Metacognition in the Primary Classroom

Guidance for implementing metacognitive strategies in primary schools produced by Kent Educational Psychology Service.

Kent County Council kent.gov.uk

Contents

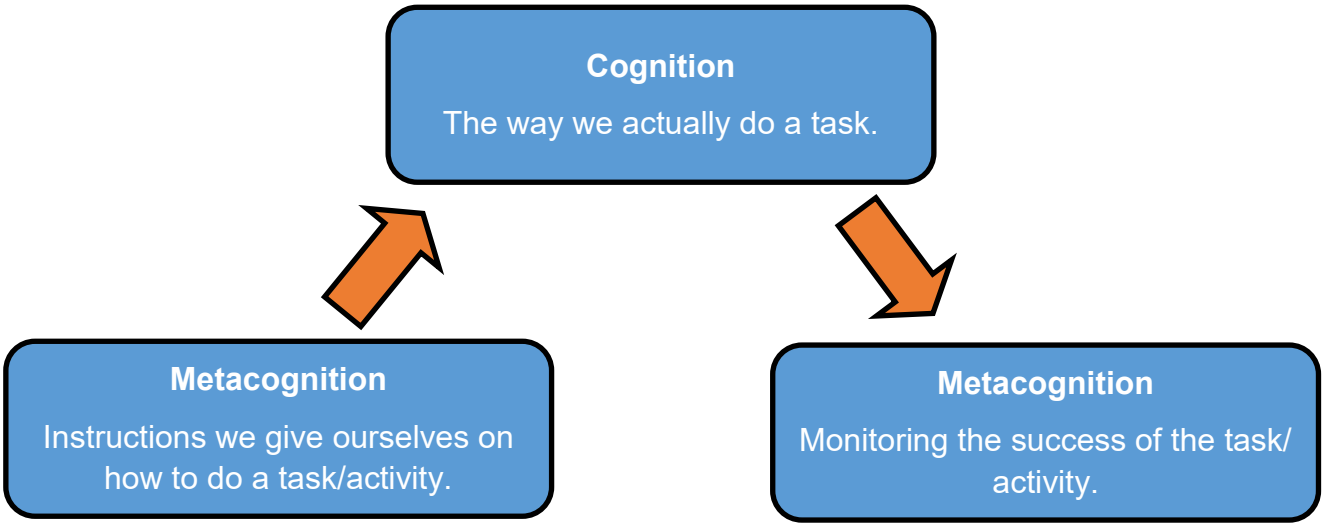
What is metacognition?

Metacognition is more than just thinking about thinking. It means having knowledge and understanding of our own cognitive processes and abilities, and those of others, as well as the ability to regulate these processes. It is part of being a **self-regulated learner** (having an awareness of strengths, areas of needs, and strategies to be learnt).

Metacognition is the conscious awareness and reflection on the process of thinking.

Metacognition versus cognition

Cognition refers to the mental processes involved in knowing, understanding and learning.



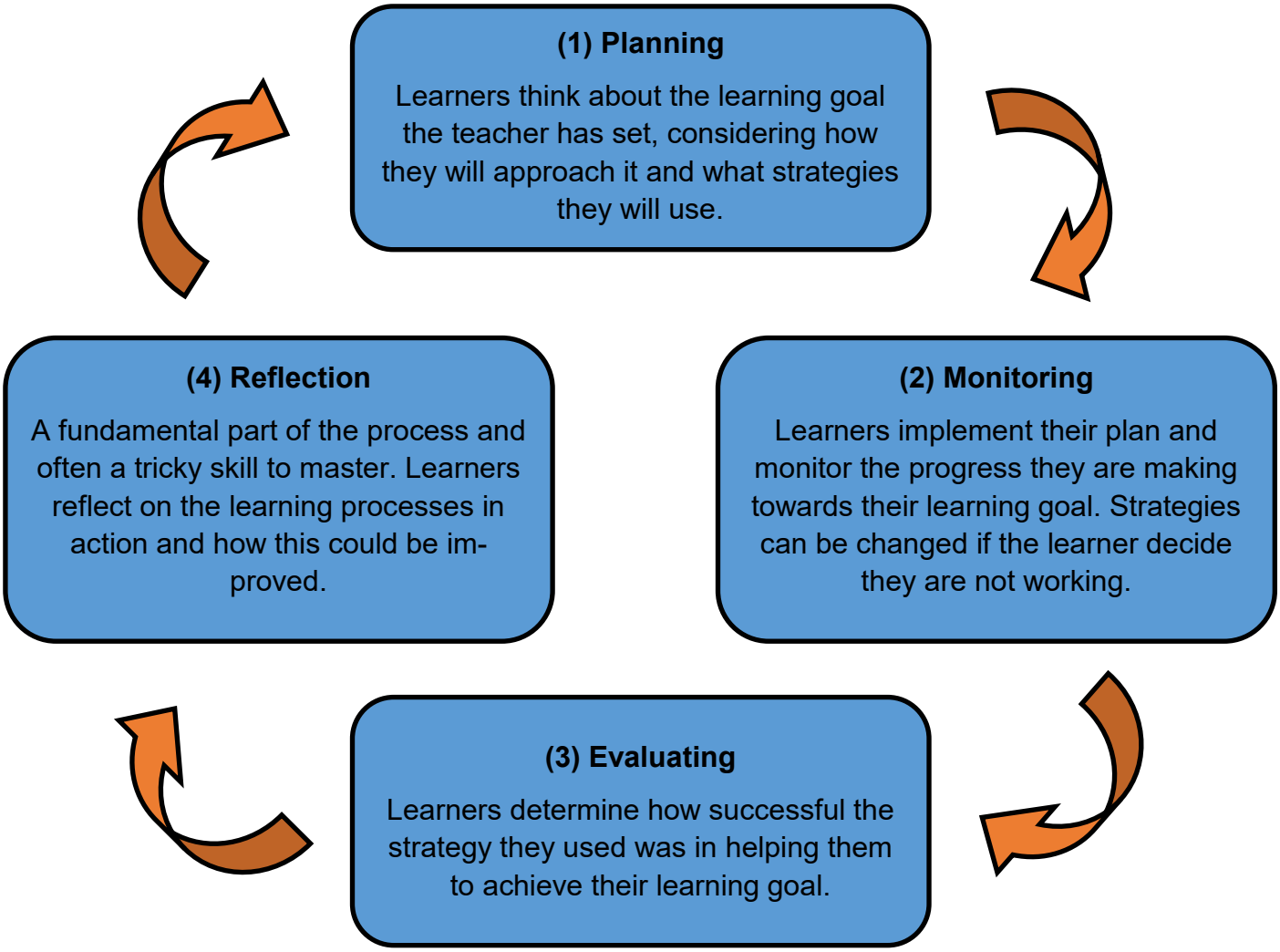
Components of metacognition

Metacognition is often considered to have two dimensions:

Type	Explanation	Example
Metacognitive Knowledge: What learners know about learning.	Knowledge of own cognitive abilities.	'I have trouble remembering dates in History.'
	Knowledge of a particular task.	'The ideas in this chapter I'm going to read are complex.'
	Knowledge of different strategies available and when they are appropriate to use.	'If I scan the text first, it will help me to understand the overall meaning.'
Metacognitive regulation: What learners do about learning.	Describes how learners monitor and control their cognitive processes.	A learner might realise that a particular strategy is not achieving the desired results, so they decide to try a different strategy.

Phases of metacognition

There are four phases of metacognition. These phases are an ongoing cycle and can be applied to any subject or learning task. Applying these throughout a task means we update our metacognitive knowledge alongside our subject knowledge and skills.



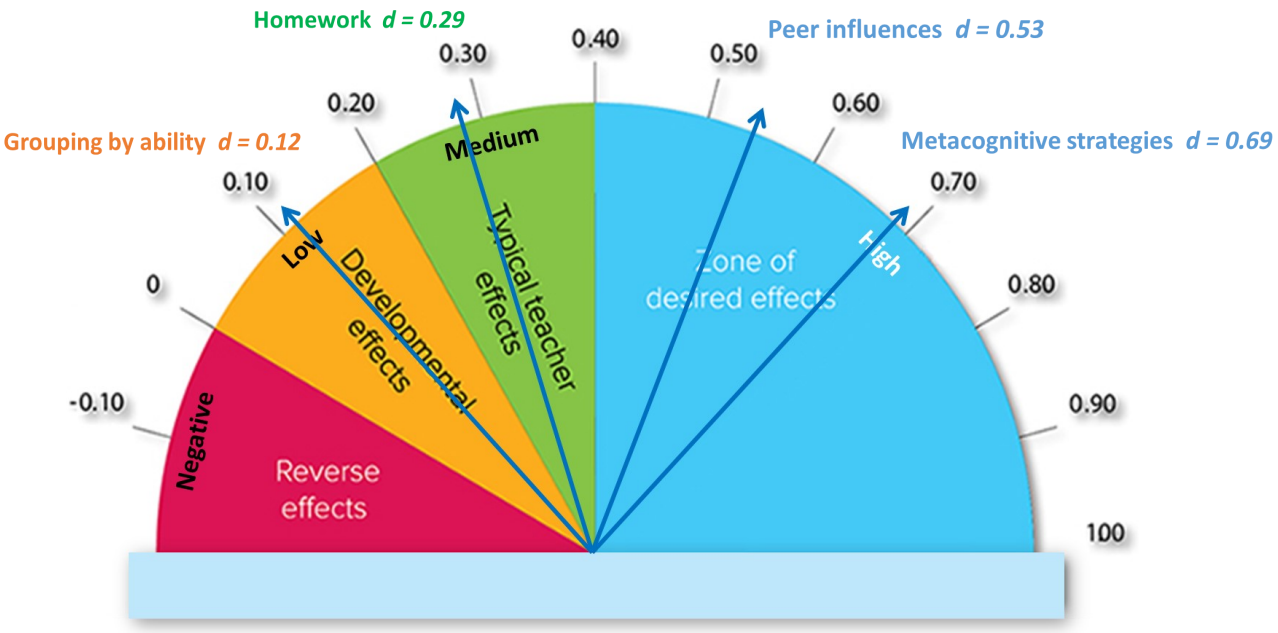
Thinking point

How does metacognition compare to other educational activities? Before you read the next page, think about what order you would put the following in (from least effective to most effective):

- **Peer influences**
- **Homework**
- **Metacognitive strategies**
- **Grouping by ability**

Why is metacognition important?

John Hattie investigated the impact of different educational initiatives by calculating their effect sizes. The bigger the effect size, the stronger the impact.



Metacognition had the biggest impact on learning and was found to:

- Shape active, rather than passive, learners
- Give pupils a sense of control over their learning
- Promote “deep” learning and “learning how to learn”
- Impact both learning and attainment
- Be a key component of assessment for learning
- Positively impact a learner’s attitude towards challenges and failures

Other benefits of metacognition

There is a significant evidence base that suggests metacognition and self-regulation approaches have consistently high levels of impact, with pupils making an average of 7 months progress. Strategies are usually more effective when taught in collaborative groups so that learners can support each other and make their thinking explicit through discussion. The approaches that have been tested typically involve applying self-regulation strategies to specific tasks involving subject knowledge, rather than learning generic ‘thinking skills’.

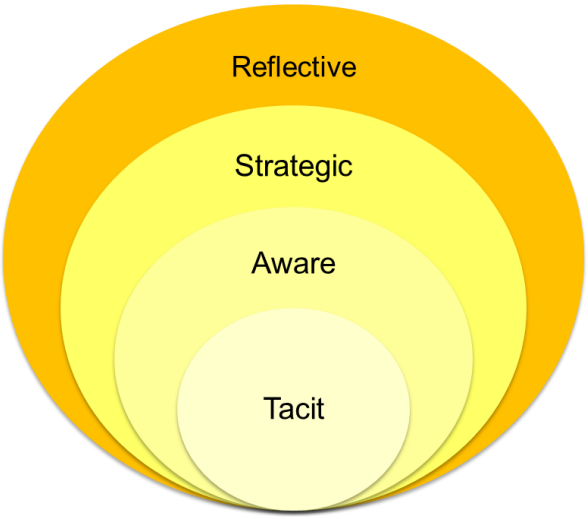
Other benefits include:

- Improved decision-making
- Improved interactions with others
- Ability to apply metacognitive skills to settings outside of school

Metacognitive Learners

Four levels (Perkins, 1992):

1. **Tacit learners:** unaware of metacognitive knowledge and do not think about any particular strategies for learning.
2. **Aware learners:** know about some kinds of thinking that they do, e.g., generating ideas, finding evidence. However, thinking is not necessarily deliberate or planned.
3. **Strategic learners:** organise thinking using problem-solving, grouping and classifying, evidence-seeking and decision-making. They know and apply the strategies that help them learn.



4. **Reflective learners:** also reflect upon learning while it is happening, considering the success (or not) of any strategies they are using and then revising them as appropriate.

What does an able metacognitive learner look like?

Clark and Dumas (2016) attempted to list particular behaviours associated with metacognitive learners:

- Self-evaluation
- Recording and monitoring learning
- Asking adults for help
- Self-verbalising
- Setting goals and planning progress
- Managing time
- Engaging in learning from peers
- Showing persistence, resilience and managing distractions
- Seeking out resources from the classroom
- Giving themselves rewards or sanctions based on outcomes
- Memorising and rehearsing information
- Being aware of their own difficulties

Thinking point:

Before moving on, consider the following question:

What do you already do to support your students to develop metacognition?

Developing Metacognitive Skills

Growth mindset (Dweck, 2006):

For metacognition to be embedded as a strategy, process and culture, we have to encourage a growth mindset amongst pupils. **This is the belief that anyone can increase their intelligence and performance through effort and persistence.**

Learning needs to be seen as a flexible process, whereby thinking and reflection will aid development.

Framework for the classroom

1) Teach pupils about 'metacognition', including the concepts and process of 'planning' 'monitoring' 'evaluating' and 'reflecting'.

2) Choose a few metacognitive strategies/tools you feel would work with your pupils.

3) Introduce strategies alongside subject content and clear learning objectives.

4) Model strategies and scaffold their use until pupils can use them independently.

5) Set appropriate levels of challenge to develop self-regulation.

6) Ensure 'metacognitive talk' is promoted and developed in relation to lesson objectives.

Metacognitive strategies

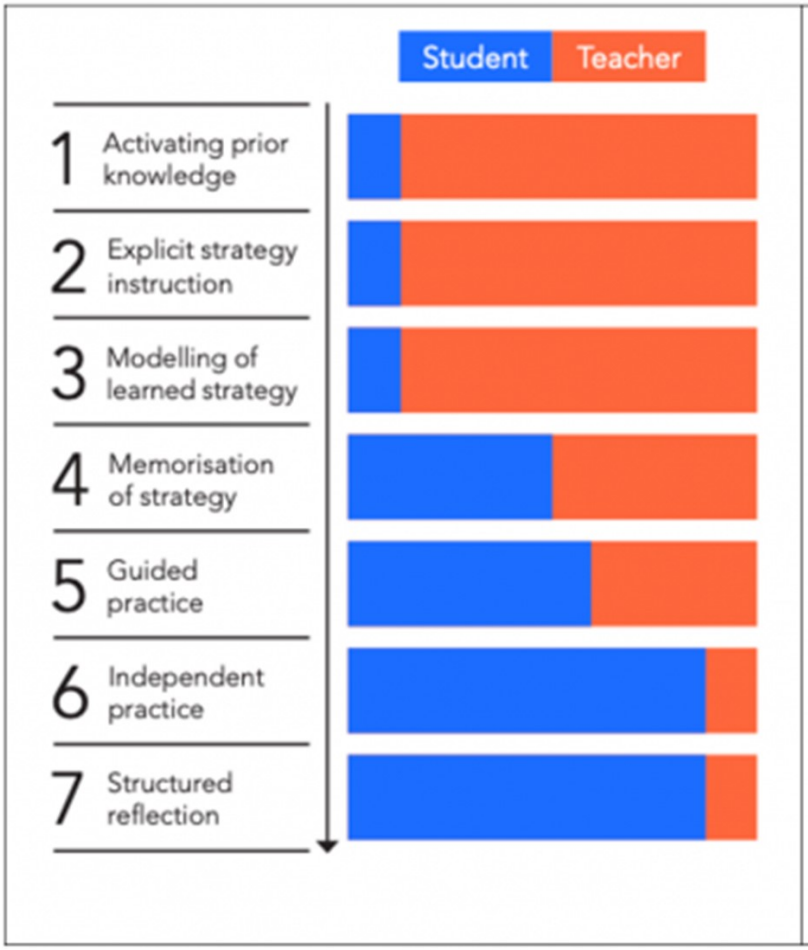
Metacognitive strategies are different to cognitive strategies. Cognitive strategies are used to make cognitive progress, e.g., using phonics to decode an unknown word. Metacognitive strategies are used to **monitor** cognitive progress.

There are many different metacognitive tools and strategies that children can use, some of which apply across different domains of the school curriculum. It is important that children have clear learning goals so they know which strategies will help them achieve and monitor their goals. Discussing strategies in class can help students to understand what strategies are available to them, and how they impact on their learning.

Seven step model

Particular metacognitive strategies are often subject– or task-specific. The evidence suggests that they are best taught through subject content, rather than explicit 'learning to learn' or 'thinking skills' sessions. The seven step model below outlines how the explicit teaching of metacognitive strategies can be applied to different subjects at different phases and ages.

This model is useful for developing students' independence and can provide a valuable reflective tool for teachers. Furthermore, making the model visible to students and explicitly linking progression through these steps helps make students more aware of their learning.



Examples

1. I ask students a series of questions about what they have learned previously that is relevant to today's learning
2. I talk to students about how they will complete the task and take them through each step as well as discussing possible strategies and how to manage their emotions
3. I verbalise my thought processes to students about the task, my choice of strategy and how I am managing my emotions
4. I check to see what students have understood and that they can remember the key aspects that have been taught
5. Multiple opportunities are provided for students to practice and support is gradually removed as students take on more responsibility
6. Students then complete the task by themselves without support
7. Students consider any changes they think they should make next time, whether the strategies they chose were effective and how their emotions affected their behaviour

Strategy evaluation matrix

Strategy	How to Use	When to Use	What is it for?
Skim / Survey	Search for headings, highlighted words previews, summaries	Before you read a long piece of text	Gives an overview of the key concepts, helps you to focus on the important points
Slow down	Stop, read and think about information	When information seems important. If you realise you don't understand what you have just read.	Improves your focus on important information.
Activate prior knowledge	Stop and think about what you already know about a topic.	Before you read something or do an unfamiliar task.	Makes new information easier to remember and allows you to see links between subjects. Information is less daunting if you already know something about the topic
Fit ideas together	Relate main ideas to one another. Look for themes that connect the main ideas, or a conclusion	When thinking about complex information, when deep understanding is needed.	Once you know how ideas are related they are easier to remember than learning as if they are separate facts. Also helps to understand them more deeply
Draw Diagrams	Identify main ideas, connect them, classify ideas, decide which information is most important and which is supporting	When there is a lot of factual information that is interrelated	Helps to identify main ideas and organise them into categories. Reduces memory load. May be easier to visualise

This reference aid can help pupils to familiarise themselves with possible strategies that they might use and the appropriate context for using them.

Introduce **one strategy at a time** (perhaps monthly) to give pupils the time to practice each new strategy and integrate it with the older ones.

Time should be allocated each week to reflect on where pupils have used the strategies and what benefits they noticed. This could take the form of a journal entry or small group discussions.

Thinking point

Before moving on, consider the following question:

Are there any lessons where one of the strategies listed above may be especially useful?

PMI: Plus, Minus, Interesting

A PMI is used to record all the positives (plus), negatives (minus) and interesting parts of an idea, which gives students an opportunity to look at a concept or idea from different angles. This can help weigh up the pros and cons, which in turn develops a student's critical thinking and decision-making skills.

PMIs can help pupils to:

- See both sides of an argument
- Consider things from a different point of view
- Think broadly about an issue
- Suspend judgement
- Make informed decisions
- Work as individuals or with others

KWL(H) Grids

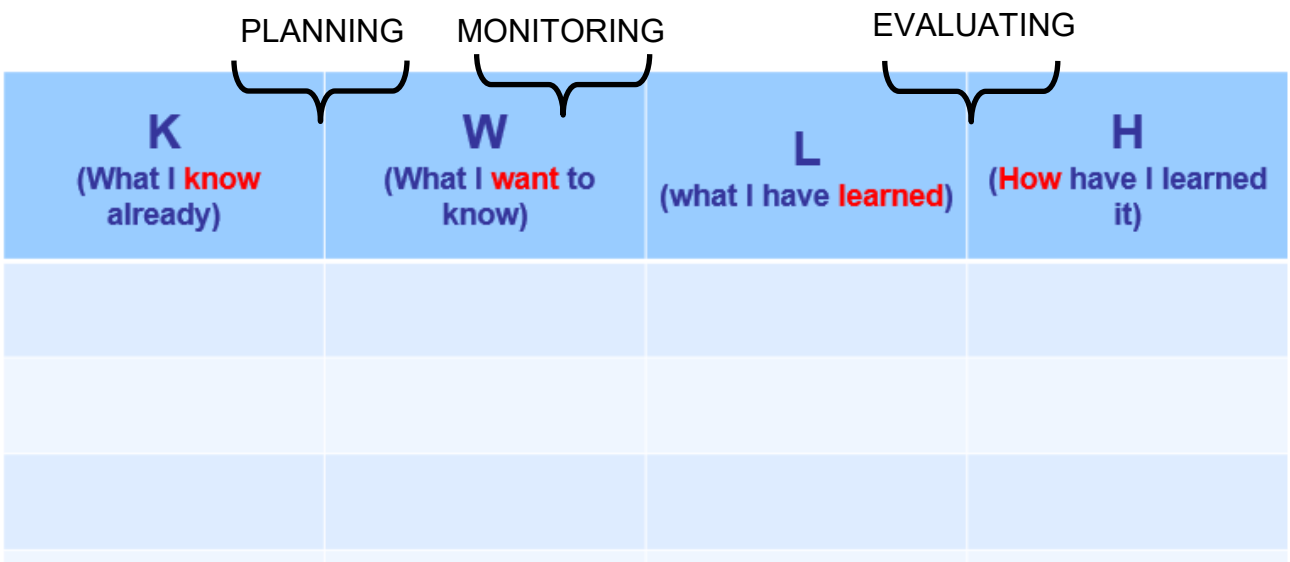
KWL Grids support pupils to plan, monitor and evaluate their learning.

⇒ **'K'** stands for 'know' - think, then list, what you already know about a topic (e.g., key-words, terms, phrases).

⇒ **'W'** stands for 'will' or 'want' - list questions of what you want to know more about, based on the list made in 'K' (e.g., what do you want to learn and/or expect to learn, generally or specifically?).

⇒ **'L'** stands for 'learned' - answer questions listed in previous stage and list any new information found. Check it against 'W' - what you wanted to learn.

These grids can be expanded with **'H',** which stands for 'How' - how you can learn more. Pupils can think of how they can learn more or answer questions not previously answered. They can think of other sources of information to help them do this, e.g., websites, organizations.



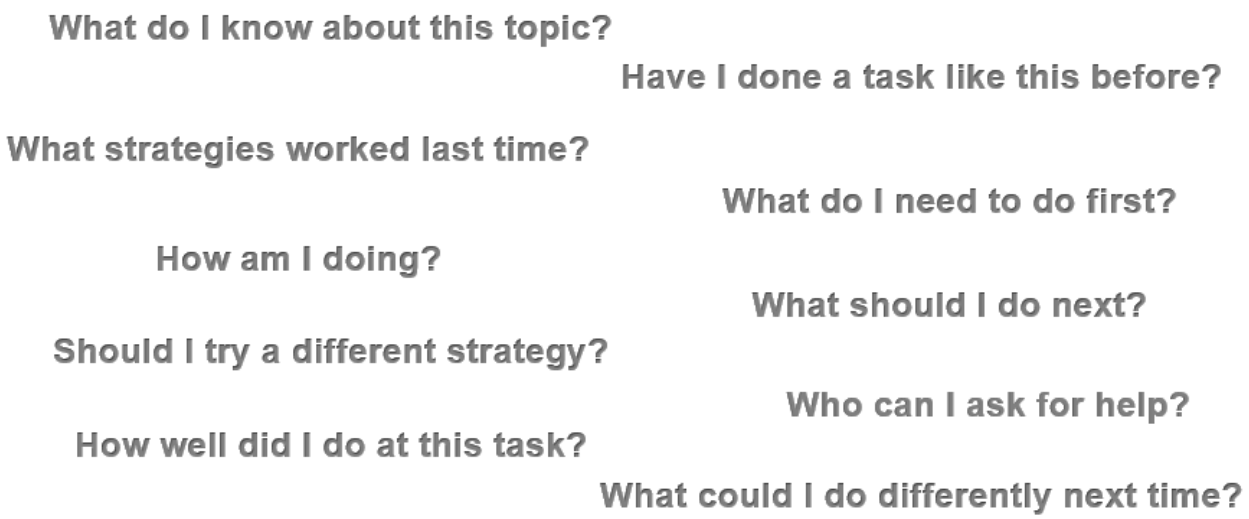
Metacognitive awareness

You can encourage the development of metacognition in the classroom by giving students the opportunity to use metacognitive strategies at key stages of a task. Lessons should be structured in a way that allows students to practice metacognitive strategies. Broadly, we need to split lessons into four stages: you, plan, do and review.

Stage	Information
You	Giving students a lesson starter where they need to consider their prior knowledge on the topic, and any strategies they have previously used to learn about this topic.
Plan	Setting pupils a task (a learning goal). The learning goal needs to be clear and explicit. Students plan their approach to it, the strategies they will use, how long it will take them – so they can allocate the right amount of effort – and what could potentially go wrong.
Do	Pupils carry out the task, monitoring their progress as they go. To help them, you could stop halfway through and give sentence scaffolds to reflect on, e.g., I am doing the task successfully because…. I am confused by…. I might need to change my strategy because…. It is particularly important to highlight anything they are confused by, because this shows students that confusion is an integral part of learning. Recognising what we don't understand also leads to better metacognition.
Review	Allow your students time to review what they have learnt – how successful was their strategy in helping them achieve their learning goal? What did and didn't go well? What could they do differently next time, and what other types of problem could they use this strategy for?

Metacognitive Talk and Questioning

Metacognitive talk involves a person saying out loud what they are thinking whilst completing a task. This can help learners to focus on and monitor their cognitive processing. Learners can ask themselves different questions depending on which stage of metacognition they are engaging in (planning, monitoring, evaluating).



Metacognitive Talk and Questioning (Continued)

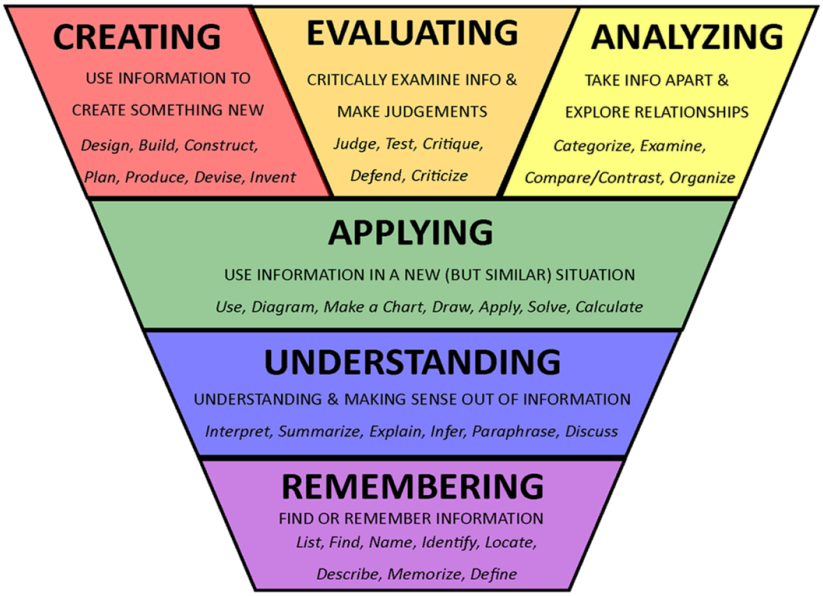
Dialogic teaching

Developing the quality of classroom talk is an effective way of improving and practising learners' metacognitive skills.

As devised by Robin Alexander, 'Dialogic teaching', emphasises classroom dialogue through which pupils learn to reason, discuss, argue, and explain.

A key element of the dialogic approach is to encourage a higher quality of teacher talk by going beyond the closed 'teacher question–pupil response–teacher feedback' sequence.

Bloom's Taxonomy



Higher Order Thinking

Bloom's Taxonomy outlines a variety of cognitive skills. At each level, pupils are asked to engage with learning in a different way. Every level is an important step in the process of moving towards higher order thinking skills.

Lower levels form the foundations of learning, whilst higher levels are associated with higher order thinking.

Questions and key words for critical thinking

Are you sure? How do you know? Can you tell me why?

Remembering	Understanding	Applying	Analysing	Evaluating	Creating
You want to find out what the children know	*You want to find out what the children understand*	*You want to support the child in solving a problem, using what has been learned*	*You want to support the child to examine and break down information into parts*	*You want to support the child in reflecting on and evaluating work and ideas*	*You want to support the child to represent information in a new or alternative way*
Who…? What…? Where…? When…? Which…? Why…? How would you show / explain / describe …?	Tell me in your own words… Which is the best answer and why? What facts and ideas show…? How are these the same / different? What is the effect of …? What is the main idea of …? What does this mean?	How would you solve … using what you've learned? What do you already know that could help you? What other way would you plan to …? What would happen if …? What do you think you need to do next? How could you use what you've learned?	What are the parts or features of …? What is the theme? How is … related to …? How could you sort these? Why do you think …? What evidence can you find to support this? What conclusions can you draw? What is the function of …?	What works / worked well? What would you change? How could it be improved? Do you agree with the actions / with the outcome? What is your opinion of …? What information could you use to support these views? How would you prove / disprove? What / which is most important and why? Why did they choose …? How would you do it differently?	What changes would you make to solve …? Can you think of another way? Can you predict / estimate? What do you think it's going to be ? How would you adapt … to create a different …? How could you put all your ideas together?

Metacognition in context

Reading

Zhang and Sheepo (2013) outline how metacognitive strategies can be applied to reading comprehension.

Metacognitive Strategy	When?	How?
Planning	Before reading a text.	• What do I already know about this text? • What can I learn from the titles, subtitles and images?
Monitoring	Whilst reading a text.	• How well am I understanding the text? • What connections, predictions and inferences can I make? • What can I learn from the context clues, text features and text structure? • What can I use or do to improve my understanding?
Evaluating	During and after reading a text.	• What judgements can I make from reading this text? • What is important? • Is it credible? Appropriate? Useful? • Did I enjoy reading it? • What progress did I make as a reader?

Furthermore, reading comprehension can also be developed through a specific intervention called **Reciprocal Teaching**, or **Reciprocal Reading**, which employs children's metacognitive skills. This method has a good global evidence base for improving learners' comprehension of texts (McHugh, 2016). It can be delivered in small groups and involves learners taking an active role in, sharing responsibility for and building an understanding of a text. Children will read an extract by themselves and follow this with a group discussion that uses explicit comprehension strategies.

The discussion follows four stages:

1) **Predict** – using prior knowledge and clues in the text to predict what might happen next. It is a helpful tool because it encourages motivation to read the text and develops inference skills.

2) **Clarify** – identifying unknowns in the text, such as words or phrases and utilising strategies to help them overcome this.

3) **Question** – generating questions about what has been read and then answering them.

4) **Summarise** – children to provide a summary of what they have read. Supports children to identify key points and explain what they have read in their own words.

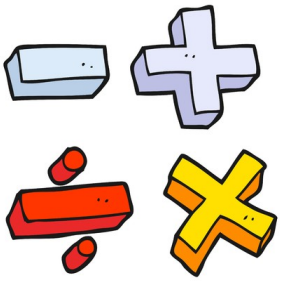
*The concepts of Reciprocal Teaching can also be applied to **mathematical word problems**.*

Maths

Clive Davies, OBE – a former headteacher and OFSTED inspector, now using his experience as an education author and school advisor – highlights several examples of how metacognition can be used within Maths lessons.

For further information, visit:

www.focus-education.co.uk



The key differences:
Lesson 2……..

- **Follows the planning, monitoring and**
- **evaluating principles**
- **Demands more collaborative learning**
- **Requires demanding thinking**

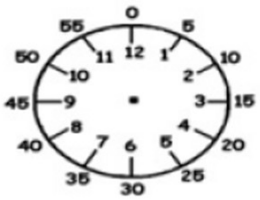
Lesson 1

In a Year 1 classroom, a group of learners were provided with a tube of smarties.
They were invited to open the box and then instructed to sort the contents according to colour.
Once they had achieved this they were then asked to create as many additions as they could using the colours.
The pupils ended up with many different calculations, taking account of the colours, that is, 5 red add 3 yellow makes 8 altogether.
The use of mathematical language was positive as was the recordings made by the pupils.
Some of the pupils then went on to bring together three different colours and created further calculations based on this way of combining different colours.
By the end of the lesson, some of the pupils had started to think about subtraction in the terms of difference, that is, how many more…., etc.

Lesson 2

If we are more conscious of supporting learners' metacognition then the lesson could have started in a more open way:
What maths can we learn from a tube of smarties?
We could have provided learners with a short opportunity to handle the smarties and to think of ideas.
We could then focus on their planning by getting them to consider the best way of approaching the problem.
We could then have collected a range of different ideas from the pupils and got the group to consider the best ideas.
When they were working on the ideas the pupils could have been asked to consider if this was the best way of approaching the problem (monitoring).
Could they think of a different way?
Were they happy with the way the activity was unfolding?
At the end of the learning the pupils could provide feedback on how successful they were. If they were to do it again, how would they approach it differently (evaluating).

Maximising opportunities for pupils to learn metacognitively in Mathematics

Example Year 4 Problem	Encourage learners to go through the three phases outlined. Here are the types of questions they should be thinking about.
Why do you think clock faces have numbers 1 to 12 when there are 24 hours in the day? Make a case for staying with the 12-hour clock face and make a case for inventing a 24-hour clock face. State your own preference before finding out your friends' thoughts.  	**Planning Phase** • Talk to your partner about what your first thoughts were when you heard the question. • Talk to a partner about the steps that you think you are • going to take. • How do your ideas compare with your partner's ideas? **Monitoring Phase** • Do you think you have taken the right path? • Are you happy with the way you are tackling the task? • Do you think your mathematical knowledge is good enough to complete this task? • Explain the steps you have taken so far. Do you need to make any adjustments to your thinking? • Does this problem remind you of another you have completed recently? **Evaluative Phase** • Tell your partner what your reason was for choosing your idea and what the main reason was for rejecting other possible ideas. • On a scale of 1 to 10 (with 10 being super confident). How confident are you about the way you completed the task? Why? What else would you need to know to increase your confidence. • What advice would you give yourself or someone else if you/ or they had to complete another similar task? • Write a list of three steps that would help someone else complete the task for the first time. • What advice would you give someone else if they were to tackle a similar problem?

Feedback

How we provide feedback to children can also be an important step in the development of metacognitive skills.

Feedback following **achievements** should look at:

- The correct use of the task-specific strategy
- The effort and perseverance required to complete the task
- A confirmation that the child has the ability to manage such tasks
- Statement that ability can improve over time and is not fixed

Feedback following **failure or disappointment** should look at:

- The use of an appropriate strategy that could be improved
- Aspects of effort or perseverance that could be changed
- Reassurance that the student has the ability to accomplish the task

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Useful Resources

Visible Thinking Activities: https://www.inquisitive.com/blog/2019/03/27/visible-thinking/#see-think-wonder

Education Endowment Foundation—Metacognition and Self-regulation: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/metacognition-and-self-regulation

Article from Edutopia 'How to get students to think about their own learning': https://www.edutopia.org/article/how-get-students-thinking-about-their-own-learning