all the relevant information needed for manufacturing.

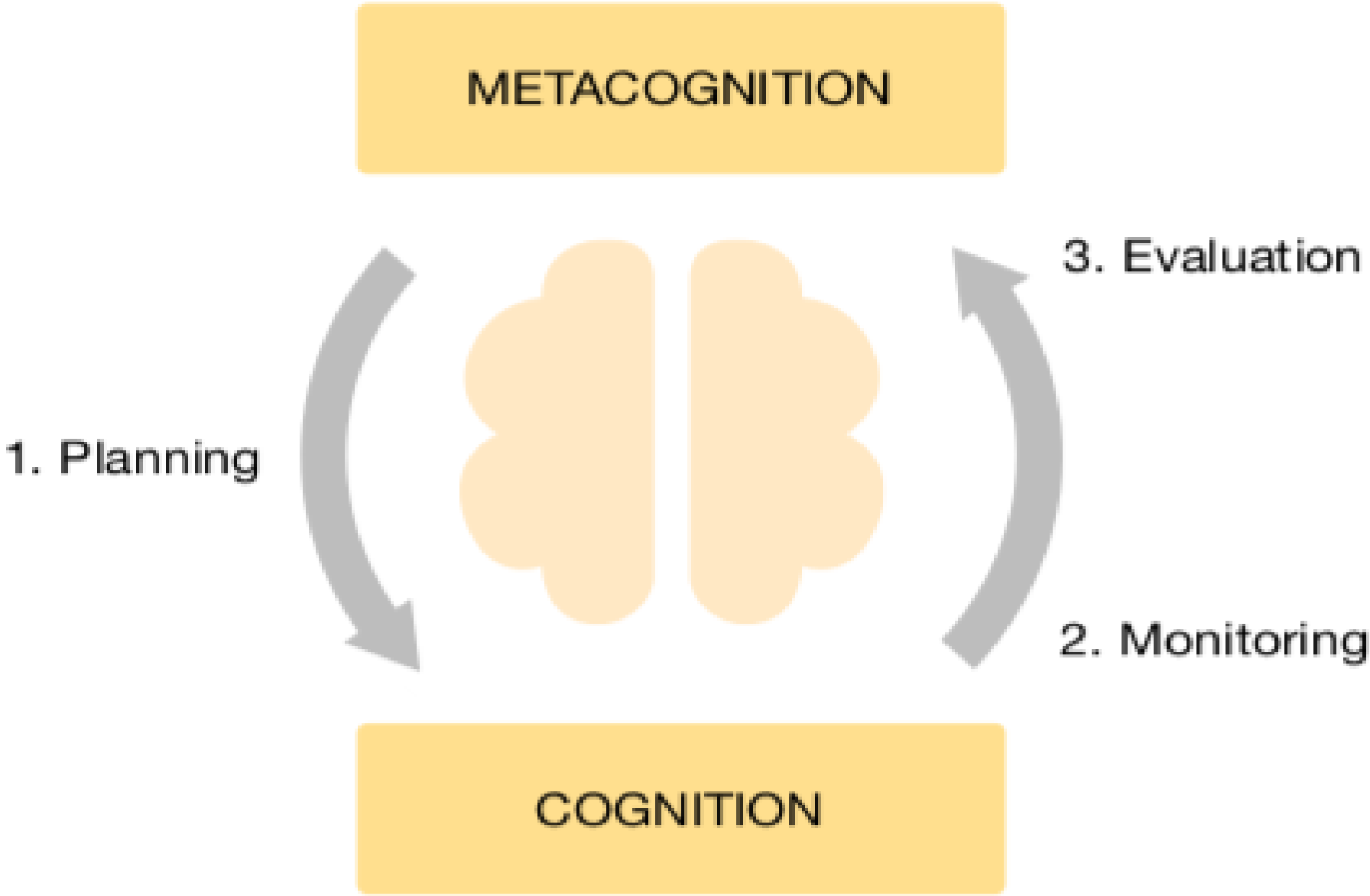


3. Evaluation

- Evaluate the final solution against the design brief, client requirements and the design specification;
- Gain third party feedback and/or client approval on their final 3D product.

2. Monitoring

- Continually monitor progress using a checklist (parts/materials/size list);
- QA/QC checks undertaken during manufacturing stages.



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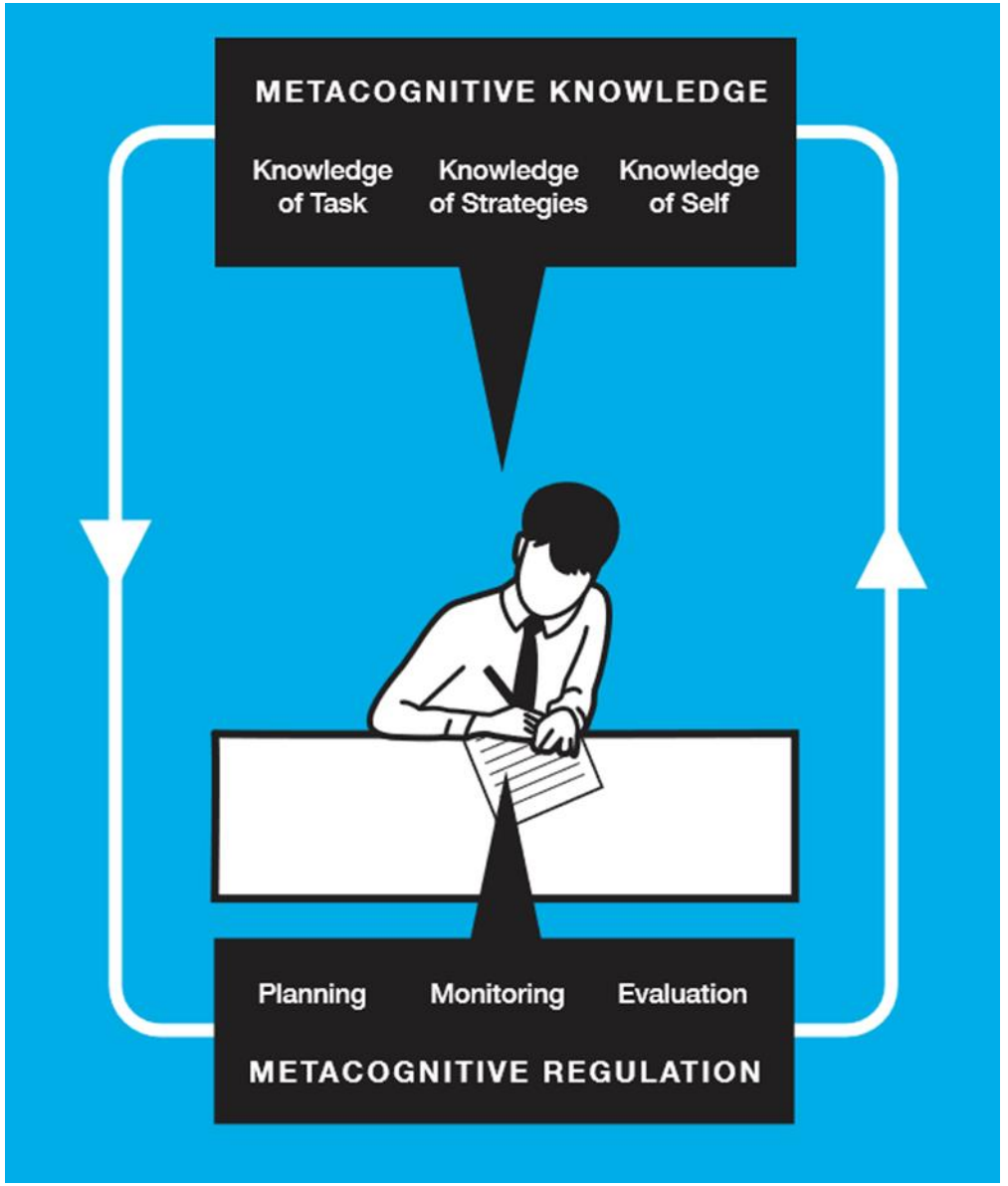
THE METACOGNITIVE PROCESS



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1. **Activating prior knowledge**

   The teacher discusses with pupils the different causes that led to World War One while making notes on the whiteboard.

2. **Explicit strategy instruction**

   The teacher then explains how the fishbone diagram will help organise their ideas, with the emphasis on the cognitive strategy of using a 'cause and effect model' in history that will help them to organise and plan a better written response.

3. **Modelling of learned strategy**

   The teacher uses the initial notes on the causes of the war to moc
   the fishbone diagram.

4. **Memorisation of learned strategy**

   The teacher tests if pupils have understood and memorised the k
   fishbone strategy, and its main purpose, through questions and di

5. **Guided practice**

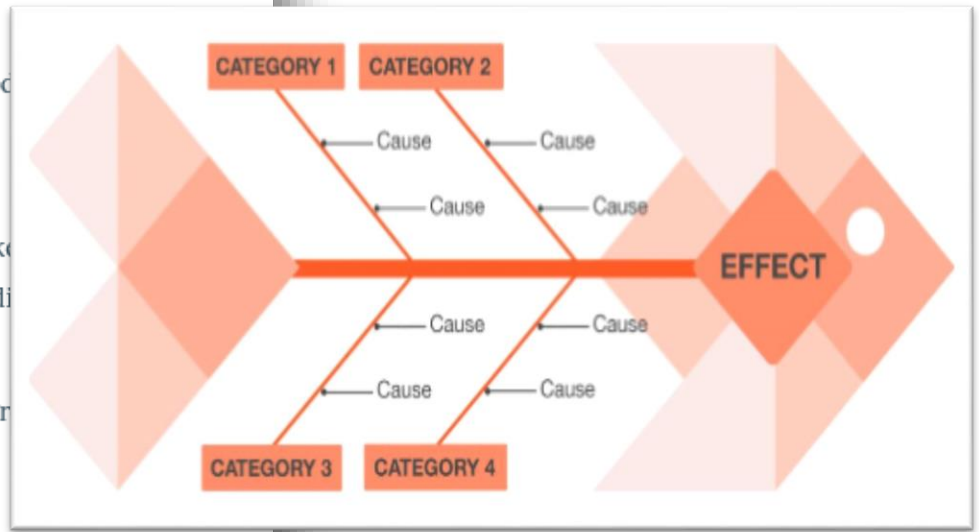
   The teacher models one further fishbone cause with the whole gr
   verbally contributing their ideas.

6. **Independent practice**

   Pupils complete their own fishbone diagram analysis.

7. **Structured reflection**

   The teacher encourages pupils to reflect on how appropriate the model was, how successfully they applied it, and how they might use it in the future.



Teaching metacognitive strategies

1. Activating prior knowledge
2. Explicit strategy instruction
3. Modelling of learned strategy
4. Memorisation of strategy
5. Guided practice
6. Independent practice
7. Structured reflection

Teaching a metacognitive technique/ teaching new learning

1. Activating prior knowledge	Retrieving previously learnt information that is relevant to the task
2. Explicit strategy instruction	Explaining how to complete the task
3. Modelling of learned strategy	Exemplifying an aspect of the task or strategy (by the teacher)
4. Memorisation of strategy	Checking that the information has been understood and remembered
5. Guided practice	Collaboratively completing one or more aspects of the task or strategy
6. Independent practice	Completing the task or strategy on their own
7. Structured reflection	Evaluating the strategy

		Using short division method in maths
1	**Activating prior knowledge**	Teacher checks pupils prior knowledge of division etc.
2	**Explicit strategy instruction**	Teacher explains the short division method and why it is useful, making connections with previously used models and images.
3	**Modelling of learned strategy**	Teacher models the short division method a few times
4	**Memorisation of strategy**	Teacher questions pupils to check order of the steps and the pupils explain to each other or write these out
5	**Guided practice**	Teacher completes another example on the board with the students offering the next step each time
6	**Independent practice**	Pupils use the method the day after, for homework, and at the end of the week.
7	**Structured reflection**	Reflect on the short division method: tricky bits? Does it always work? Do we struggle with bits? Use of examples and non-examples to evaluate.

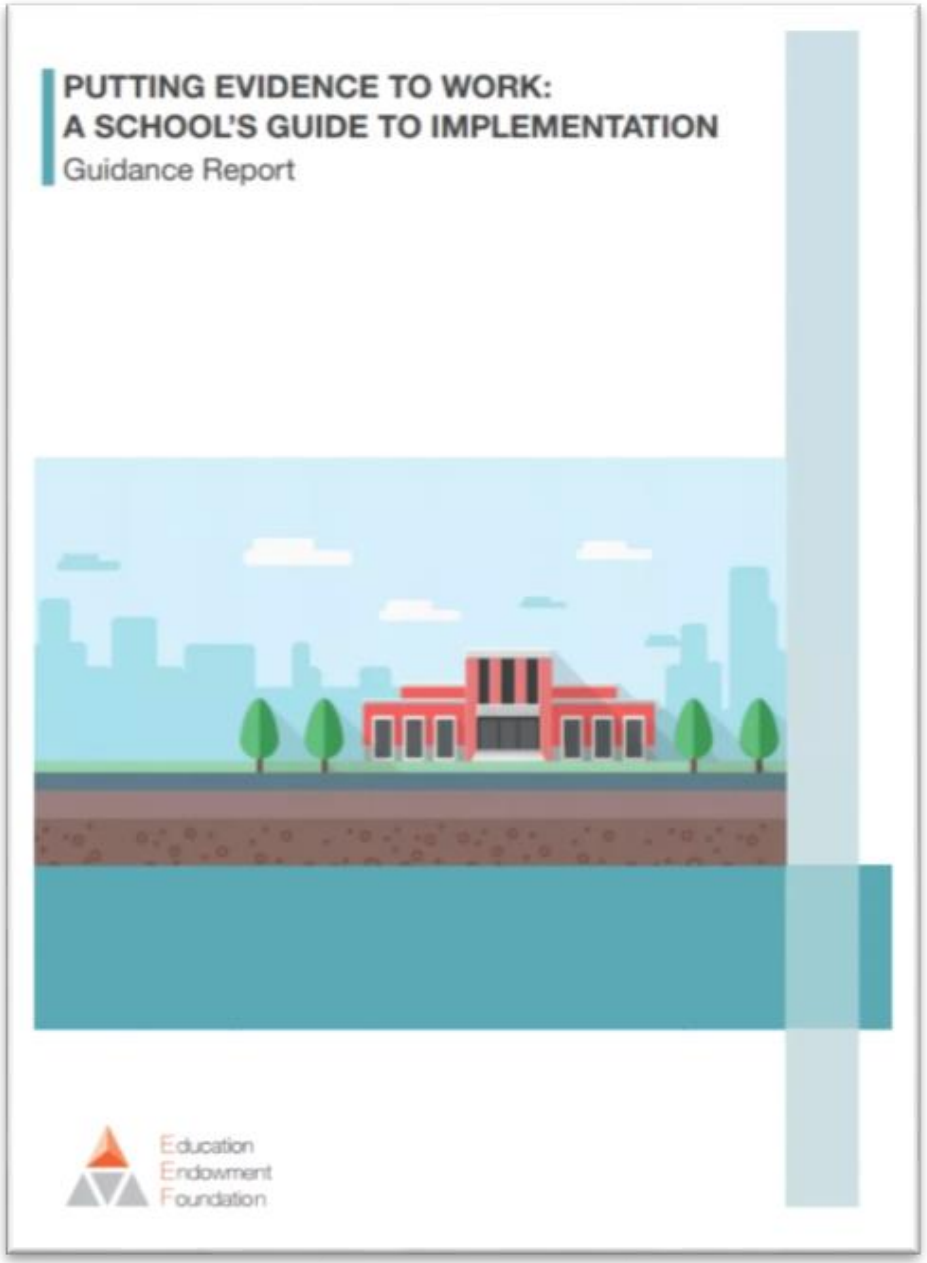
Metacognitive process: 7 step model

Stage		Teacher and pupil activities
1	Activating prior knowledge	.
2	Explicit strategy instruction	
3	Modelling of learned strategy	
4	Memorisation of strategy	
5	Guided practice	
6	Independent practice	
7	Structured reflection	

1-3 More teacher led
4-5 50:50
6-7 More student led

What's next?

- What aspects of these metacognitive strategies do I already do?
- Are there areas where students could benefit from their further use in learning?
- Who do I want to speak to about this?
- How might I develop the use of these strategies further in my school/organisation?



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Huntington Research School

S T A Y IN TOUCH

Name: _____

Job Role/Title: _____

School/Trust/Organisation: _____

☐ Early Years ☐ Primary ☐ Secondary ☐ Special School ☐ FE

Town/City: _____

Email Address: _____

Your information will only be stored if you opt in to our newsletter or courses below.

☐ **Please tick to receive the National monthly newsletter**

Future Courses & Events

Please tick any of the following boxes if you wish to receive information about about a specific course in the future from Huntington Research School:

- ☐ Designing Effective CPD
- ☐ Developing knowledge of evidence
- ☐ Early years language / literacy
- ☐ Early years maths
- ☐ Effective practices for Pupil Premium
- ☐ Literacy / Vocabulary
- ☐ Metacognition & Self-regulated Learning
- ☐ Memory
- ☐ Mathematics
- ☐ SEND
- ☐ Working with parents to support children's learning

☐ Other: _____

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You can withdraw consent at any time: Newsletters have an unsubscribe button, or you can contact HuntResearchSch@gmail.com stating you'd like to opt out of future newsletter or training courses. If you would **NOT** like any correspondance from us, please do not tick any of the opt-in boxes on this