



## Learning and memory

For learning to take place, information needs to be stored in our memory. But how? And what do we mean by memory?

Two key memory processes involved in learning are working memory and long-term memory. **Working memory** is used for holding information in our mind while we process it; it's our mental 'notepad'. Working memory can be thought of as the **gateway to learning**.

Information needs to be processed in the working memory gateway to be successfully transferred to **long term memory**. This is where it becomes stored as knowledge. Knowledge is a resource that we bring back in to working memory to help us make sense of new information. But, like all gateways, working memory has its limitations!

Working memory is **limited in capacity**, which has important implications for learning and teaching. If too much information is presented at once, or information is coming in from multiple streams at the same time, students can experience cognitive 'overload'. Once working memory gets overwhelmed, the incoming information is lost and needs to be heard or read again to be processed and remembered.

It's important to consider how **individual differences** impact learning and memory. The parts of the brain involved in learning are the same for everybody. However, variation in the **speed and capacity** of cognitive processes affects *how* learning happens across individuals. Working memory is impacted by:

- **Natural variation:** Working memory capacity varies across individuals, so learners may differ in how much information they can take in and process at a time.
- **Age and/or developmental stage:** Working memory develops over time, maturing by about 15 years of age. This means that learners at different developmental stages may require different amounts of time, scaffolding, and repetition when learning new concepts.
- **Having a neurodevelopmental disorder:** Individuals with Attention-Deficit Hyperactivity Disorder (ADHD) and Developmental Language Disorder (DLD) may have more limited working memory capacity than the general population.

### Everyday tasks that are impacted by working memory difficulties include:

- processing instructions delivered verbally, especially when they include multiple steps
- reading skills: not only the development of comprehension and fluency, but also learning how to decode text
- anything that involves holding information in mind while trying to do something with it, particularly without strong background knowledge and strategies to draw on (e.g., mental maths)
- learning new vocabulary

In the **Accessible Assessment Project**, we increased the accessibility of assessment task sheets by reducing extraneous cognitive load. We did this by providing concrete instructions in accessible language, definitions of key terms, and steps for completion that were described in sequence. We removed distracting images and irrelevant information from the task sheets. By reducing unnecessary cognitive load in task sheet design, these changes made best use of students' working memory capacity, allowing them to focus on important information. This helped improve their comprehension of the task, leading to improved achievement outcomes for both students with language and/or attention difficulties and students without these difficulties.



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