

# How Pupils Learn

The following 'Learn that' statements have been addressed through taught sessions, both in Whole School Issues and in Maths. The 'taught sessions' referred to below are maths specific sessions.

## Learn that....

1. Learning involves a lasting change in pupils' capabilities or understanding.
2. Prior knowledge plays an important role in how pupils learn; committing some key facts to their long-term memory is likely to help pupils learn more complex ideas.
3. An important factor in learning is memory, which can be thought of as comprising two elements: working memory and long-term memory.
4. Working memory is where information that is being actively processed is held, but its capacity is limited and can be overloaded.
5. Long-term memory can be considered as a store of knowledge that changes as pupils learn by integrating new ideas with existing knowledge.
6. Where prior knowledge is weak, pupils are more likely to develop misconceptions, particularly if new ideas are introduced too quickly.
7. Regular purposeful practice of what has previously been taught can help consolidate material and help pupils remember what they have learned.
8. Requiring pupils to retrieve information from memory, and spacing practice so that pupils revisit ideas after a gap are also likely to strengthen recall.
9. Worked examples that take pupils through each step of a new process are also likely to support pupils to learn.

## Corresponding Taught Sessions

Theories of Learning  
Introduction to Teaching for Mastery  
Mathematical Coherence  
Developing Mathematical Fluency  
Effective lesson planning

## Learn How To....

Avoid overloading working memory, by:

- Receiving clear, consistent and effective mentoring in how to take into account pupils' prior knowledge when planning how much new information to introduce.

- Discussing and analysing with expert colleagues how to reduce distractions that take attention away from what is being taught (e.g. keeping the complexity of a task to a minimum, so that attention is focused on the content).

And - following expert input - by taking opportunities to practise, receive feedback and improve at:

- Breaking complex material into smaller steps (e.g. using partially completed examples to focus pupils on the specific steps).

Build on pupils' prior knowledge, by:

- Discussing and analysing with expert colleagues how to sequence lessons so that pupils secure foundational knowledge before encountering more complex content.
- Discussing and analysing with expert colleagues how to identify possible misconceptions and plan how to prevent these forming.

And - following expert input - by taking opportunities to practise, receive feedback and improve at:

- Encouraging pupils to share emerging understanding and points of confusion so that misconceptions can be addressed.
- Linking what pupils already know to what is being taught (e.g. explaining how new content builds on what is already known).

Increase likelihood of material being retained, by:

- Observing how expert colleagues plan regular review and practice of key ideas and concepts over time (e.g. through carefully planned use of structured talk activities) and deconstructing this approach.
- Discussing and analysing with expert colleagues how to design practice, generation and retrieval tasks that provide just enough support so that pupils experience a high success rate when attempting challenging work.

And - following expert input - by taking opportunities to practise, receive feedback and improve at:

- Balancing exposition, repetition, practice and retrieval of critical knowledge and skills.
- Increasing challenge with practice and retrieval as knowledge becomes more secure (e.g. by removing scaffolding, lengthening spacing or introducing interacting elements).

## Mentor Meeting Activity

Pre reading:

Hattie, J. (2012) Visible Learning for Teachers. Oxford: Routledge.

Get trainees to complete a Maths problem for a topic they are about to teach but leave a line between their steps of working. Then with the trainee go back over this and see if together you can fill in the missing lines with extra lines of working. This is helpful because then the trainee can start to appreciate all small steps required to solving a problem which as experts

they do automatically but students can't do automatically because they don't have the working memory capacity.

Use of a revision ready model ([Cornell notes](#)) to break down AO3 questions. This will have a literacy element and summary element to support the main body of work . Allows for lots of reflection on how complex a seemingly simple problem can be and allows for scaffolding for presentation. Also hits Literacy elements.

[Lasts](#) - Giving structure to retrieval practice, last lesson, last week, last topic, last year.

### Follow up Activity

Once the trainee has identified all the steps needed in answering their example question they could then add to their lesson plan all the questions they could ask in order to pull out the next steps from the pupils.

To complete their own series of Cornell notes to prepare them and focus for a lesson.

Have them undergo diagnostics with their classes so that they can build on prior learning. Also they can identify early misconceptions and address them.