

Approaches to revision based on evidence from cognitive science

Mrs Lockett

“If nothing has altered in the long term memory then nothing has been learned” Sweller



Working memory

- Working memory is the memory system where small amounts of information are stored for a very short duration (Peterson & Peterson 1959)
- Clark, Kirschner and Sweller call it ‘the limited mental “space” in which we think’ (2012, p. 8).
- Research suggests that an average person can only hold about four chunks of information in their working memory at one time (Cowan 2001),

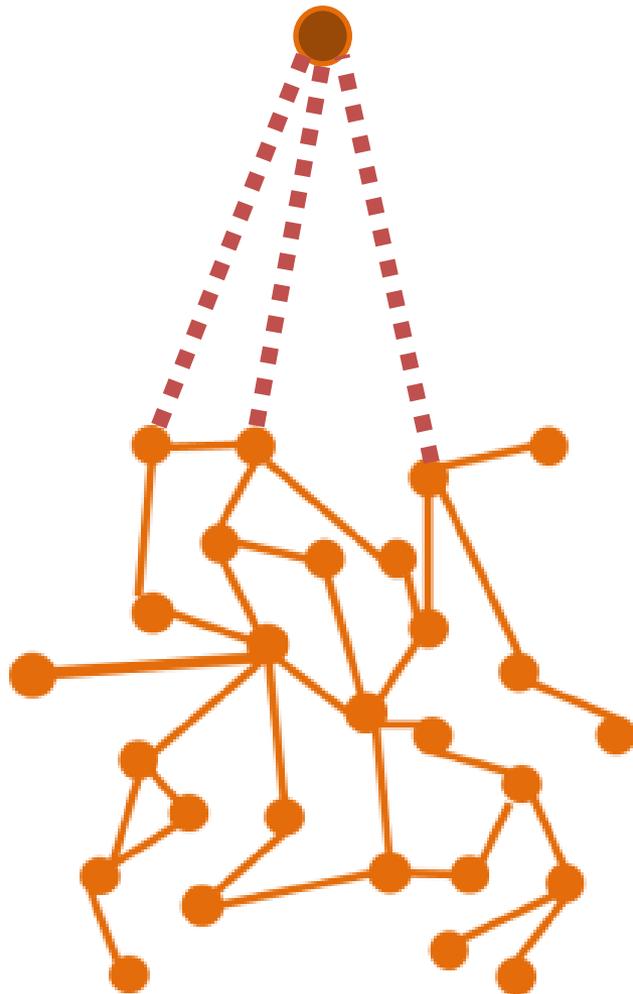
Long term memory

- Long-term memory is the memory system where large amounts of information are stored semi-permanently (Atkinson & Shiffrin 1968; Tulving 1972).
- Clark, Kirschner and Sweller call long-term memory ‘that big mental warehouse of things (be they words, people, grand philosophical ideas, or skateboard tricks) we know’ (2012, p. 8).

Novice v's Expert learners

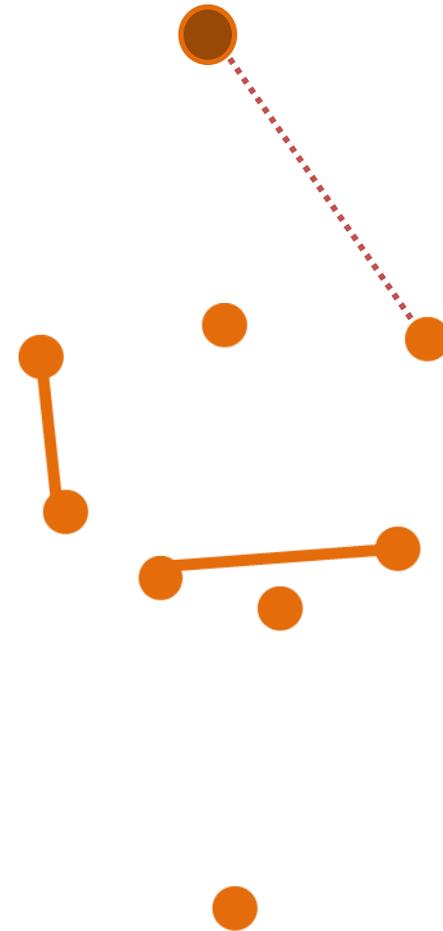
- There are fundamental differences in the way that novices and experts think
- All students are novices
- Experts refer to complex schema in the LTM
- Novices do not have extensive schema so all learning is more difficult

Learner with well-developed schema



New knowledge

Learner with poorly developed schema



Schema

- The limitations of working memory can be overcome by schema construction and automation.
- For example, try to remember the following combination of letters: y-m-r-e-o-m.
- In this case each letter constitutes one item, so you are being required to remember six items at once.
- Now try to remember the following combination of letters: m-e-m-o-r-y.
- In this case you are still required to remember the very same six items. However, because you have a schema in your long-term memory for the word 'memory', you are able to chunk the letters into just one item. Now your working memory is freed up to remember other items.

‘Memory is the residue of thought’

- Unless we think we don’t learn
- If students choose to revise in ways that don’t make the brain work hard then the learning gains are limited
- Popular learning strategies yield poor results:

Rereading notes/ copying from a book/ highlighting = largely pointless activities

Answering questions (in a low stakes way) – makes students think

Robert Bjork

'Desirable difficulties'

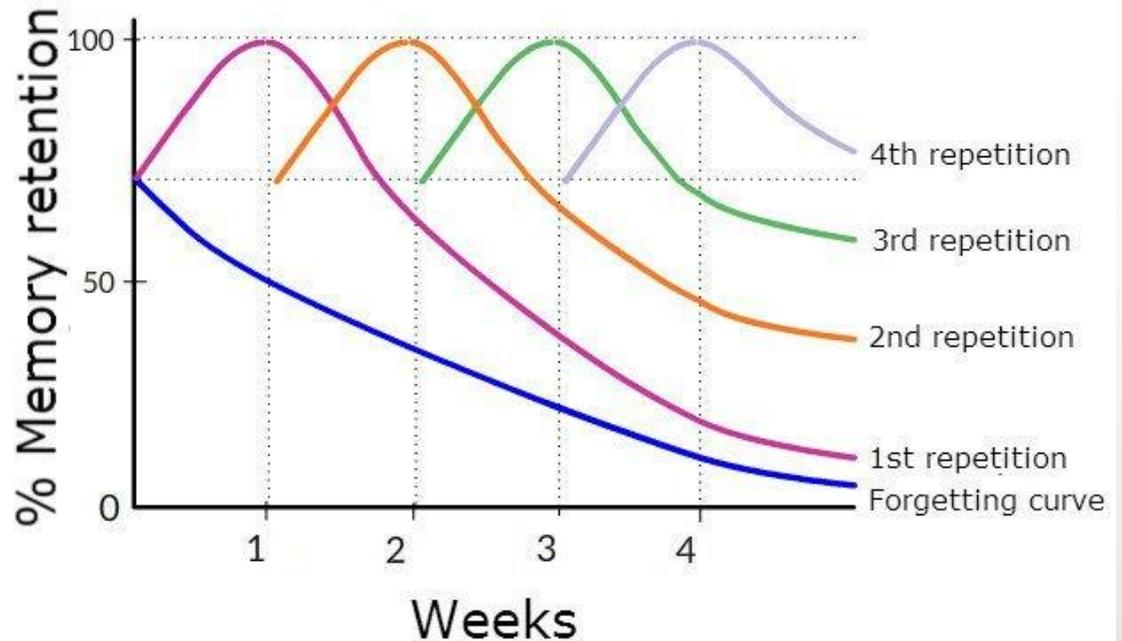
- Retrieval practice
- Practice testing
- Spaced practice
- Interleaving

Ebbinghaus Forgetting Curve



Forgetting curve for newly learned information

Spacing effect



Make it stick – the science of successful learning...

“When you read a text or study lecture notes, pause periodically to ask yourself questions like these, without looking in the text:

What are the key ideas?

What terms or ideas are new to me?

How would I define them?

How do the ideas relate to what I already know?...

Generating questions for yourself and writing down the answers is also a good way to study...When you quiz yourself, check your answers to make sure that your judgements of what you know and don't know are accurate” (202).

Self-quizzing...

1. Read over notes- cover up the notes- try to write down as much as you can remember – self assess
2. Read back over notes- use the notes to write questions- answer the questions- self assess

Track your scores...

- Aim for 80% accuracy on every quiz
- If you get below that, do it again
- Resist the temptation to look back at notes when you get stuck on a question – you are only cheating yourself...

Spaced practice...

- When retrieval is difficult, it reinforces the work, shifting it from short-term recall to long-term learning.
- It is therefore highly ineffective to cram the night before a an exam.
- You need to repeat retrieval over a long period of time

Spaced practice...

- Once you have revised a topic and you are able to remember lots of information, move on to another one
- A few weeks later cycle back around and start the whole process again

Retrieval Practice



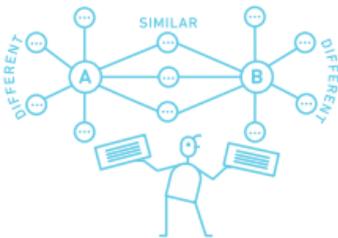
- Test yourself on the material that you need to learn.
- Testing yourself will feel difficult and slow at first but it is the **best** way to memorise.
- Put your books away and then write down as much as you can remember.
- You can also recall or explain things out loud to yourself (active recall)
- Create quiz questions to test yourself.
- Make flashcards with questions and prompts.
- Use past paper exam questions.
- Once you know what you don't know – focus on learning these details.

Spaced Practice



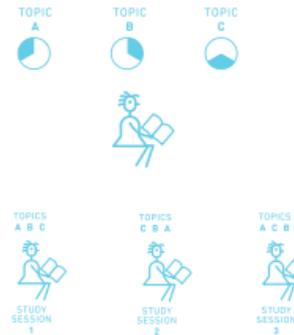
- Review the information that you need to learn regularly.
- Try to review new information you have studied once within 24 hours, then again after a week, then again after a month.
- Spreading your revision like this will mean you learn more in less time and will also mean you learn more quickly in lesson time during the year.
- Short regular revision sessions will also help to keep you calm during the exam periods.

Elaboration



- Ask yourself questions while you are studying about how things work and why.
- Make connections between different ideas to explain how they work together.
- Think of two ideas (or characters) and think of ways they are similar and different.
- Describe how the things that you are studying apply to your own experiences and memories.

Interleaving



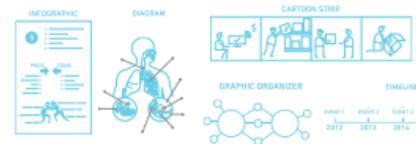
- Switch between ideas during a study session. Don't study one idea for too long.
- Go back over the ideas again in different orders to strengthen your understanding.
- Make links between different ideas as you switch between them.
- Don't switch too often! You need to make sure that you fully understand the ideas before moving on.
- Interleaving will feel harder than studying one topic for a long time. Don't give up – it will be more effective!

Concrete Examples



- Collect examples of exam questions and high quality responses from class, revision guides or websites such as Mr Bruff.com.
- Make links between what you need to learn and the examples that you have collected.
- Identify the qualities that you can emulate in your own responses.

Dual Coding



- Take information that you are trying to learn and draw visuals to go along with it.
- Try to come up with different ways to represent the information visually.

Leitner System

- The Leitner System is a more efficient way of using flashcards to revise
- It is a simple method that uses the principle of spaced practice/ repetition at increasing intervals
- The method involves sorting flashcards into categories depending on how confident you feel

Method...

- Create flashcards for a topic: questions on the front – answers on the back
- Sort the cards into 3 boxes, labelled A-C:
 - a) Cards/ questions that you find challenging or particularly difficult to remember the answers**
 - b) Cards/ questions that you are a little more confident about**
 - c) Cards/ questions that you are very confident about**

Method...

- a) Test yourself on answering questions on cards in box A every day**
- b) Test yourself on answering questions on cards in box B once every 3 days**
- c) Test yourself on answering questions on cards in box C once every 5 days**

Move the cards...

- Every day, quiz yourself on your box A cards – if you get the answer right, move the card up to box B
- Every 3 days quiz yourself on your cards in box B – if you get an answer correct, move it up to box C; if you get it wrong, move it down to box A
- Every 5 days quiz yourself on your cards in box C- if you get a question wrong, move it down to box B

Retirement Box...

- Once you have cards in box C that have been in there a long time and you always get the answers correct, retire those cards to a separate box.
- And give yourself a reward 😊

Benefits...

- You can focus on revising the content that you find the most challenging more often
- You can feel a sense of achievement as you move cards through the system
- You can interleave revision by putting lots of cards for different topics/ subjects in the boxes; you are dividing up your revision by learning – not subject.
- You can increase the complexity of the system if you want to.