Shotton Hall Research School

TOWN END ASSOCIATE RESEARCH SCHOOL

# 5 MINUTES ON...

# MEMORY

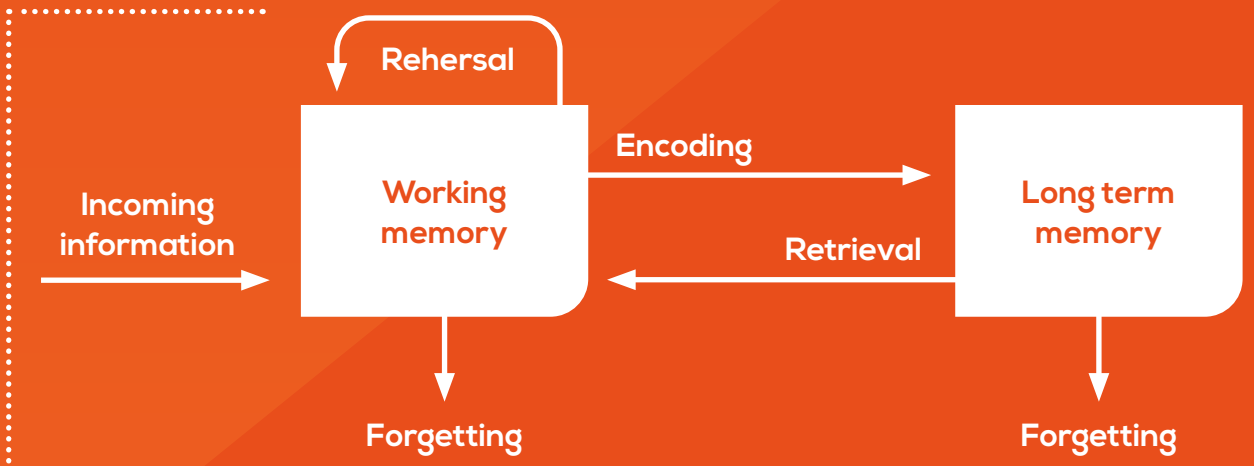
## How might we define memory and how does it relate to learning?

The process of forming a memory involves **encoding, storing, retaining and subsequently recalling information and past experiences**. Cognitive psychologist Matlin described memory as the "process of retaining information over time." Memory is intrinsically linked to learning.

Learning is **complex activity** which is not directly observable. It should have **two** core outcomes:

> The **long-term retention** of **valuable** knowledge, skills or understanding.
> The ability to **transfer** what has been retained to **different** contexts and situations.

Moreover, we can only think deeply and critically about what we know well, about what we have a lot of knowledge about. To aid thinking, that knowledge must be encoded in long-term memory. This is not about rote learning: knowledge is an important step in progressing to more complex understanding. To learn, students must transfer information from working memory (where it is consciously processed) to long-term memory (where it can be stored and later retrieved). Learning is an alteration in long-term memory.




*Improving Secondary Science Guidance Report, EEF*

## What does the evidence tell us about memory?

There are two broad categories of memory: short-term/working memory and long-term memory.

### Long-term memory

> The LTM is potentially limitless in capacity.
> However, information in it can decay over time, or suffer from interference.
> We can encode knowledge in the LTM and strengthen our ability to recall it by rehearsing or refreshing it.
> An example of this is retrieval practice.
> Knowledge can be stored in the LTM in the form of schemas: we can think of these as interconnected webs of knowledge, stored securely, in a 'chunk'.
> We could also think of a schema as a pattern of thought that organises categories of information, and the links between them.
> If stored in 'schemas', we recall this knowledge into our WM and use it to aid our thinking.

### Working memory

> Our WM is the ability to hold in mind and manipulate a limited amount of information over short periods of time. We use it to process information and think.
> Information in the WM is typically lost after 30 secs.
> Capacity: a typical adult can only hold up to 4 'chunks' of information in the WM at any one time unless they are refreshed by rehearsal.
> The WM deals with each schema as a single element of information so the load on the working memory is reduced because even complex schema can be dealt with as a single element.
> As well as limits with capacity and time, information can be lost in the WM due to distraction or interference.
> WM is even more limited in children and capacity develops across childhood.

*Working Memory: A Practical Guide for Teachers, CAER (2022)*

## How does working memory relate to cognitive overload?

> The limit of the working memory means that it can quickly become overloaded when dealing with a new task. Any task that exceeds the limit of the working memory will result in cognitive overload and this increases the possibility that the content may be misunderstood and not effectively encoded in the long-term memory.

> We can structure complex tasks so that working memories are not overloaded by limiting the amount of new information pupils need to process.

> Approaches to managing cognitive overload include evaluating the working memory demands of tasks, using short-loop generative learning tasks, planning sequences of lessons so that any background knowledge is covered in advance; revisiting taught ideas; using worked examples or partially worked examples to model steps of a process; breaking down tasks into steps; avoiding split attention and helping pupils to commit important and frequently used pieces of information to memory. (CAER, 2022)

## How do we build memory in our pupils? How do we do it really well?

> Take every opportunity to build pupil schemas by making links between knowledge explicit.

> Provide opportunities for pupils to rehearse and refresh knowledge.

> Provide opportunities for pupils to retrieve knowledge they previously learnt (low stakes testing).

> Encourage pupils to elaborate on what they have learnt. Elaborative interrogation involves prompting pupils to generate an explanation for an idea that they have learnt.

> Revisiting knowledge after a gap to help pupils retain it in their long-term memory (spaced review).

> Interleaving content and revisiting it.

> Self-explanation: explaining how new information is related to known information, or explaining steps taken in a process.

> Using knowledge organisers and making explicit links between sections.

> Various iterations of independent practice can encode knowledge in the LTM: aim for an 80% success rate.

## How it could look in a classroom - a teaching tip (knowledge organisers):

> Purpose: to strengthen recall and develop pupil schemas.

> Design KOs to be quizzable by thinking carefully about their format.

> Actively teach the different sections and build pupil schemas: make links between sections explicit so knowledge does not appear fragmented.

> Ensure that pupils rehearse the information by reading it, covering it up and citing from memory. Students should not look at the information.

> Engage pupils in rehearsal by using the KO as a quiz by testing on certain sections.

## Questions we should ask ourselves about memory:

> What have pupils previously been taught that relates to what I want them to learn today? What relevant knowledge can I encourage them to retrieve?

> What type of retrieval would work best with what I am trying to get pupils to remember at this stage?

> What is it pupils need to remember specifically? Can I break it down into manageable chunks?

> Am I using strategies that pupils are used to across the whole school in order to support their learning?

> Have pupils practised independently using knowledge enough? Can they use it in multiple contexts?

**Useful wider reading:**


> Educational Endowment Foundation. (2018). Improving Secondary Science. EEF: London.
> Improving Secondary Science Guidance Report, EEF
> Roediger, H., Brown, P. and McDaniel, M. (2014) Make it Stick: The Science of Successful Learning.
> Unleash the Science of Learning – Retrieval Practice
> CAER-Working-Memory-Guidance.pdf

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