Metacognition

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Session overview

1. Evidence base

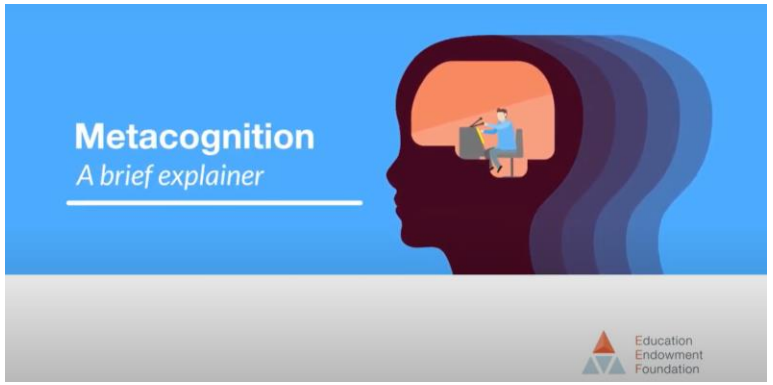
2. Potential implementation challenges and possible solutions

About the EEF: **Our Mission**

The **Education Endowment Foundation** (EEF) is an independent charity dedicated to breaking the link between family income and educational achievement.

We do this by supporting schools, nurseries and colleges to improve teaching and learning through better use of evidence.

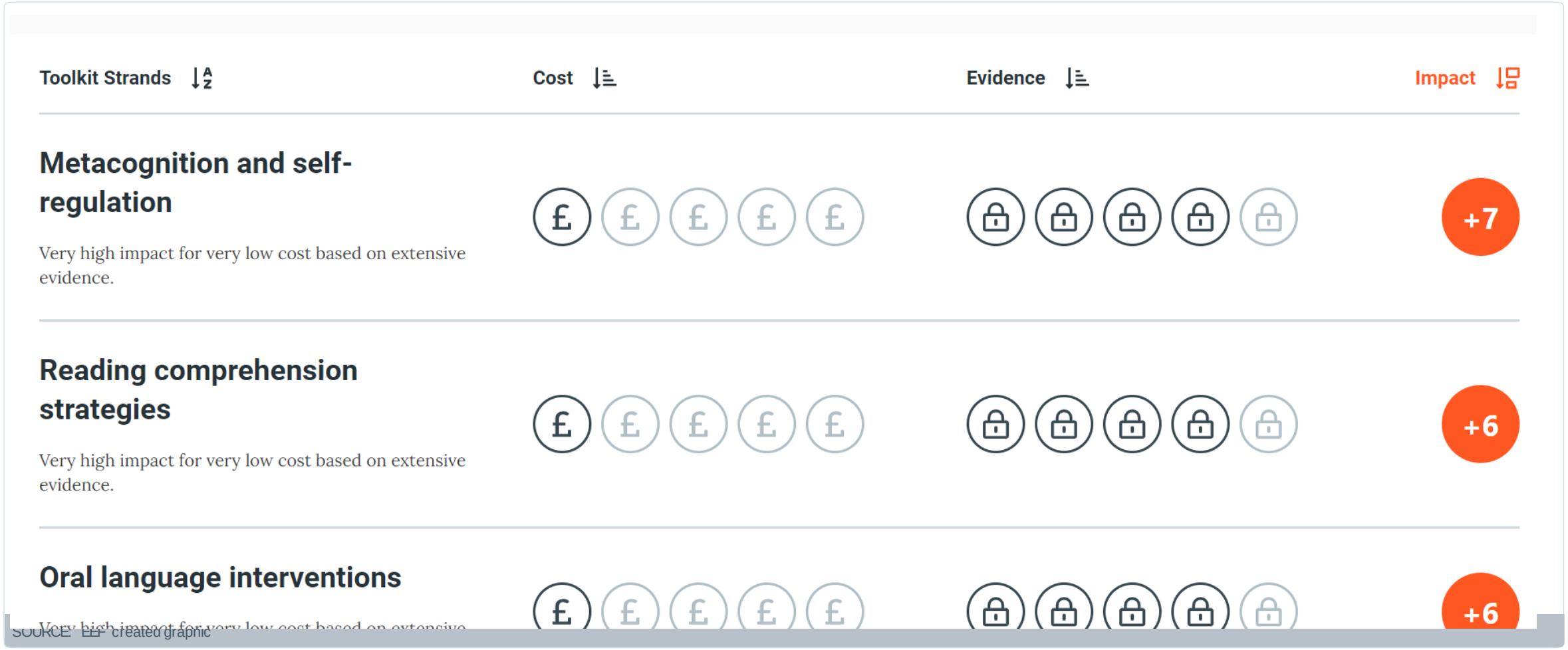
Our approach: **Evidence mobilisation**



EEF Teaching and learning Toolkit

An accessible summary of education evidence

246 studies



Toolkit Strands	Cost	Evidence	Impact
Metacognition and self-regulation Very high impact for very low cost based on extensive evidence.	£	🔒🔒🔒🔒	+7
Reading comprehension strategies Very high impact for very low cost based on extensive evidence.	£	🔒🔒🔒🔒	+6
Oral language interventions Very high impact for very low cost based on extensive	£	🔒🔒🔒🔒	+6

SOURCE: EEF created graphic

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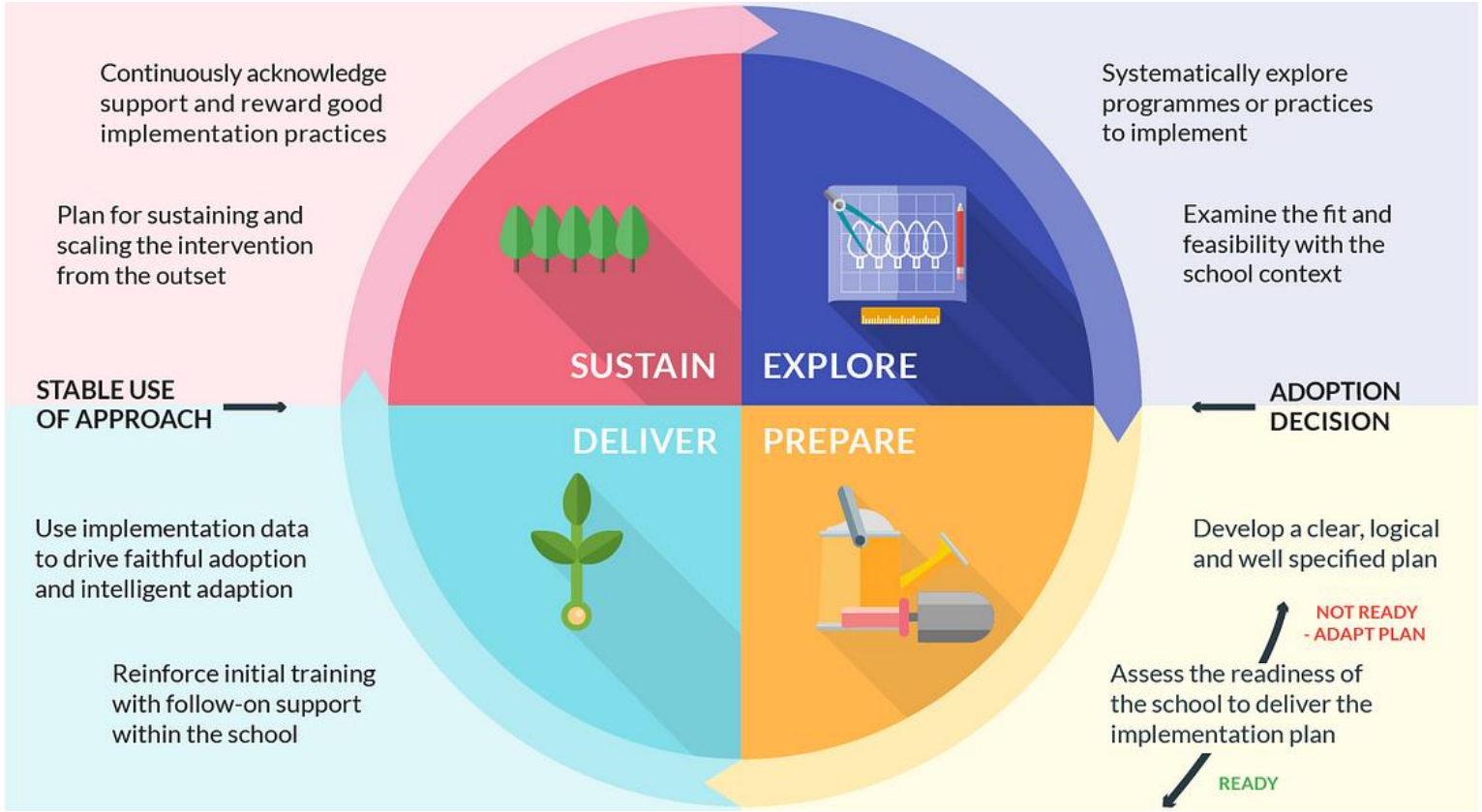
2 Potential implementation challenges



Potential implementation challenges:

1. Build a secure shared model and language for Metacognition

2. Develop a deep and applied understanding of metacognition

3. Make metacognition manageable - shrink the focus

Potential implementation issue:

1. Build a secure shared model and language for Metacognition

What this might look like…

- *Staff knowledge of metacognition is varied*
- *Staff use different language to define metacognition*
- *Staff lack a consistent model for metacognition*
- *As a result Metacognition becomes something 'fuzzy' and hard to define*
- *Building staff knowledge over time becomes challenging due to the lack of clear definition to revisit*

What is Metacognition?

'cognition of cognition…'

'thinking about thinking…'

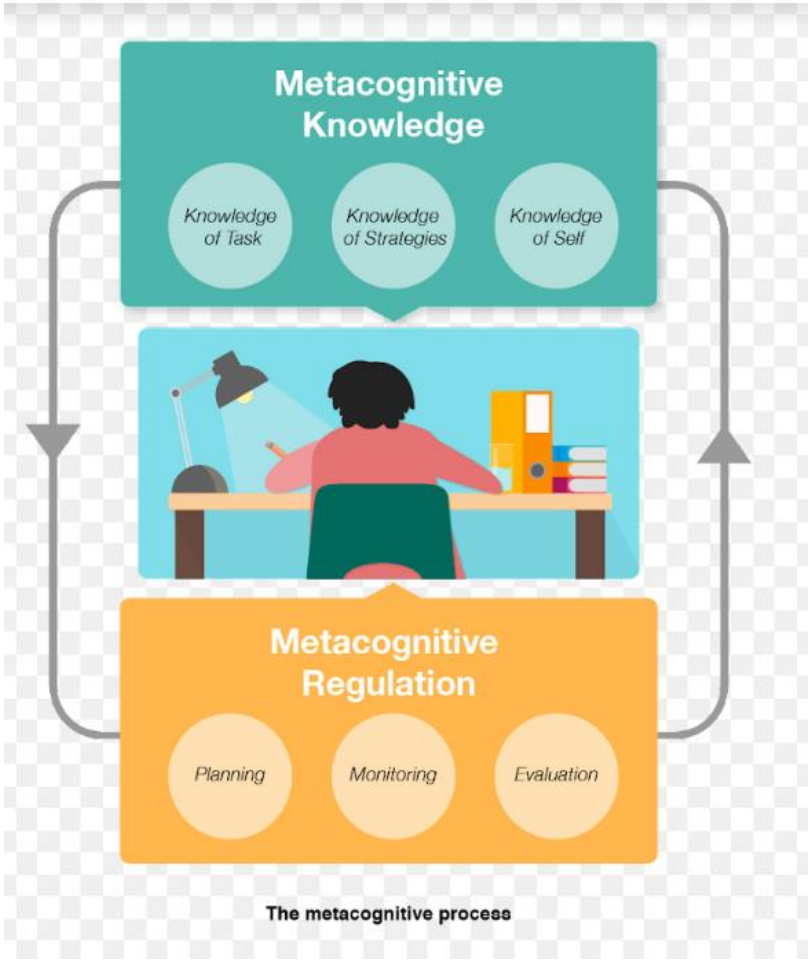
'being aware of one's awareness…'

What is Metacognition?

The term was introduced by American developmental psychologist **John Flavell in 1976,** who viewed it as "*learners' knowledge of their own cognition*"

"I am engaging in metacognition 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."

Possible solution: Developing a shared model



The metacognitive process

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.

1. Build a secure shared model and language for Metacognition

[Metacogntion - A Brief Explainer - YouTube]

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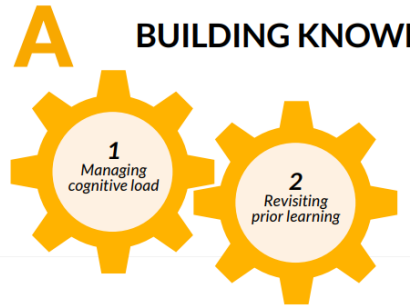
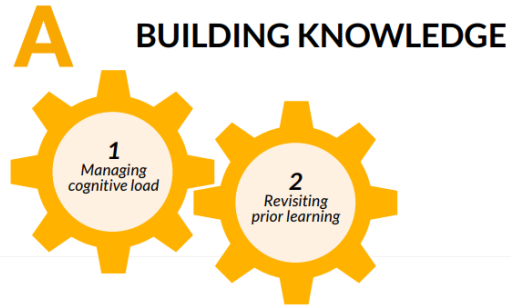


1. What is Metacognitive knowledge?

a Knowing how to approach a learning task

b Planning an approach to learning

c Knowledge of the task, strategy and self



2. What is Metacognitive regulation?

a Applying your prior knowledge and making a plan

b Thinking deeply about the learning

c Pupils ability to plan, monitor and evaluate their learning based on their existing knowledge

Potential implementation issue:

2. Building a deeper and applied understanding of metacognition

What this might look like…

- Staff struggle to identify metacognition in action
- Knowledge of what metacognition looks like across subjects and phases is limited
- Staff struggle to give examples of intended outcomes in relation to pupil learning behaviours
- Knowledge of adult behaviours that support metacognition in the classroom is varied

Possible solutions

1. Use a non-academic example to build applied understanding.

2. Use examples and non-examples to build applied understanding.

3. Take time within the **prepare** stage to consider what metacognition looks like across subjects and phases

1. Use a non-academic example to build applied understanding.

How did you get here today…?

How did you plan your journey?
How did you monitor your journey?
Would you do anything differently next time?

2. Use examples and non-examples to build applied understanding.

What does a self-regulated learner look like?

Zimmerman gives a helpful description of what a successful self-regulated learner looks like:[4]

'These learners are proactive in their efforts to learn because they are aware of their strengths and limitations and because they are guided by personally set goals and task-related strategies, such as using an arithmetic addition strategy to check the accuracy of solutions to subtraction problems. These learners monitor their behavior in terms of their goals and self-reflect on their increasing effectiveness. This enhances their self-satisfaction and motivation to continue to improve their methods of learning.'

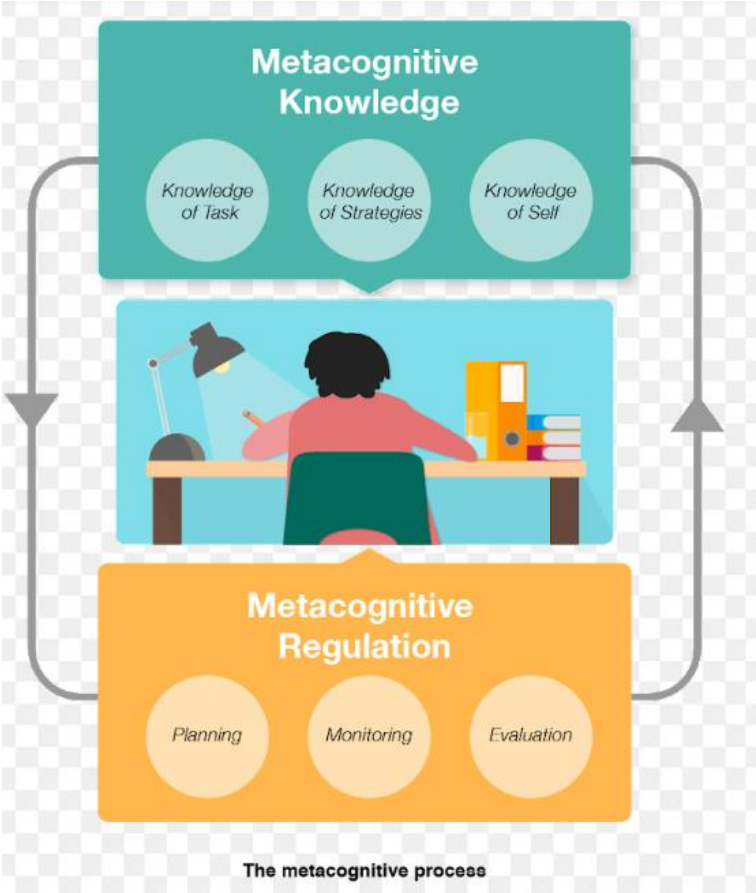
WHAT ARE METACOGNITION AND SELF-REGULATED LEARNING?

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.

How does Freya exhibit metacognitive behaviour?



The metacognitive process

- Knows strengths and weaknesses
- Set herself a goal
- Manages emotions
- Monitors her success
- Choose and applied a strategy
- Shows independence
- Motivates herself to learn and persevere
- Resilient

METACOGNITION: A BRIEF EXPLAINER
Follow-up activities

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This worksheet relates to the 'Building Knowledge' group of mechanisms, as featured in the EEF guidance report 'Effective Professional Development'.

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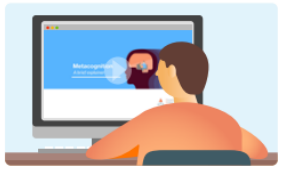

The EEF's animation 'Metacognition: a brief explainer' can be found here:

youtu.be/sAike_RQY_Dg

Questions for discussion

Leaders using the EEF's animation 'Metacognition: a brief explainer' when delivering professional development training on Metacognition might find these key questions a good starting point for discussions:

1. ***What is Metacognitive knowledge?***
   a. Knowing how to approach a learning task
   b. Planning an approach to learning
   c. Knowledge of the task, strategy and self
2. ***What is Metacognitive regulation?***
   a. Applying your prior knowledge and making a plan
   b. Thinking deeply about the learning
   c. Pupils' ability to plan, monitor and evaluate their learning based on their existing knowledge
3. ***Can you describe an example of when you have supported pupils to plan, monitor and evaluate their learning—what was the impact?***
4. ***Moving forward, what adaptations could you make to your deliberate teacher habits to support pupils to be more confident when faced with an independent learning task?***

Worked examples

These examples and non-examples of independent learning behaviours could form the basis of a range of activities aimed at deepening staff understanding for example:

1. ***Ask staff to sort into examples and non-examples to consolidate understanding.***
2. ***Ask staff to create examples and non-examples to explore what independent learning behaviours look like across different subjects and phase.***

Example	Non-Example
Adam's teacher has asked him to solve a maths problem. He recognises the type of problem and remembers that he has used visual representations successfully in the past to help him. Then he flicks through his Maths book to find a completed example to help jog his memory, before beginning the task.	Adam's teacher has asked him to solve a maths problem, but he is unsure of what to do. He grabs some manupulatives and begins to move them around, to appear busy. When this doesn't help, he asks for a pass to use the toilet.
Natasha is revising for her A-levels. She found revising for her GCSE's overwhelming and stressful. In response she decides to speak with a trusted adult and together they come up with a manageable revision timetable for the coming term.	Natasha is revising for her A-Levels. She feels overwhelmed with the amount of content she needs to revise. She puts it off until a week before her first exam, cramming her work. As a result, she enters her first exam feeling exhausted and under-prepared.

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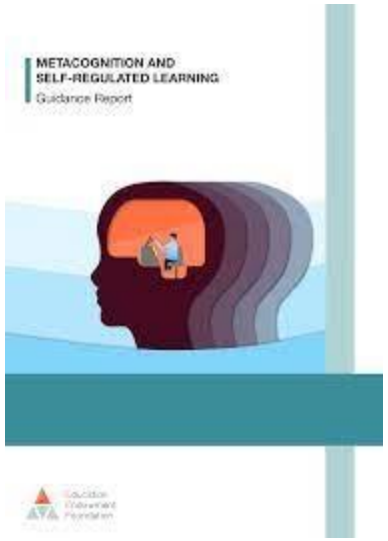
Potential implementation issue:

3. Make metacognition manageable - shrink the focus

What this might look like…

- *Too many active ingredients*
- *Lack of specificity around active ingredients*
- *Too many strategies introduced at the same time*
- *Staff become unsure of what to focus on*
- *Lack of high quality materials to support implementation*

Possible solutions: Shrink the focus



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.

3. Make metacognition manageable - shrink the focus

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Implementation planning: Case study

Problem (why?)	Progress of disadvantaged pupils	Feedback from schools suggests that pupils lack independence.		
What? Active ingredients	Build staff knowledge of memory and retrieval practices.	Build understanding of metacognition (rec 1).	Ensure that key curriculum areas reflect an understanding of how pupils learn and remember more.	Introduce the 7-step model. Ensure that all staff activate prior knowledge at the start of a learning sequence. (rec 2)
How?	All schools identify approaches to Metacognition on SDP	Series of Twilight PD sessions	Teaching and learning lead work with subject leads to consider implications for curriculum design.	Subject leads to introduce **activating prior knowledge** at the start of a learning sequence.

3. Make metacognition manageable - shrink the focus

"Implementation improves when materials are of high quality, with essential elements identified and sufficient flexibility to be adapted to school timetables and for appropriate differentiation"

Dr. Jake Anders, EEF Projects Review (2017)

High quality materials that support implementation

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.

SUPPORTING PUPIL INDEPENDENCE THROUGH QUESTIONING

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Questions to support metacognitive regulation:

- Metacognitive regulation involves pupils planning, monitoring, and evaluating their learning. This process supports independent learning behaviours.
- This tool is useful for teachers and teaching assistants seeking to support pupils to plan, model and evaluate their learning through questioning.
- These questions can be used across subjects and school phases.
- Questions can be targeted at pupils or modelled by the teacher during explicit teaching as a 'think aloud'.
- They can be used as a tool for Teaching Assistants when supporting pupils.
- Helping pupils to plan, monitor and evaluate their learning to support independence features in the EEF's guidance report on Metacognition and self-regulation.

eef.li/metacognition

1. Planning (start of the task):

- *Have you seen a task like this before?*
- *What prior knowledge do you have that might help?*
- *What is your plan / goal?*
- *What strategies will you use?*
- *What resources will you need?*
- *How will you stay focussed and motivated during the task?*
- *Are there any bits that you might find tricky—what will you do if you get stuck?*

2. Monitoring (during the task):

- *Are you sticking to your plan?*
- *Is the strategy you have chosen working or do you need to try something else?*
- *Have we used any strategies in the past that might help you here?*
- *Do you have everything you need?*
- *Could you check in with your partner to see how you are getting on?*
- *Are you keeping your focus and sticking to the task?*

3. Evaluating (after the task):

- *Did you achieve your goal?*
- *How did your plan help—did you have to adapt it?*
- *Did your strategies work?*
- *Did you stay motivated and on task—what helped?*
- *Do you need more/less support next time?*
- *What will you do differently next time?*
- *What have you learned about yourself and your learning?*

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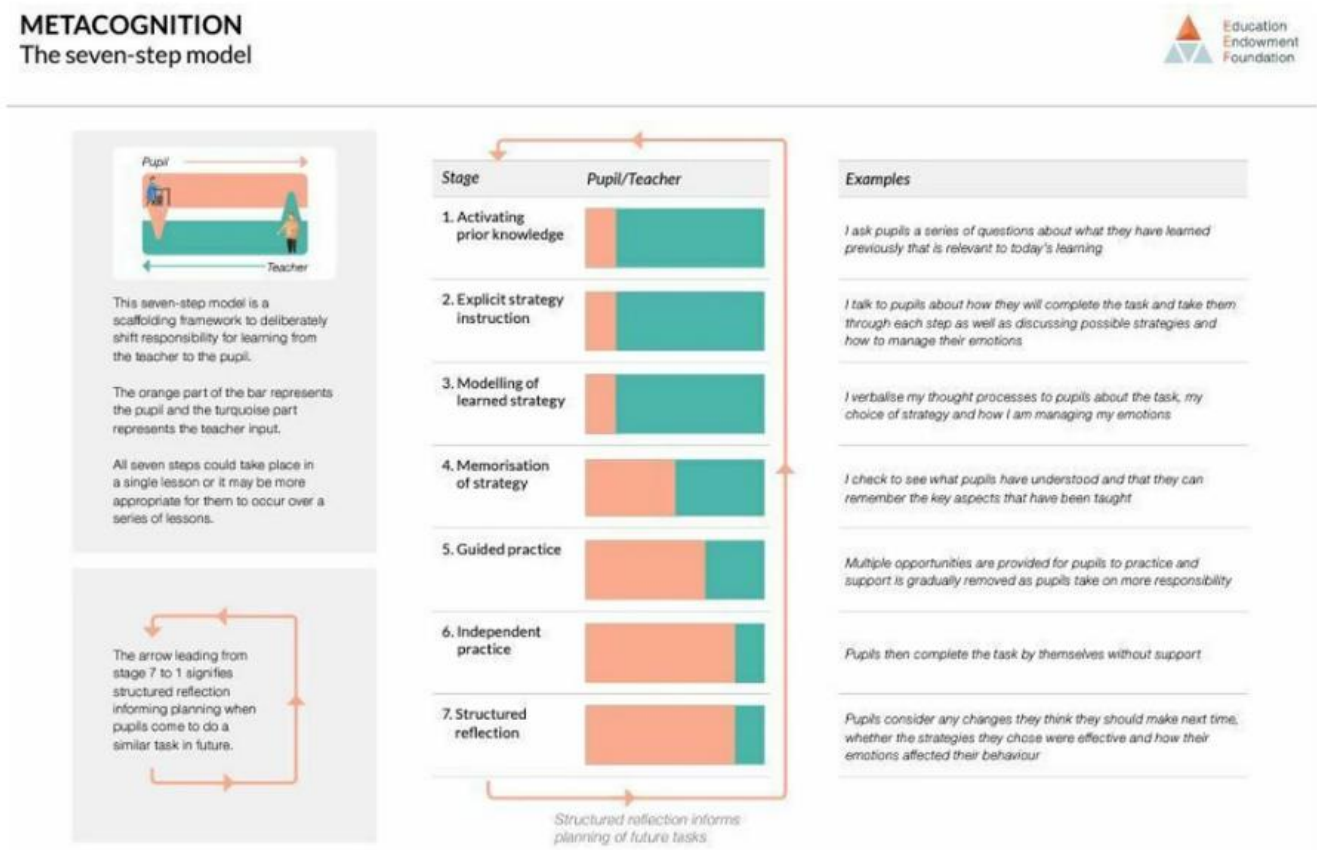
2

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.

7 step model to support the gradual release of responsibility for learning from pupil to teacher.



Metacognition: The seven-step model

3. Make metacognition manageable - shrink the focus

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Model the metacognition of an expert learner: Using a 'think aloud'

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.

INTEGRATING EVIDENCE INTO MATHS TEACHING

Planning a Think Aloud

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*These steps model the metacognitive cycle of '**plan, monitor and evaluate**'. Modelling this aloud for pupils demonstrates how you—as an 'expert' learner—continually monitor the impact of the approach you have adopted during the problem-solving process itself, and then evaluate the effectiveness of this in order to inform future learning.*

The importance of developing motivation and independence features in the EEF's guidance reports on Improving mathematics in key stages 2 and 3, and Metacognition and self-regulated learning.

Planning my approach

- What is the problem asking me to do?
- Have I seen problems before that look like this one?
- What mathematics might help me to solve this problem?
- What information in the problem is important?
- What information is less important?
- What might I need to work out?
- Would drawing a diagram help?

Monitoring my progress

- Is my chosen strategy working?
- Are there different ways to solve this problem?
- Should I think about solving this problem in a different way, or should I stick with my plan?
- Has my teacher shown me anything which might help me here?
- Would it help if I asked another pupil to check my work so far?
- Look back: have I made any obvious mistakes?

Evaluating my success

- Does my answer make sense? How do I know?
- Is there any way that I can check my answer?
- Am I sure I have answered the question? *Re-read the problem and your solution t make sure!*
- Does my answer need units?
- Would another pupil understand my working out? *You could ask a friend to check.*
- Can I explain to someone else what I dic and why I did it?
- Would a different way of solving this problem been quicker?
- Would I solve the problem in a different way if I tried it again?
- Could I share and discuss these differen approaches with another pupil?

At the end of your learning

- *Can you explain to someone else at home how you planned, monitored, and evaluated your maths learning today?*
- *What might you do differently next time?*

SUPPORTING KNOWLEDGE OF SELF THROUGH MODELLING

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- For pupils to be successful independent learners they need to be aware of their strengths and limitations.
- Good self-knowledge can be linked to positive learning behaviours.
- This tool is designed to support teachers to plan opportunities to explicitly model knowledge of self.
- Modelling self knowledge can provide opportunities to develop social and emotional learning (SEL) skills.
- Teachers can model their self-knowledge at each stage of the learning process, across subjects and school phases.
- These prompts could be integrated through a think aloud or re-directed as questions to pupils.
- Modelling your own thinking to help pupils develop positive learning behaviours features in the EEF's guidance on Metacognition and Self Regulation and Improving Social and Emotional Learning in Primary Schools.

eef.li/metacognition

eef.li/primary-sel

Knowledge of self forms part of metacognitive knowledge and refers to our knowledge of our own abilities and emotions.

Recommendation 3 from EEF's Metacognition and Self-regulated Learning guidance report suggests that teachers should verbalise their metacognitive thinking as they work through a learning task. This tool could support staff to model their knowledge of self at each stage of the metacognitive process.

1. Planning (start of the task):

- *In the past when faced with a similar task I felt...*
- *Is this task asking for subject knowledge I can remember? To help me I could...*
- *To keep myself focussed I will...*
- *When I am successful I will feel...*
- *If I feel worried I can...*
- *I can find... distracting. I will need to...*

2. Monitoring (during the task):

- *I am going to use my prior knowledge to help me with...*
- *I am staying focussed and on task by...*
- *How challenging am I finding this? What do I need to clarify?*
- *How confident am I feeling? To keep going I could...*
- *If I need to calm myself down I could...*

3. Evaluating (after the task):

- *When I felt... I...*
- *I stayed motivated by...*
- *I found it hard to stay motivated today because... Next time I will...*
- *My behaviour in today's lesson helped me to...*
- *I have learnt that I...*
- *Next time I will...*

3. Make metacognition manageable - shrink the focus

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METACOGNITION
A starter kit

What is metacognition?

Metacognition and self-regulation approaches support pupils to think about their learning more explicitly, often by teaching them specific strategies for planning, monitoring, and evaluating their learning.

What is this starter kit?

Building independent learning habits into teaching can be challenging. Evidence tells us that explicitly teaching metacognition can support pupils to think about their own learning more purposefully, leading to more independent learning behaviours.

This resource could be used as a starting point for schools who want to support pupils to build more independent learning behaviours.

It offers advice and recommends specific tools to help build staff knowledge around metacognition, and also provides suggested activities for initial professional development.

While some of the metacognitive strategies can be described generically, they can only be improved through practice—this means applying them to specific tasks. Other EEF guidance reports, such as those on literacy and mathematics, provide more detailed subject-specific guidance for teachers.

Why metacognition?

The EEF's **Teaching and Learning Toolkit** suggests the potential impact of metacognition and self-regulation approaches is high (+7 months additional progress).

Pupils who are metacognitive demonstrate more independence and resilience throughout the learning process. The explicit teaching of metacognition can be particularly helpful for learners that come from socio-disadvantaged backgrounds.

To find out more...

The EEF's guidance report **Metacognition and Self-regulated Learning**, offers practical advice on how to develop pupils' metacognitive skills, whilst our **Effective Professional Development** guidance report offers further evidence-informed approaches to support schools in developing professional development that improves teacher practice.

Access metacognition explainer animation

Use your smartphone's camera or QR app to access the explainer video.

youtu.be/sAik_RQY_Dg

Access EEF metacognition resources

Use your smartphone's camera or QR app to access our metacognition resources.

eef.li/metacognition

Purpose of activity	Resource
Building a shared professional understanding	***Metacognition: A Brief Explainer*** This short animation aims to cut through the complexity by providing a clear example of metacognition in practice. It could be shared with staff during training to build knowledge. Watch the animation here: youtu.be/sAik_RQY_Dg
Consolidating understanding	***Metacognition: A Brief Explainer—Follow-up activities*** Leaders using the EEF's animation when delivering professional development training on Metacognition might find these key questions and worked examples a good starting point for discussions.
Exemplification	***Planning Professional Development—Considering a balanced design*** This worked example provides a model of how schools can draw upon the best available evidence around professional development to ensure a balanced approach to PD design, making it more likely that this will lead to a sustained change to practice.
Supporting metacognitive strategies **Rec. 1 of our metacognition guidance report says:** *"Teachers should support pupil's to plan, monitor and evaluate their learning."*	***Supporting Independence through Questioning*** Planning questions that encourage learners to **plan**, **monitor** and **evaluate** can be a good starting point when thinking about developing metacognition within the classroom. This tool suggests questions that could be used across subjects and school phases. Blank/editable versions are included for training purposes.
Rec. 2 of our metacognition guidance report says: *"A series of steps—beginning with activating prior knowledge and leading to independant practice, before ending with structured reflection—can be applied to different subjects, ages and contents."*	***Metacognition—The seven-step model*** In this 'Voices from the Classroom' video, Lucy Broomfield—Primary Teacher and KS1 phase leader at Chorlton Park Primary School—explains how she uses the 'seven-step model' to support pupils' independent learning. Watch here: youtu.be/PS9s-ML6aMU
Rec. 3 of our metacognition guidance report says: *"Teachers should verbalise their metacognitive thinking."*	***Supporting Self-Knowledge through Modelling*** This tool provides a range of prompts that could be used by teachers using a 'think aloud' to model knowledge of self at each stage of the metacognitive process. Blank/editable versions are included for training purposes.

3. Make metacognition manageable - shrink the focus

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3 things that have made you think…

2 things to find out more about…

1 conversation with a colleague…

Get involved with the EEF