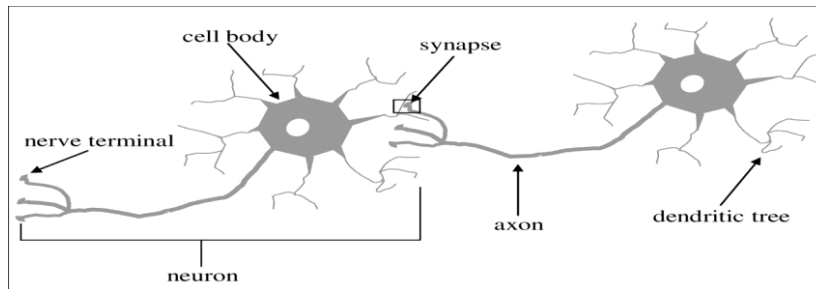


The Science of Learning

Your brain is amazing! Not only does it monitor and regulate essential life processes such as breathing, allow us to coordinate our complex body systems and feel emotions, it is also responsible for learning, analysing, storing and retrieving information.

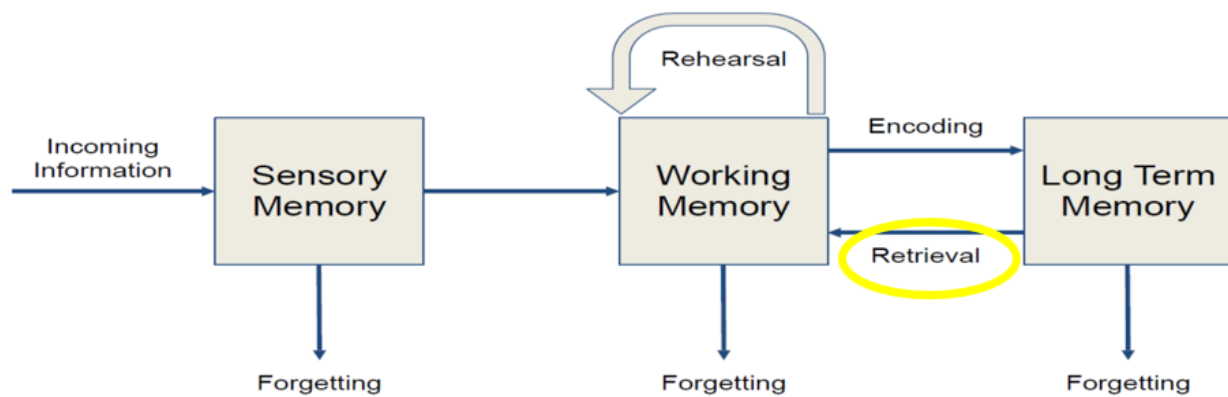
Did you know?

Your brain is about 60% fat! The other 40% is a combination of water, protein, carbohydrates and salts. It contains blood vessels and nerves, which are made of neurones. The nervous system is the bodies information transport system. It carries electrical impulses from neurone to neurone across gaps called synapses.

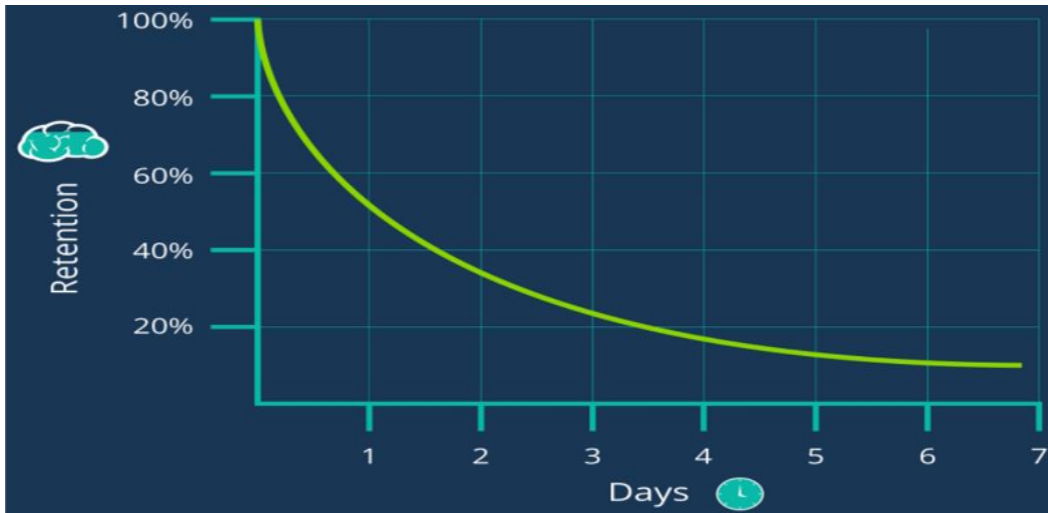


How do we actually learn?

When we first learn something new, it is stored in our working memory for 10-30 seconds. We then transfer it to our long-term memory by using and applying it, this is called encoding. We take it out of our long-term memory by retrieving it.

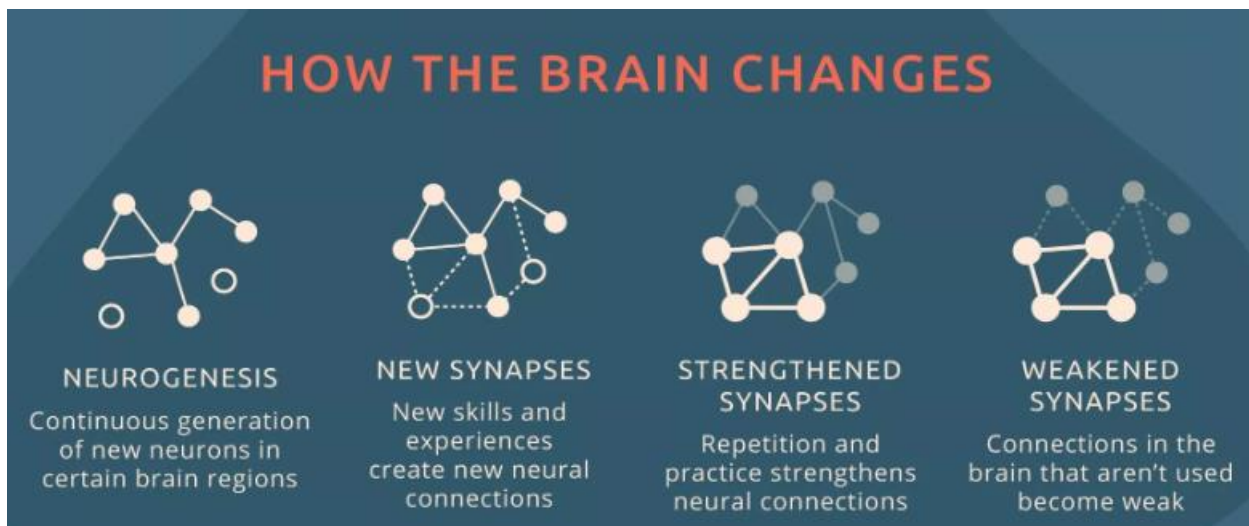


The only problem is that... over time we forget and this is not helpful.



What can we do to remember? (How to revise)

We know that the brain is able to change, this is called neuroplasticity and we know that practice makes perfect. Why? Because it strengthens the connections between neurones.



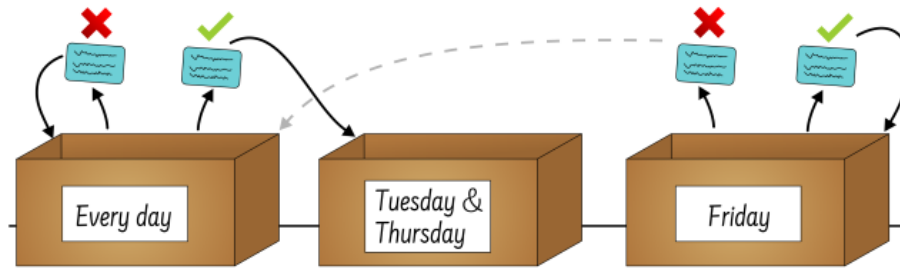
One of the most important things to have to be a high-performance learner is a growth mindset. Mistakes are an opportunity to learn and we can ALL get better. Just because you can't do something now doesn't mean you'll never do it, just that you can't do it YET. Believe in yourself and your amazing brain! It just needs a chance to strengthen those connections.

1. Summarise making notes

When we are learning it is helpful to summarise.

- 😞 Copying long chunks of text is not helpful
- 😊 Pick the most important parts and put it in your own words
- 😊 Add diagrams, pictures or make infographics, this is called **dual coding** (two separate but linked memory ideas are created, which helps us remember)
- 😊 Download a Cornell notes template and use it to find key points and questions
- 😞 Flashcards with information on both sides are not helpful
- 😊 Flashcards with a question or key word on one side and information on the other can help you test yourself and retrieve information.
- 😊 Use the Leitner system. Make space for 3 piles of flashcards. Start with all flashcards in pile one. Test yourself, if you get it right, put the flashcard in the pile 2, if you don't leave it in pile

one. Every time you test yourself and get it right, put the card in the next pile. Every time you get it wrong, put it down a pile. Go back to the cards in the lower piles more often than those in the higher piles you got right.



- 2. Retrieval practice** is when we see what we can remember without help. It is a way to practice using information so that we strengthen those neural connections. It is a skill we need, not just for assessments and exams, but to build on what we learn and strengthen our memories. There is lots of evidence to show that it is VERY effective.

How? Any kind of revision where you have to actively remember information;

- Drawing pictures as summaries (also uses dual coding)
- Re-writing notes from memory
- Using questions on flash cards (Leitner system and apps like Anki can help)
- Quizzes (online or in books)
- Websites such as www.senecalearning.com
- Making mind-maps

3. **Fill the gaps**

Most importantly, retrieval should find out what you know and what you don't and then we can **fill the gaps**. You can use KAOs, revision guides and websites like <https://www.bbc.co.uk/bitesize> to help.

4. **Apply**

Once the knowledge is there, we can **apply** it to exam and assessment questions.

5. **Review**

Finally, we can **review** how we did and go through the process again, because we rarely remember things that we only visit once or twice. This is our revision cycle.

When do I revise?

To keep memories we have to practice retrieving them at spaced intervals. That means leaving gaps between revision sessions. You should create a revision timetable to use time effectively.



To create a revision timetable:

1. List all of your subjects.
2. RAG rate them to show how difficult you find them. (Red = difficult, green = easy)
3. Download a template or draw a grid to show your week, hour by hour.
4. Shade in in any after school activities, time for tea, clubs or times when you cannot revise.
5. Think about how long you can concentrate for and make this how long you revise.
6. Fill in the blocks with your list of subjects.
7. Break your subjects down, when you study, what topic/paper/text/skill will you look at?
8. DON'T fill all the time, you need to have breaks, sleep and relax as well.
9. DO be ambitious.
10. Make your revision space. It should be as quiet and distraction free as possible. There are study times available at school.

Exam/Assessment Technique

- Before exams
 - REVISE
 - REST, memories are consolidated whilst we sleep
 - PREPARE, make sure you have all of your equipment and that you know what is being examined, how to answer, where and when the assessment is and how long it lasts.
 - ARRIVE on time
- During exams
 - RTQ. Read the question carefully. Most marks are lost when people don't do this.
 - Highlight or underline keywords.

- Circle the command word so you know what type of question it is.

	Test 1	Test 2	Test 3	Test 4
Mass of solid in grams	0.12	0.13	0.14	0.15

Calculate the mean mass of solid.

Do not include the anomalous result in your calculation.

Give your answer to 2 significant figures.

Mean mass = _____ g

(3)

- If you are stuck, don't panic, take a deep breath and then READ, RETRIEVE, RESPOND. READ: look at your highlighted/underlined words again. RETRIEVE: think about what you remember about those words. RESPOND: write the answer.

Revision Cycle

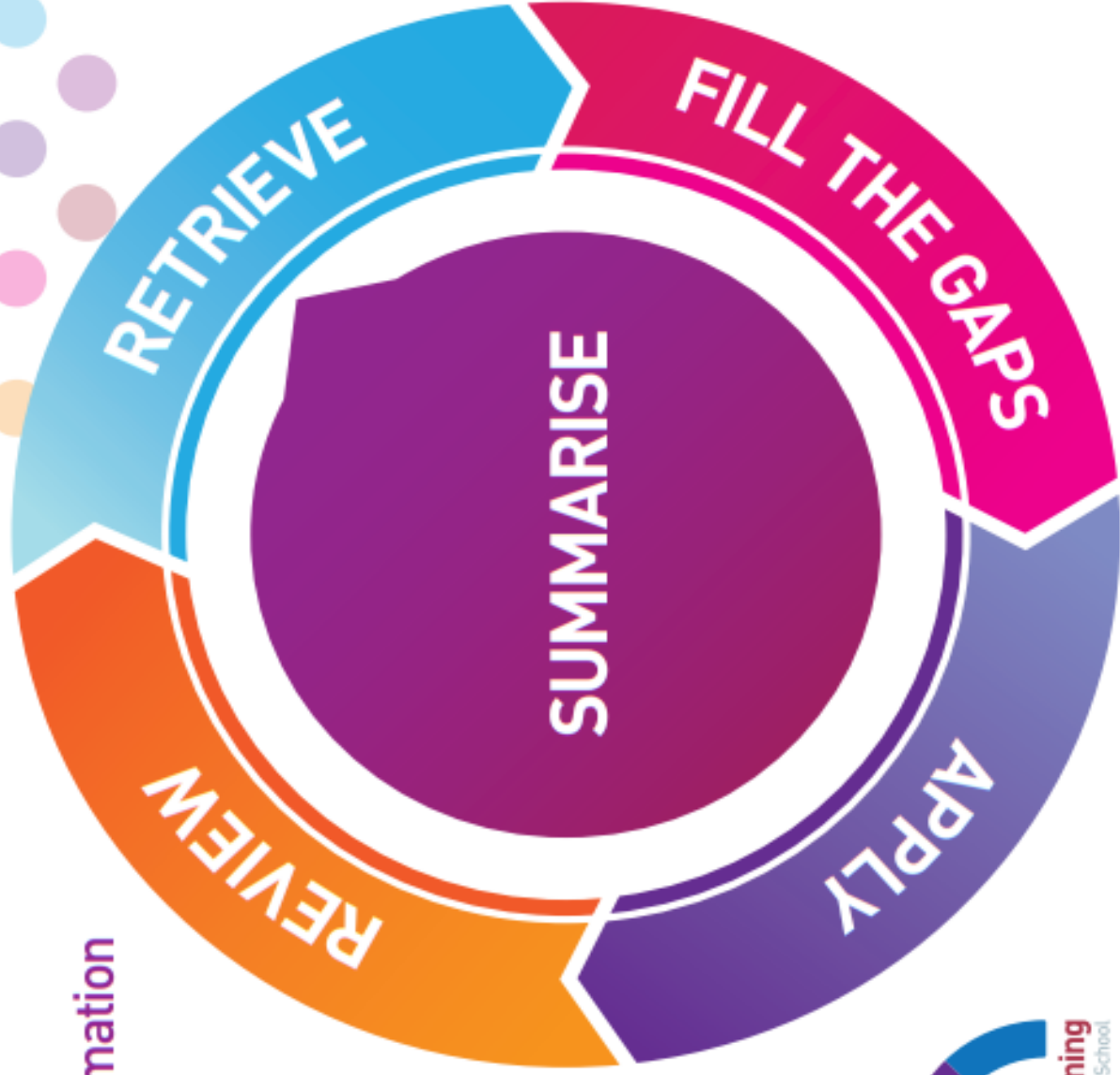
1. **SUMMARISE:** shorten information

2. **RETRIEVE:** find out what you know

3. **FILL THE GAPS:** look at what you don't remember

4. **APPLY:** practice using the information

5. **REVIEW:** reflect on how you have done and repeat



How can we become better at learning?

By using retrieval practice (reviewing what we know and what we don't know), filling the gaps in our knowledge, applying our knowledge and reviewing our progress. This is our revision cycle.

Another way to improve learning is to think about thinking, this is called **metacognition**. There is lots of evidence to suggest that this is very effective.

Good questions to ask before a task (plan)

- What are the goals?
- What knowledge is needed?
- Can the task be broken into smaller parts?
- What strategies can be used to finish the task?
- How much time will each part take?

Good questions to ask during a task (do)

- How is it going?
- What is easy and what is difficult?
- Could there be a better way to deal with the task?

Good questions to ask after a task (review)

- How did it go?
- What were the problems and why?
- What were the easiest parts and why?
- How could it be improved for the future?

