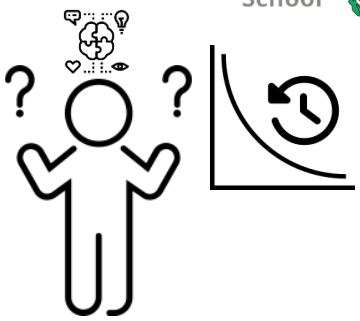
Research-informed Practice.
March 2021 Edition.

Ysgol Tregŵyr Gowerton School



A summary of Ebbinghaus' 'Forgetting Curve' and strategies to combat it.

Introduction

In 1885 Herman Ebbinghaus (2013) theorised that there was a direct correlation between memory and time. In short, Ebbinghaus suggested that 'forgetting' initially occurs rapidly and then, as time passes, forgetting begins to slow down. However, this means that any new concept learnt is swiftly forgotten if not returned to.

As educators, this makes sense to us. If we were to sit down and learn the process of blood flow through the heart, and immediately be tested on our ability to recall this, we are likely to get a fair chunk of the sequence correct. However, if we were to be tested again in a few days, a week even, it is likely a lot of the process and sequence will have been lost. This applies to all new learning. Initially, we create this 'illusion of learning' in our classrooms but knowledge must be made sticky to become fluent.

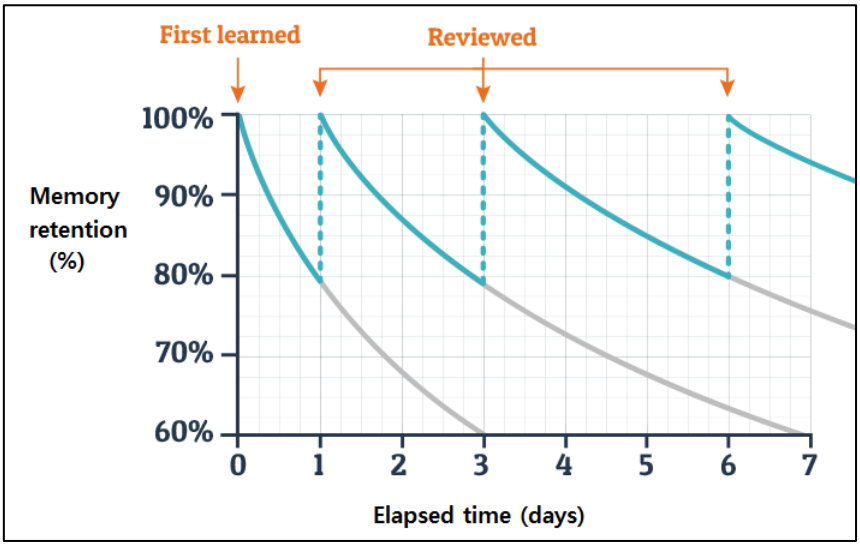
Glossary

Retrieval **fluency** is the ease with which information can be retrieved from memory.

Sticky knowledge is effectively knowledge that will stay with us forever. It is in our long-term memory.

This concept has been around for many years now and, as a result, terms such as 'spaced repetition,' 'retrieval practice' and 'distributed practice' have been established. These terms, in essence, refer to the repetition or rehearsal of information soon after it is initially learned. For the purpose of this summary, I will continue with the term 'retrieval practice.'

In order to improve memory and retention of information, opportunities to rehearse or recall learning through retrieval practice is essential. As the information/concept is retrieved, and thereby relearned, it becomes more resistant to decay and the rate of forgetting slows. *See the graph below.*



As you can see, at the point that the information is first taught/learnt, our memory retention is at 100%.

However, after only three days the rate of retention becomes 60% - almost half of the information is lost. Yet, if

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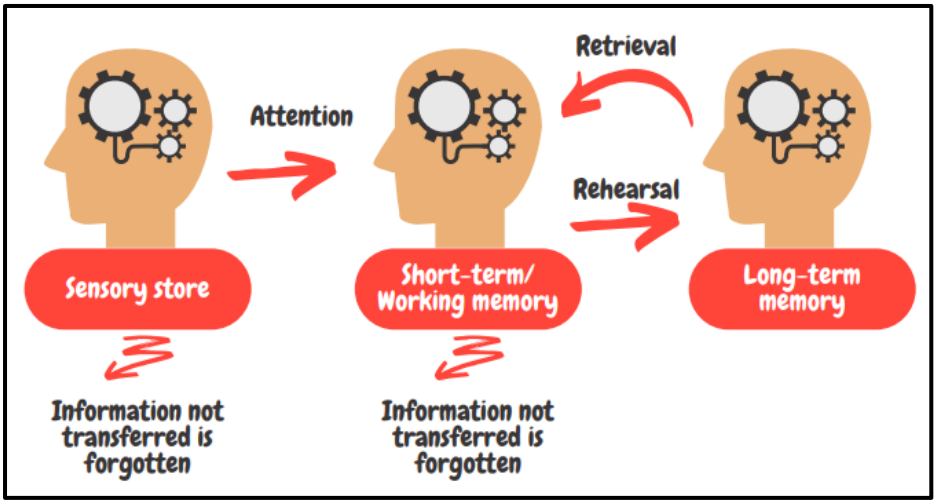
returned to via retrieval practice, this 'forgetting curve' can be slowed with more frequent repetition creating less loss of learning.

Admittedly, the notion of our pupils being able to return to this learning after one day, then three, then six is perhaps idealistic; especially for subjects that see pupils less frequently. However, there *are* ways that we can apply this concept to our classrooms in a practical way that will help to tackle the forgetting curve and increase fluency. Ideas on how to apply this to classroom will follow, however, it now seems pertinent to explore the concept of memory and why this forgetting curve occurs.

What is memory and how does retrieval work?

One way that we can explain the importance of retrieval practice is by exploring memory.



Atkinson and Shiffrin (1968) theorised that memory consisted of three stores:

1. Sensory store – where new information is encoded. This is where learning begins. We pay attention to this new information and it is then transferred to the second stage.

2. Short-term memory (sometimes referred to as the 'working memory') – new information is stored for a very brief amount of time in our short-term memory. The capacity of our short-term memory is limited which means that information is lost (this is, in simple terms, what contributes to the forgetting curve). Therefore, if we do nothing with this new material, learning will be lost and not transferred to the third stage.

3. Long-term memory – If new information is rehearsed it then becomes encoded in our long-term memory. This means information has become stickier and we are better able to recall information and learning. At this point, the information is much more embedded in our brain and we can connect our learning to new concepts.

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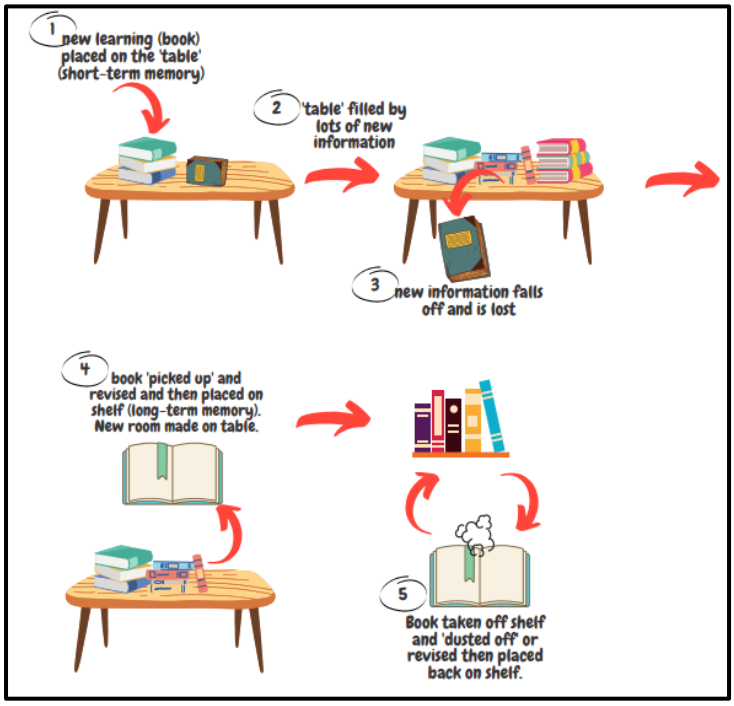
However, it is not enough to simply rehearse (or revisit) the information as the teacher. *Pupils* must be given the opportunity to retrieve this information to fully embed this knowledge in their long-term memory. Here, we can refer to working memory.

Working memory is where the information is brought back into the conscious part of our brain and either recalled or applied in further learning. By retrieving (and using our working memory), information will become stickier, pupils will be able to recall/retrieve it more easily and, thereby, be more 'fluent' in their understanding and application of concepts.

How can we approach this with pupils?

As educators we all understand the importance of revision. Yet, despite our best effort, pupils will often not heed our warnings to revise and will end up 'cramming' before tests or assessments. But (as established above) cramming does not work as our short-term memory cannot hold information for long. One way we can attempt to change this is by being explicit in the WHY of the learning - the WHY of revision.

Using an analogy to explain the concept of memory can be useful here and it is something I have used with my classes. It is as follows:



Imagine your brain as a table. This table is your working memory. Each time you learn something new in each subject throughout the day, a new book is placed on that table. Eventually, the table will become full. At this point, books begin to fall off the table and they are lost.

However, if you decide to pick up one of these books off the table, to revise the learning, then that book is picked up and placed on your shelf (the long-term memory). This book can then be returned to at a later date and you now have space on your table for new books.

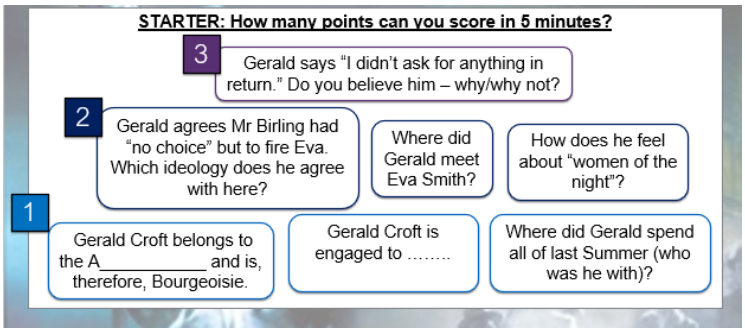
You have to make sure the books on the shelf don't get dusty and, to do this, you can pick it up every now and again and revise this book. The information inside will slowly become easier and easier to remember and will become less dusty overtime.

Ultimately, we all know our classes and what works for them. The above analogy may not work for your classes but it is something I have used with exam classes and this has helped them to understand why revision is important in a way that is fairly simple.

However, it is also useful to explain why we use retrieval practice in lessons (not just for revision); especially if an entire lesson is dedicated to retrieval. Ultimately, helping pupils to understand their own metacognition can be a very effective tool in a teacher's arsenal.

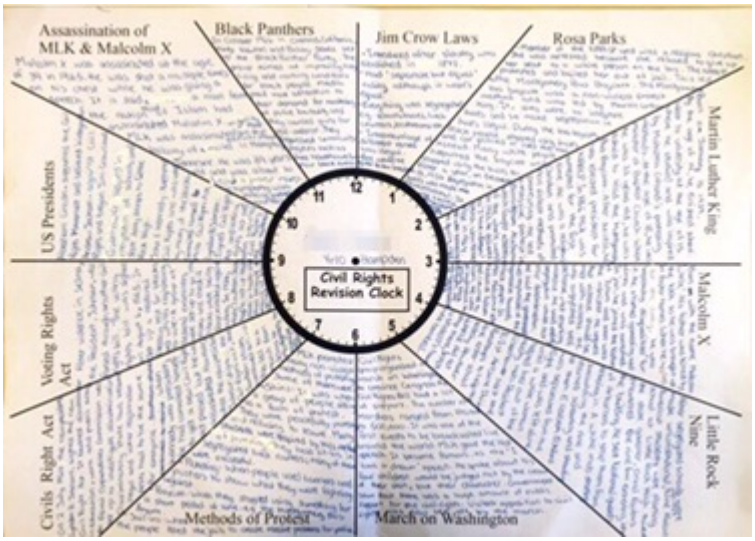
Resources or strategies for retrieval

Retrieval pyramid



Retrieval pyramids can be a useful tool to access prior knowledge. They are also very versatile and can be used as a starter, mini plenary or plenary. More or less tiers can be added depending on the time you would like to dedicate to the task.

The bottom tier could test most recent learning, with the final tier testing most dated learning. Or, the bottom tier could require the least effort to answer (simple recall) whereas the final tier could require higher order thinking (*applying* learnt information). Pupils then attempt to see how many points they can score in a given amount of time. They could be instructed that they have to attempt something from the bottom two tiers to get to the third, or they could be instructed to work through boxes randomly. Ultimately, you can adapt the structure to fit *your* purpose and intentions.



Revision clock -

https://lovetoteach87.com/2017/02/18/revision-strategies-that-work-for-me-and-my-pupils/

A revision clock is also another useful tool when it comes to retrieval and a whole lesson could be dedicated to it (or it could be set as homework). The main topic goes in the clock face and each five-minute segment is dedicated to a subtopic.

Pupils then spend five minutes per segment filling in everything they recall about that topic. This will allow pupils to see where their weaker areas of recall are, and they will be able to establish which sections they struggled with the most.

Once again, this structure can be adapted to your purpose and each segment could have a specific question that needs to be answered rather than being generalised. You can also chunk segments into longer stretches of time. Either way, it can be useful to have pupils colour-code the segments afterwards as a form of self-monitoring; red for tricky areas, amber for 'getting there' areas and green for confident areas. This would allow you and pupils to see a 'snapshot' of areas to return to.

Retrieval Grids/ Challenge Grids - https://lovetoteach87.com/2018/01/12/retrieval-practice-challenge-grids-for-the-classroom/

Retrieval grids or challenge grids are also effective and can be used to combine retrieval and spacing. Once again, this could be used as a starter or plenary (or even a homework task) with boxes being added or removed depending on how long you would like the task to last.

Each box in the grid should contain a question. The boxes could be colour-coded to indicate when the concept was first learned or they could be colour-coded and awarded points (linked to when the information was first learned, but this knowledge could be exclusive to the teacher). Pupils can lead their learning here by deciding which boxes to attempt. As always, tools like this are adaptable but this provides a useful opportunity for whole-class discussion. Equally, self-assessment or peer-assessment could be used to mark responses.

Flashcards/apps for Revision - https://www.youtube.com/watch?v=eVajQPuRmk8&t=255s

The video above explains Spaced Repetition Flashcards/Revision for pupils. The video briefly explains the forgetting curve (but is a tad complicated for KS3) and how to use flashcards to avoid this. Pupils could just be shown from 2.52 minutes onwards where the use of flashcards and study apps is explained.

Final things to bear in mind

Retrieval is a vital tool in embedding learning and maintaining pupil progress. However, we must also ensure that we explicitly discuss concepts with pupils to combat misconceptions when using retrieval strategies. So, if setting retrieval as homework, time should be made to 'check' the retrieval that has taken place so that any misconceptions can be tackled and any gaps in learning re-taught. This does not necessarily mean excessive and in-depth marking of the homework, but allowing time for verbal feedback in the classroom and calling on a range of learners to feedback can allow us the chance to make sure retrieval is effective and *accurate*.

Finally, breaking down learning into bite-sized chunks and using retrieval practice throughout a scheme of work enables learners to master a skill or concept before building upon it by making connections with new learning. The more we do this, the more connections learners make and the stronger their schema and memory becomes. Equally, the more we do this, the more we as educators can see the 'gaps in knowledge.' Therefore, given the sporadic nature of blending learning for some learners, retrieval practice is one tool we *can* use to identify the gaps that need to be 'filled.' Consequently, this allows us to hone and adapt our planning to best suit the needs of our learners during the 'recovery stage' of post-pandemic teaching.

References and Further reading:

Atkinson, R. C. and Shiffrin, R. M. (1968) 'Human memory: A proposed system and its control processes', in Spence, K. W. and Spence, J. T. (eds) *The psychology of learning and motivation*. New York, NY: Academic Press, pp. 89-195

Ebbinghaus H. (2013). Memory: a contribution to experimental psychology. *Annals of neurosciences*, *20*(4), 155–156. https://doi.org/10.5214/ans.0972.7531.200408

Useful Website - https://lovetoteach87.com/2020/09/09/a-collection-of-retrieval-practice-research-and-resources/

Kate Jones' website contains many examples of retrieval practice with further links to useful blogs, strategies and explanations. She is a Head of Department, award-winning educational speaker and author. Both of her books below are excellent starting points to retrieval:

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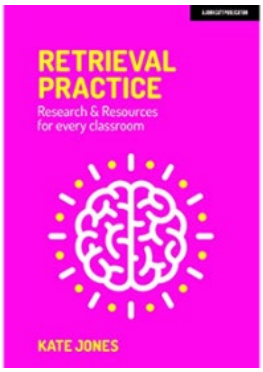

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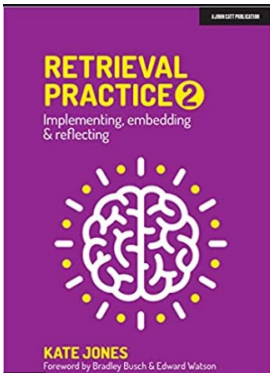

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