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Memory not memories – teaching for long term learning

oldprimarytimer 1 day ago

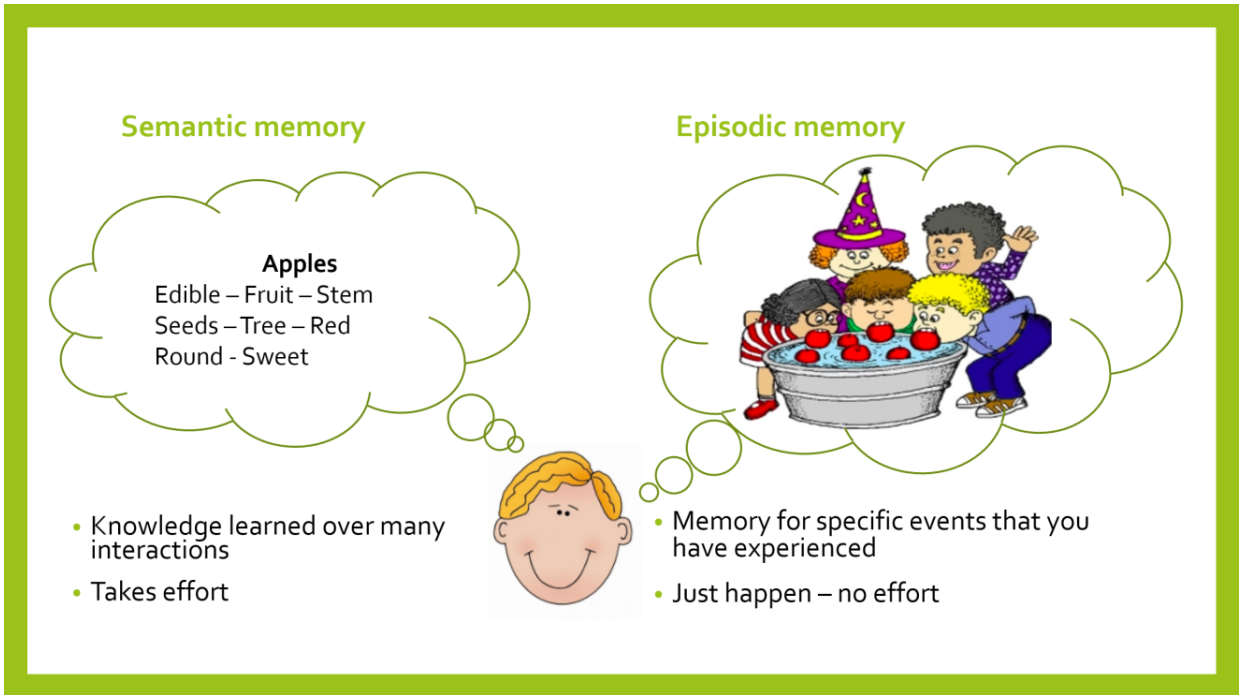
It seems like a life time ago but this time last week I should have been at ResearchEd, listening to great speakers and getting butterflies about my session later that day. Except that I slipped on the hardboard down on the kitchen floor courtesy of our kitchen refit and ended up in A&E instead. Luckily nothing is broken and my leg is slowly getting better. I'm so sorry I couldn't be there.

A few people asked if I could put my slides up. The problem was I had taken Oliver Caviglioli's work on dual coding very much to heart and knew that written text and spoken text delivered together can overwhelm the working memory whereas the brain deals much better with spoken text alongside images. My slides where therefore 99% word-free but image rich, the intention being that I would explain the slides verbally without recourse slides full of bullet points. What I was going to say was in my head rather than written down. The trouble being that without some sort of narration, the slides are hard to make sense of. So what follows is a a blog based on

what I would have said, though probably a bit longer than the 40 minute slot would have afforded. I've used many of Oliver's excellent graphics in my slides.

Does the best learning result from memorable experiences?

Children tend to easily remember exciting things such as plays and trips. This leads some teachers to suggest that the key to getting children to remember things is to make lessons full of exciting, memorable experiences. While not an unreasonable supposition, it is based on a misconception about how remembering works. The misconception arises because most teachers are unaware of the difference between semantic and episodic memory.

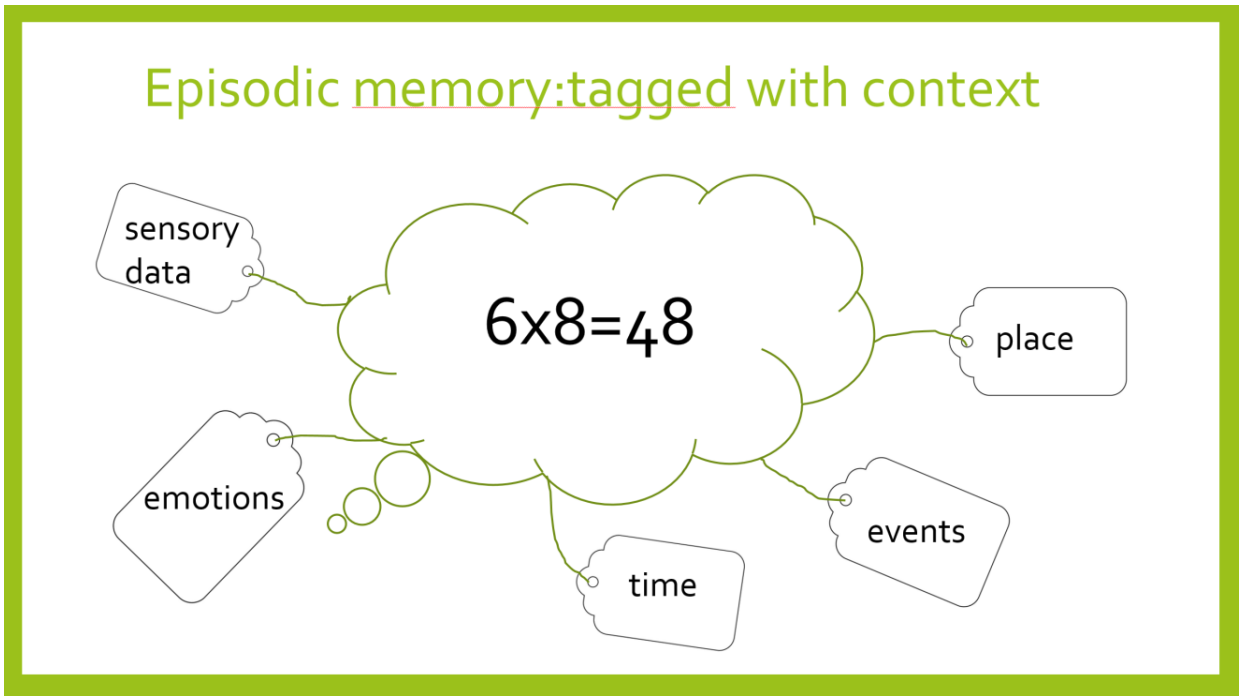


Episodic memory is where we store the 'episodes' of our life, the narrative of our days. This is the autobiographical part of our memory that remembers the times, places and emotions that occur during events and experiences. We don't have to work hard or particularly concentrate to acquire episodic memories, they just happen whether we like it or not. When we talk about having fond memories or an event being memorable, we are talking about episodic memory. We are talking about something that happened, something where details of time, place and how we felt at the time are central.

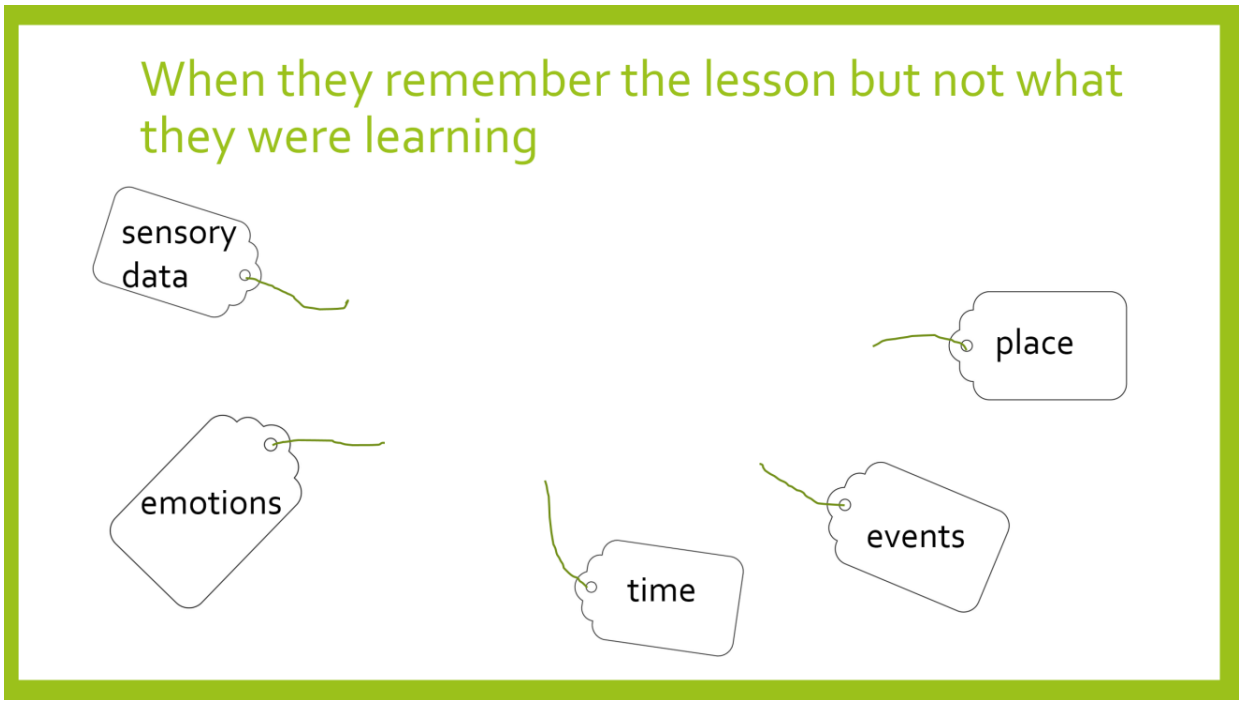
Semantic memory is where we store information, facts, concepts. These are stored 'context-free', that is, without the emotional and spatial/temporal context in which they were first acquired. These type of memories take effort, we have to work to make them happen. In fact, we don't tend to use the word 'memories' for this kind of stuff, we tend to use the word 'memorise'. After all, we don't say 'I have memories of the 7 x table' we say 'I have memorised the 7 x table.'

Episodic memory is, at first glance, the more 'human' of the two, the memory of people, feelings and places that makes us who we are. Semantic memory seems colder, more robotic. More Mr Spock than Dr McCoy. Yet it is our amazing ability to store culturally acquired learning in our semantic memory that makes as so successful as a species. The key purpose of education is to build strong semantic memory, to pass on the knowledge built up over centuries to the next generation; how to read and write, how stories work, how to use mathematical reasoning to solve problems, science with its amazing power to gives us to predict the future and the myriad of other concepts, ideas and practices. That is not to say that building semantic memory is the *only* purpose of education. We want to help form children who are emotionally literate and morally responsible too, and that will involve thinking about the *kind* of episodic memories we try and build for our children. If we treat our children with kindness and respect, they will have episodic memories of what it was like to be treated kindly and respectfully, which makes it more likely they too will treat others with kindness and respect themselves. Nor is it to say that there should be no consideration of creating the kind of memorable experiences that trips and plays and so forth afford. Such special events that punctuate the day to day routine of school life are the festivals, the 'Christmas dinner' of the school year. They are special because they are infrequent and resource-heavy and different. They contrast with the every day, bread and butter hum drum familiarity of ordinary school life. But the every day is our core purpose.

Episodic memories may be acquired effortlessly, but they come with several drawbacks in terms of acquiring skills and knowledge.

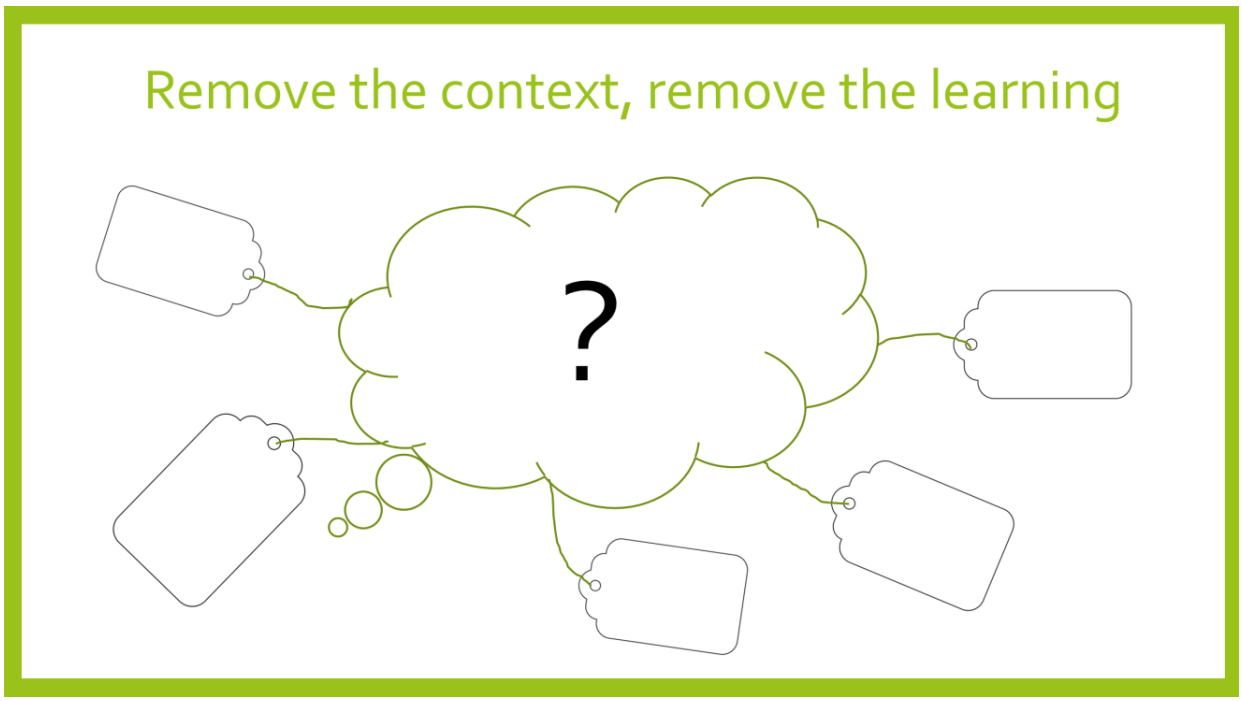


Episodic memories come tagged with context. In the episodic memory, the sensory data – what a child saw, heard and possibly smelt during a lesson – alongside their emotions, become part of the learning. These emotional and sensory cues are triggered when we try and retrieve an episodic memory. The problem being that sometimes they remember the contextual tags but not the actual learning.



I'm sure we've all had those lessons when children remember all about the

colour pens they were using or that we used post its or that Miss spilled her coffee but that actual content of the lesson itself? That's gone!

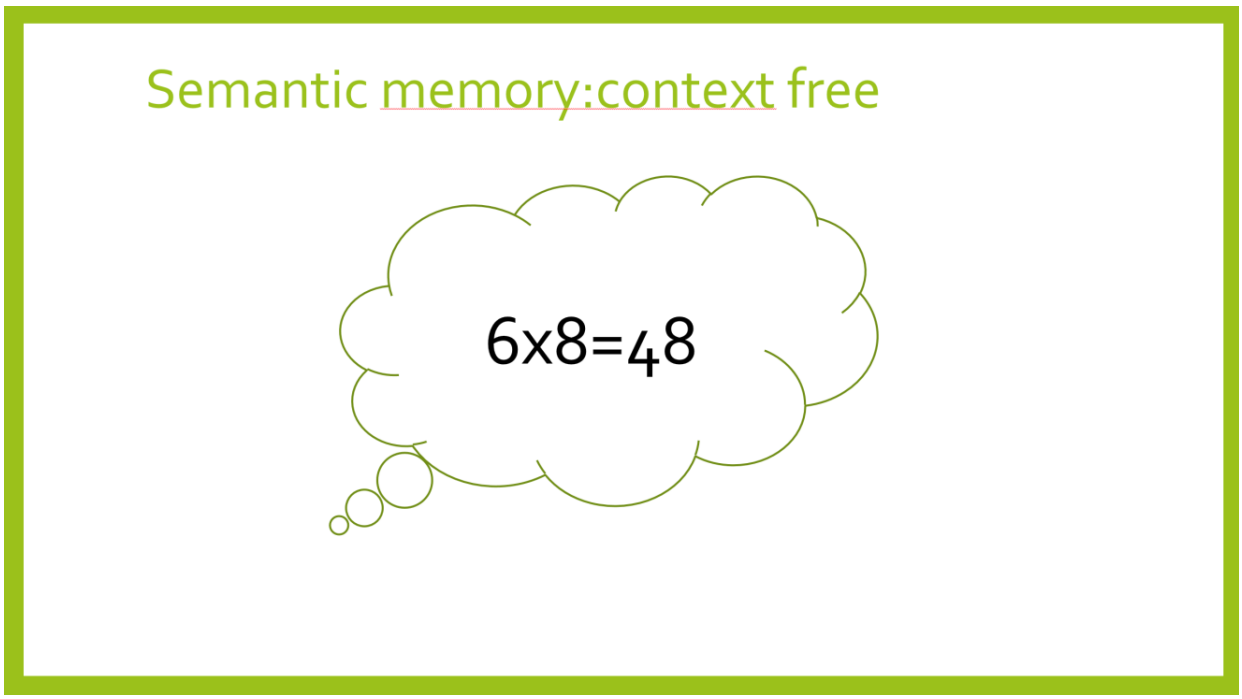


Episodic memory is so tied up with context it is no good for remembering things once that context is no longer present. Luckily our brains also have semantic memory. Semantic memories have been liberated from the emotional and spatial/temporal context in which they were first acquired. And once a concept has been stored in the semantic memory, then it is more flexible and transferable between different contexts.

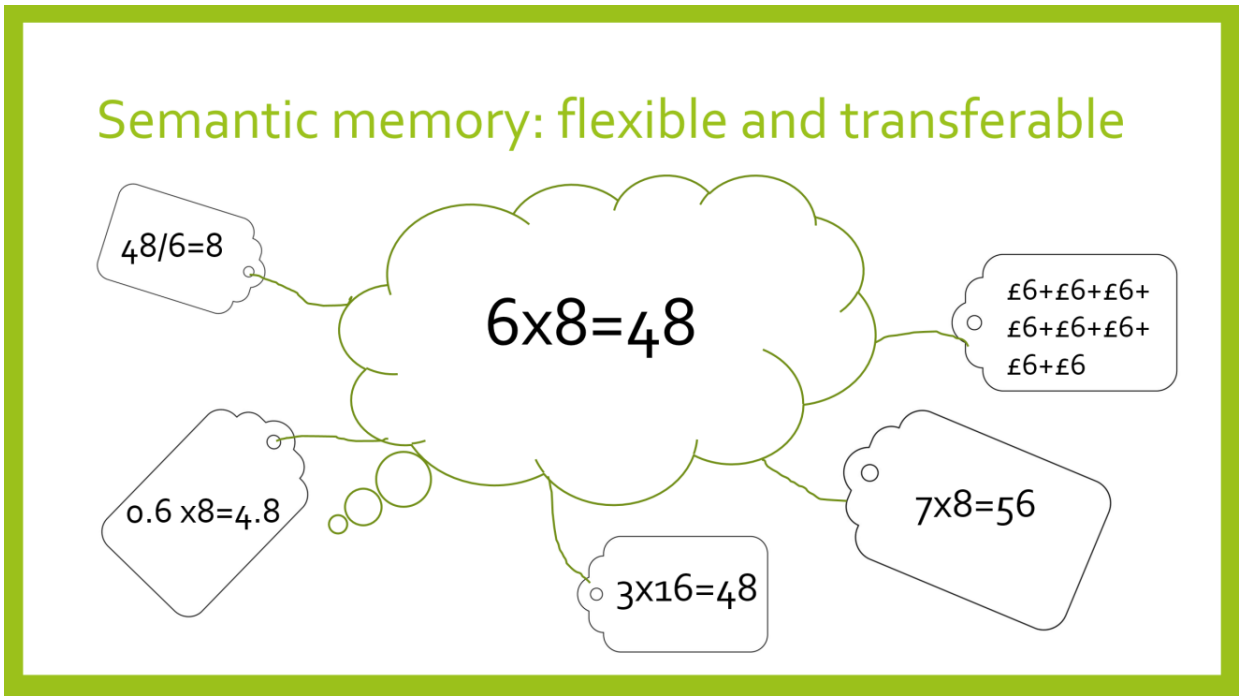
Think about your own learning at school. To be sure you will have some episodic memories of what you actually learnt, but for the most part, the episodic context-dependent aspects have long since faded. What endures is semantic memory that you won't remember actually learning because the 'memorable' context has long been forgotten, episodic brass traded for semantic gold. In this list below, see if you actually recall learning any of this stuff. Probably not, yet you know it (or most of it) and though maybe you have not thought about ox bow lakes for decades, at the very mention, back the memory comes, effortlessly. That's the beauty of semantic memory . It isn't, and doesn't need to be, tied up with episodic clutter. We don't need to have fond memories of sitting on the carpet in Reception

whilst Mrs Blackburn told us all about triangles to know about triangles.

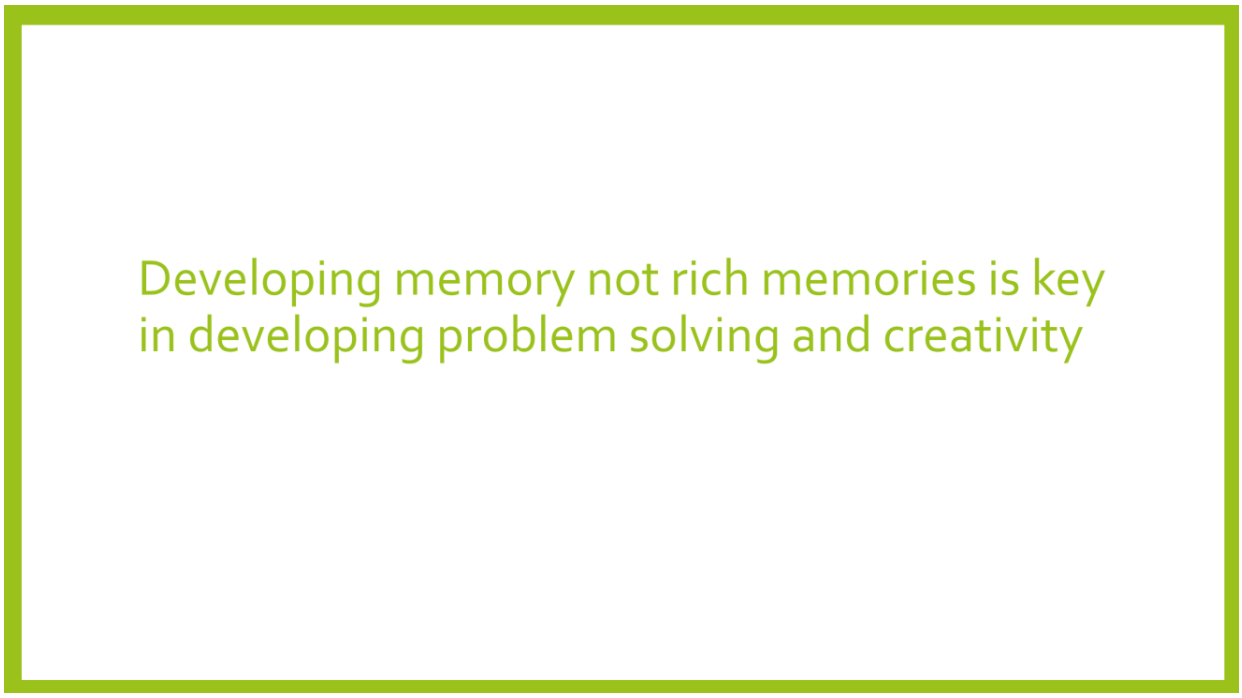
Semantic memory is context free.



Because they are context free, semantic memories are much more flexible and transferable than episodic memories.



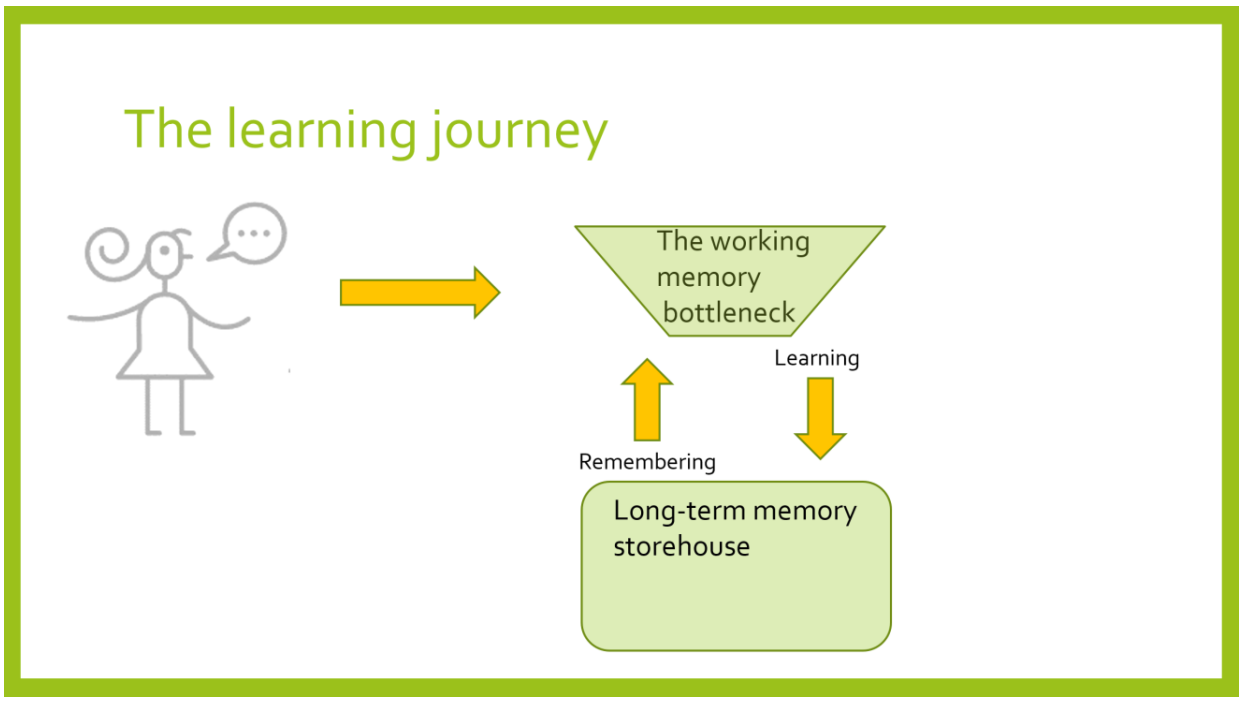
So they are much more useful. Semantic memory is what we use when we are problem solving or being creative because both of these involve applying something learnt in one context to another, novel context. Episodic memories by contrast aren't flexible and don't easily transfer because they are anchored in specifics.



Since enabling problem solving and creativity is the ultimate goal of education, it is crucial that teachers have very good understanding of how to

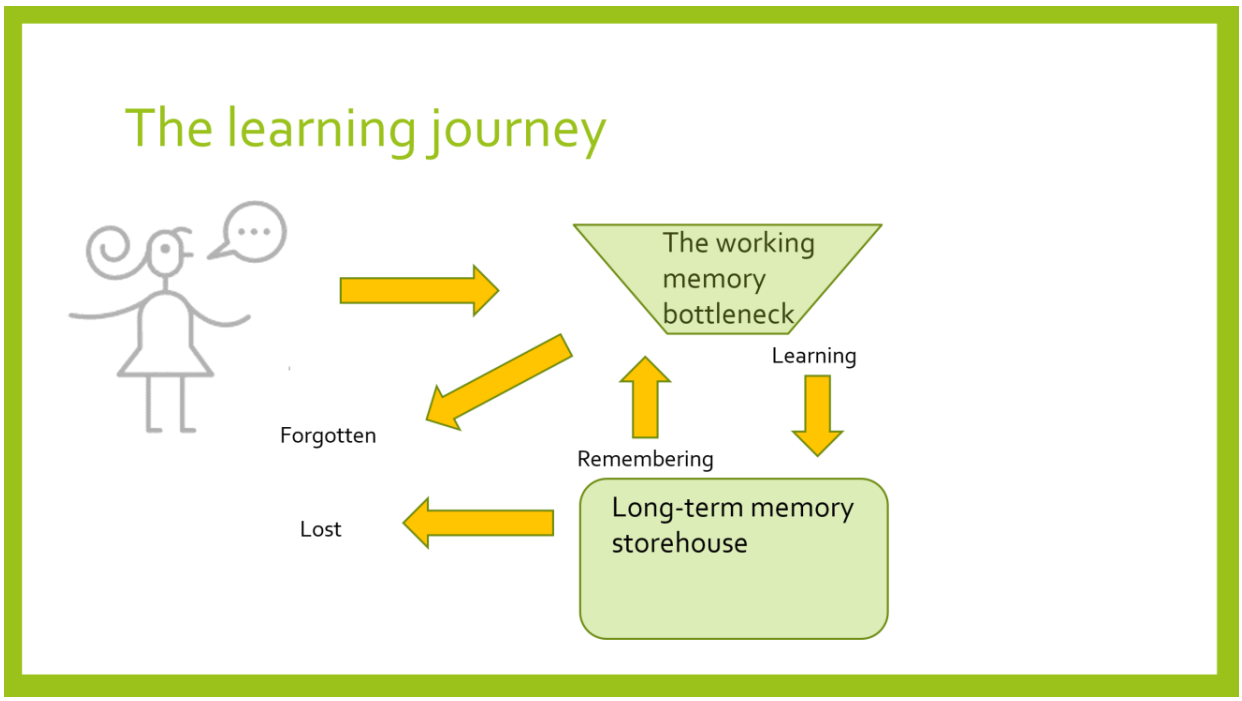
ensure that what we teach them stays learnt, that what we impart makes that all important journey from the episodic to the semantic memory. Yet few teachers have had any training on this. What is more, once you start to understand the learning journey, you realise that much of what schools focus on only addresses half (if that) of the learning journey. Our teaching and learning policies and the centrality of lesson observations as levers for school improvement tend to focus on individual lessons, whereas if we know about how semantic memories are formed, we will realise that a lesson is the wrong unit of time as Bodil Iskasen wrote. (The link to her seminal blog on this does not seem to be working so I've linked to David Didau writing about her idea.)

To understand this, we need to understand about how we come to remember stuff. I've written about this here and the following slides also remind us of the process. If you are already all Willingham-ed up, you might want to skip this bit.

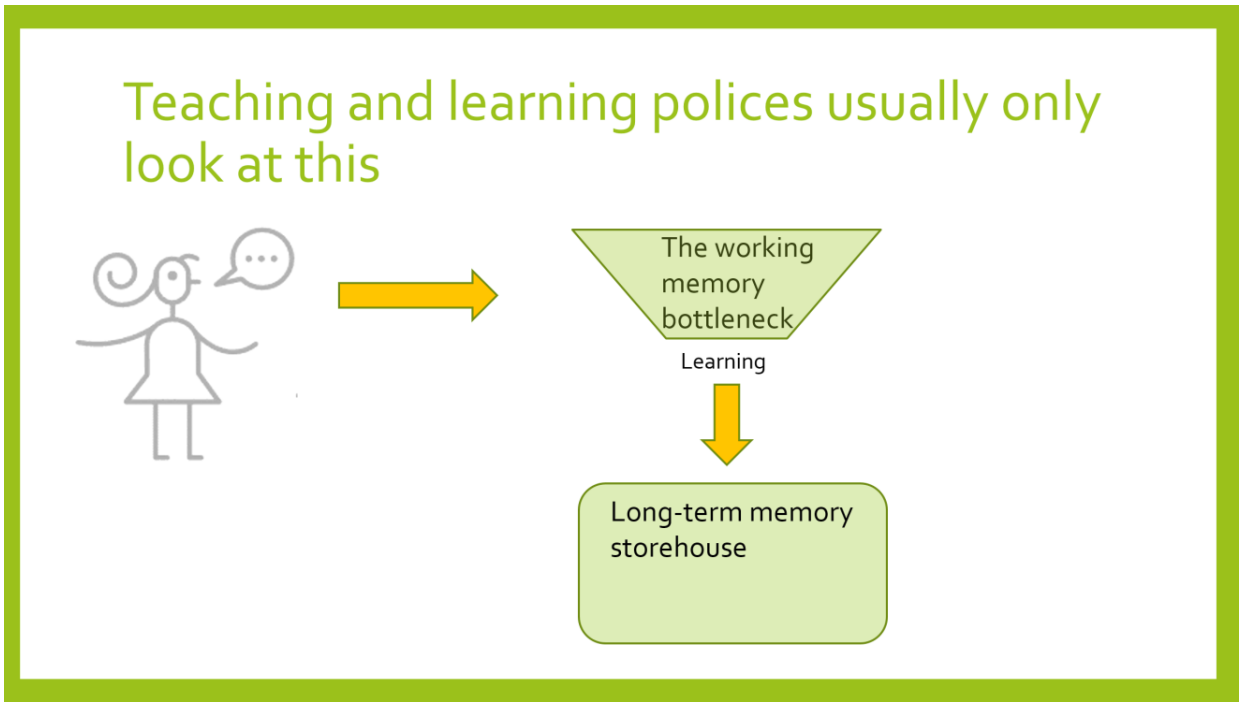


When we teach something, the information goes first into the working memory and then, in the right conditions, it passes into the long term memory. Once here, memories can be retrieved back into the short term memory when we want to think about that particular thing. Hence,

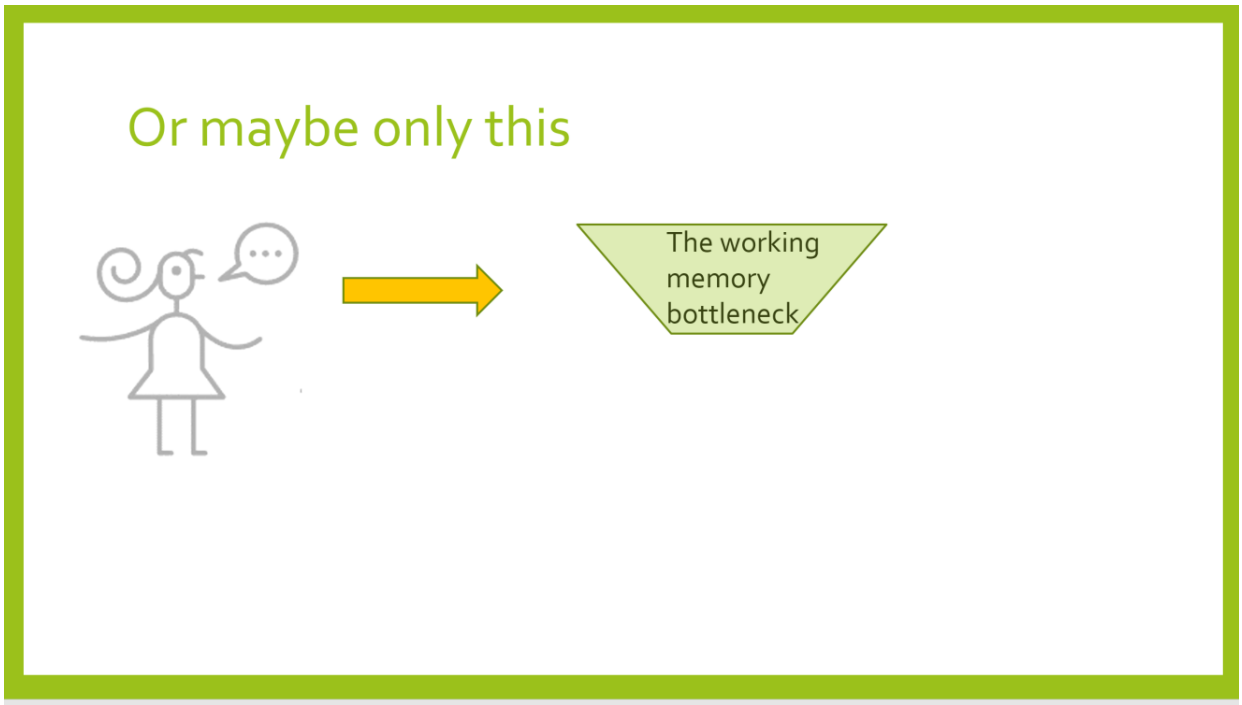
although I have not thought about ox bow lakes very much for 30 years, I can remember what they are, after all this time. However, as we all are only too aware, the process does not happen quite as straightforwardly as we would like. We teach stuff, yet our students seems to undergo a mysterious mind wipe, sometimes within hours. Stuff gets forgotten.



Our teaching and learning policies, our cpd and our lesson observations are all focused on the initial learning part of this journey. They pay no heed at all to the second leg; the bit where we remember, or don't remember stuff beyond the narrow confines of a single lesson. So sometimes we are baffled when seemingly great teachers get not so great results. Or possibly vice versa. that's because we've only looked at part of what it takes to learn something in the long term. We've only looked at this.

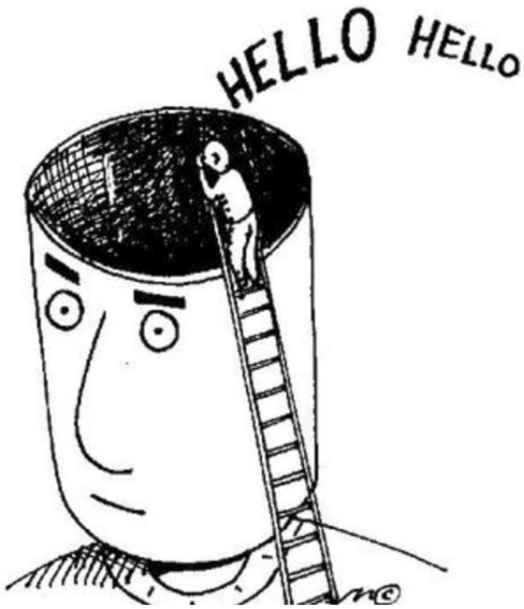


Or maybe even just this



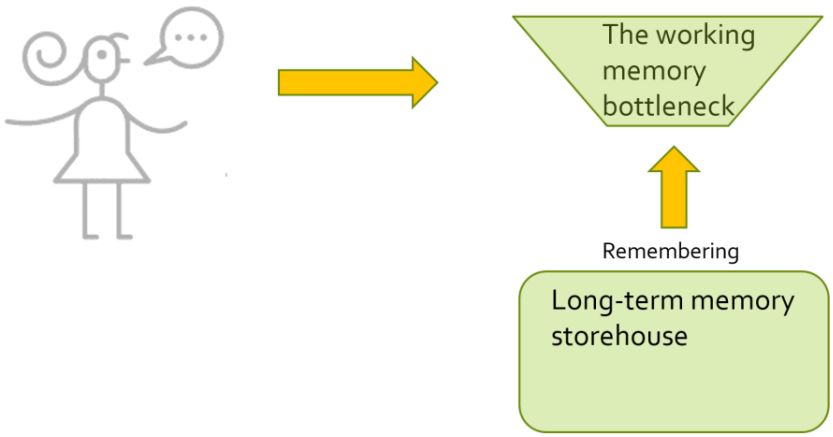
In other words, we've neglected the part of the journey that happens subsequent to the information arriving in the working memory, the stuff that makes knowledge actually stick around long term – an egregious oversight with all too familiar consequences.

So this happens at end of year assessments.



Whereas we should also focus on this.

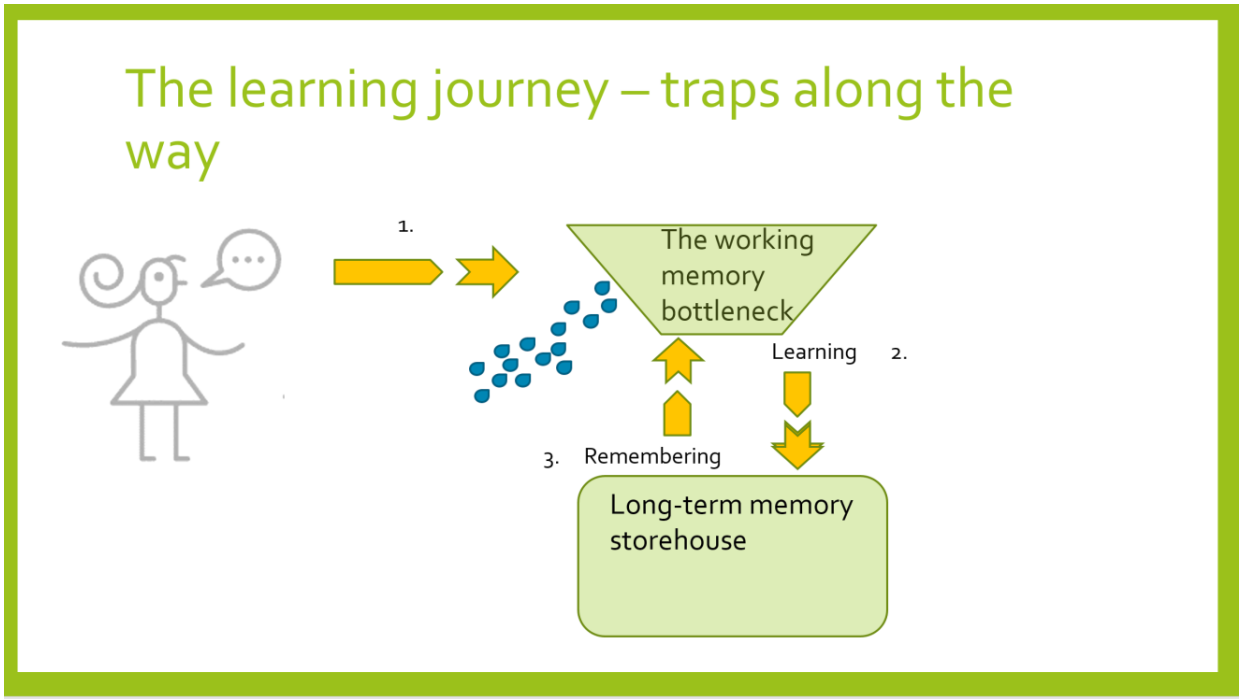
We need to concentrate on augmenting remembering



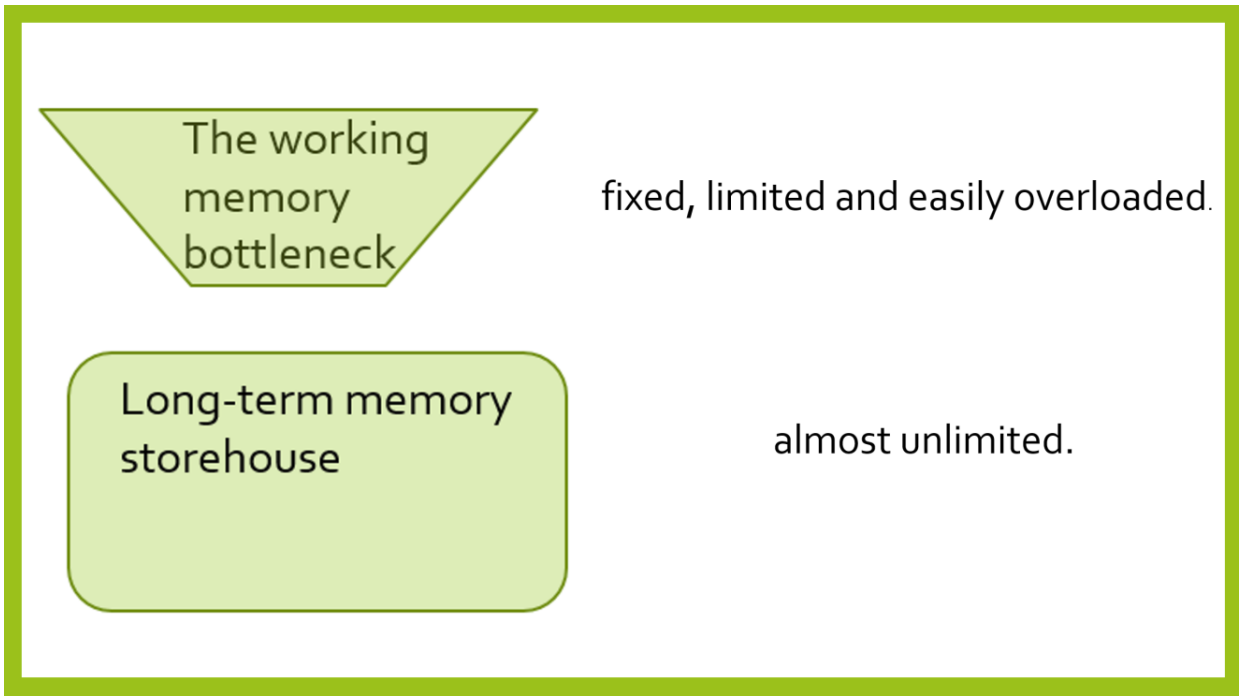
Since lesson observation only focuses on the here and now of a lesson at the point of delivery, it is of limited use in helping see if learning is actually happening. Learning is a long-term process, yet we try and 'see' the unseeable by looking at proxies, all of which tell us very little about whether learning is beginning to happen or not, as Robert Coe explains here.

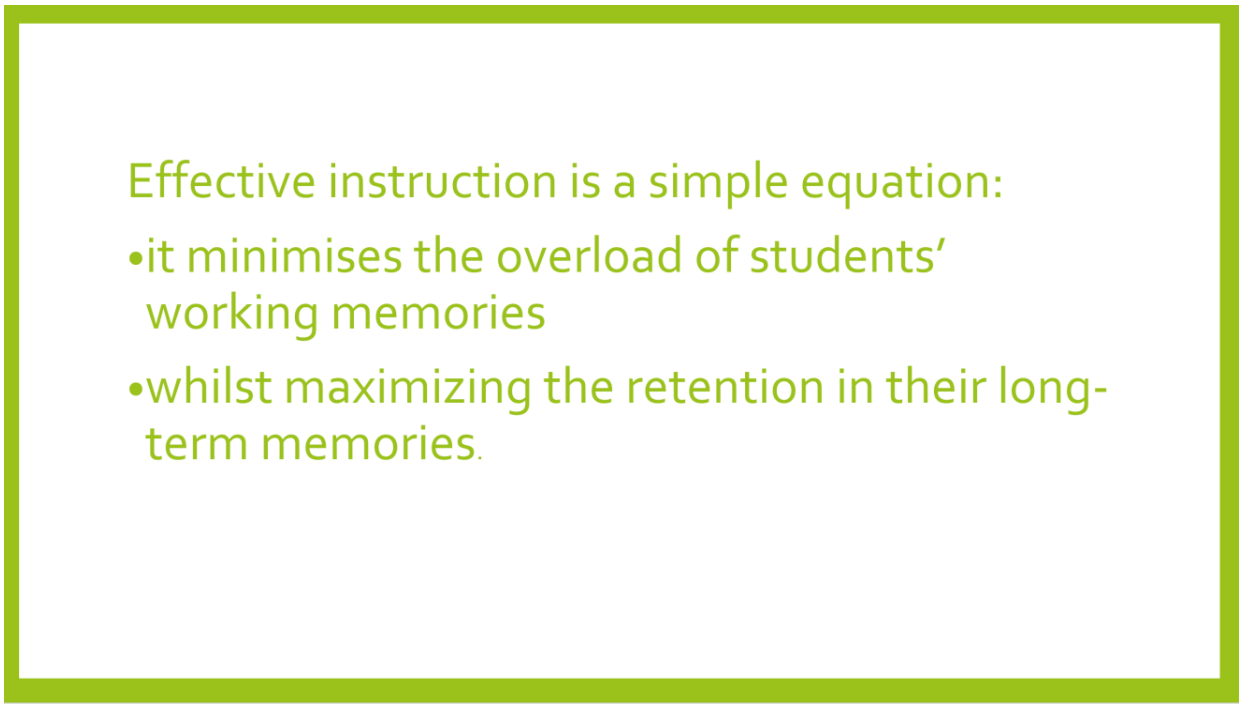
Teaching for long-term learning

If we want to maximise long-term learning, we need to be aware of the three pressure points where our learning may go awry. Traditionally, we have focused on the first of these points and not paid any attention to points two or three.

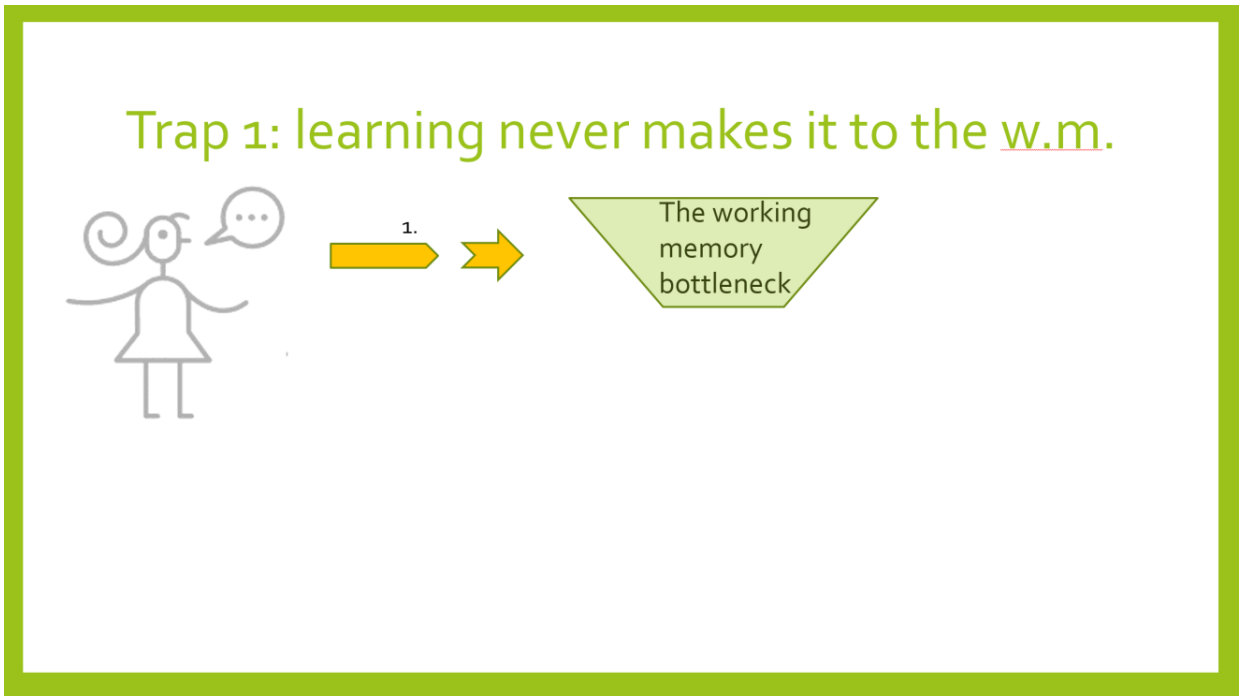


The working memory is has very limited capacity and is easily overwhelmed. By contrast, the capacity of the long term memory is vast. If we want children to remember stuff for the long term, we need to make the most of this huge capacity. The aim of all learning should be to improve long term learning.

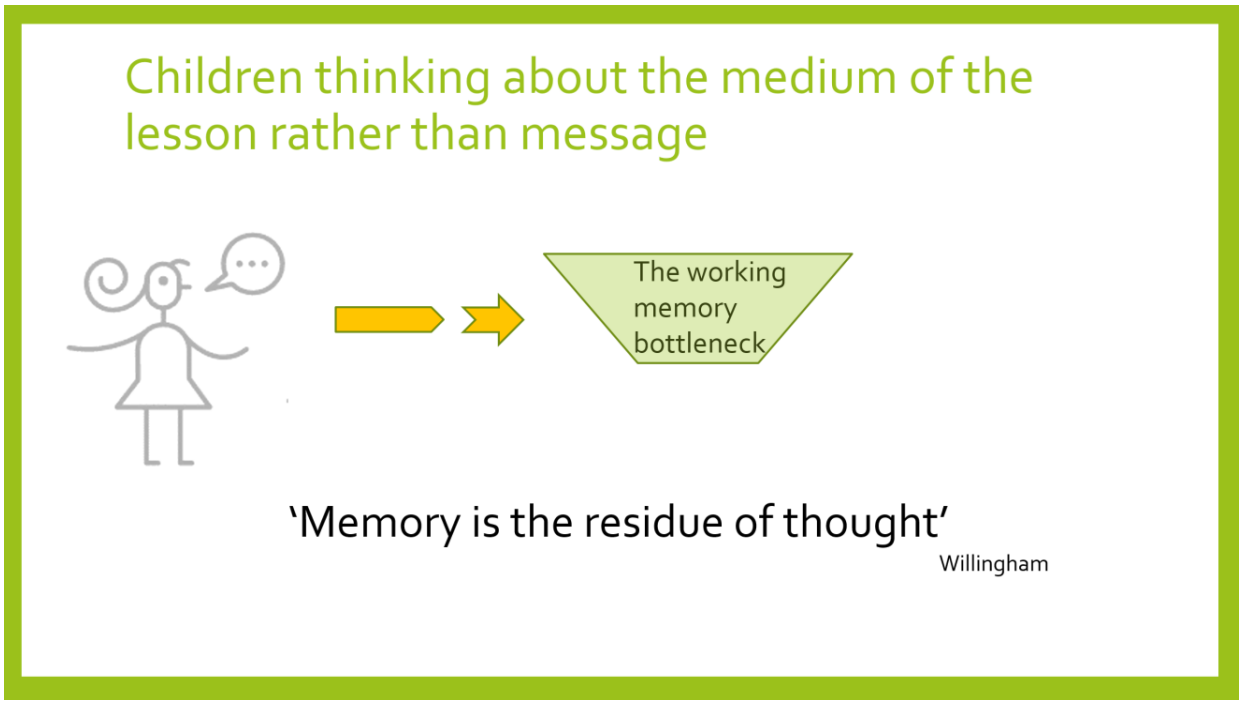




The first hurdle, the one we are most familiar with already, is to make sure that what we teach actually makes it to the working memory in the first place.



We remember what we think about, so lessons need to be planned so children think about the right things. If they are thinking hard about what colour pen to use in their poster or how they might win a game, rather than what the poster is about or the maths behind the game, then that's what they will remember.

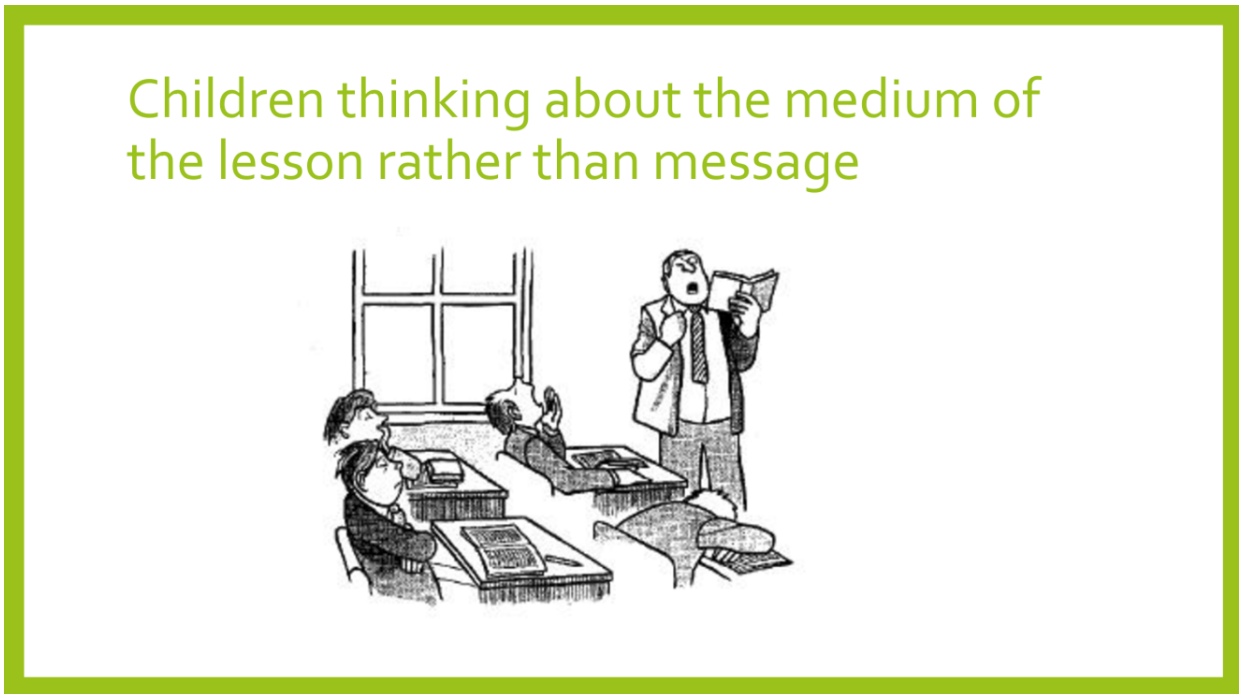


This can be a danger with exciting 'memorable' lessons. The exciting but extraneous features are what get remembered, rather than the more prosaic,

but more important information that we want them to learn.

For example, when teaching young children to count, sometimes using ‘interesting’ objects means the child’s focus is more on the dinosaurs than the counting. So that’s what gets remembered.

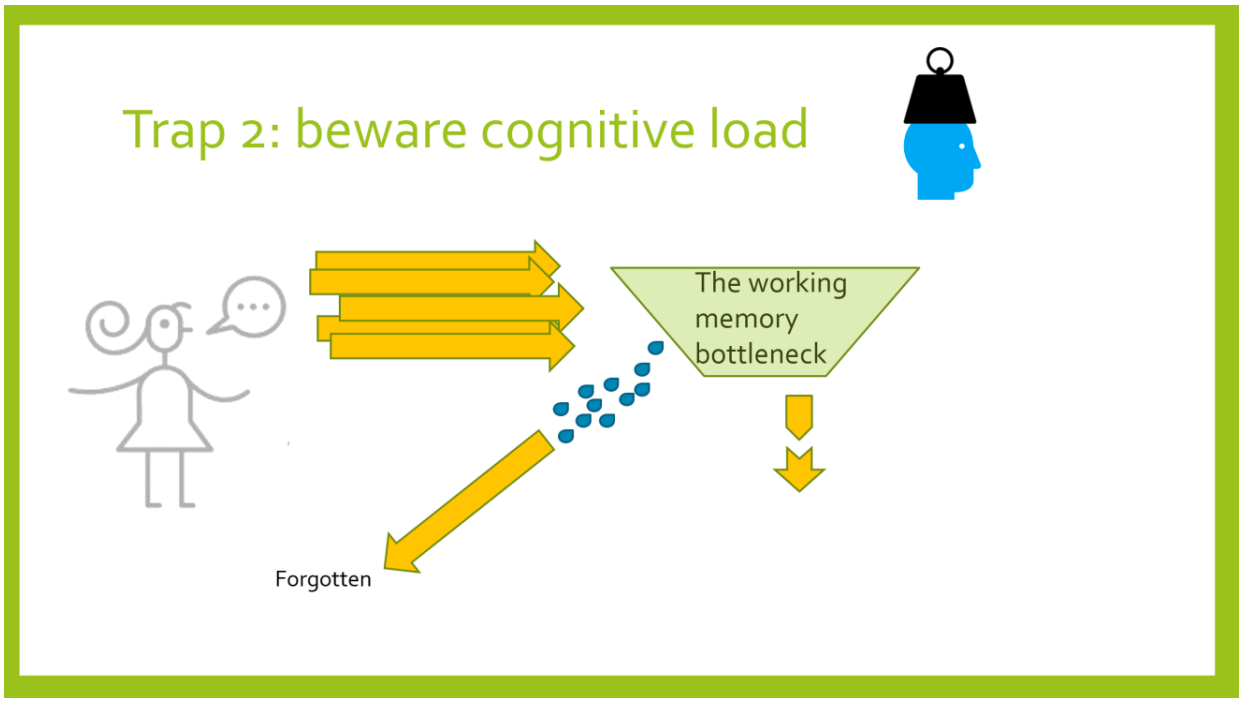
Of course the converse is also true. If a lesson is so tedious that all anyone can think about is how boring it is, then that will be what is remembered, at the expense of content.



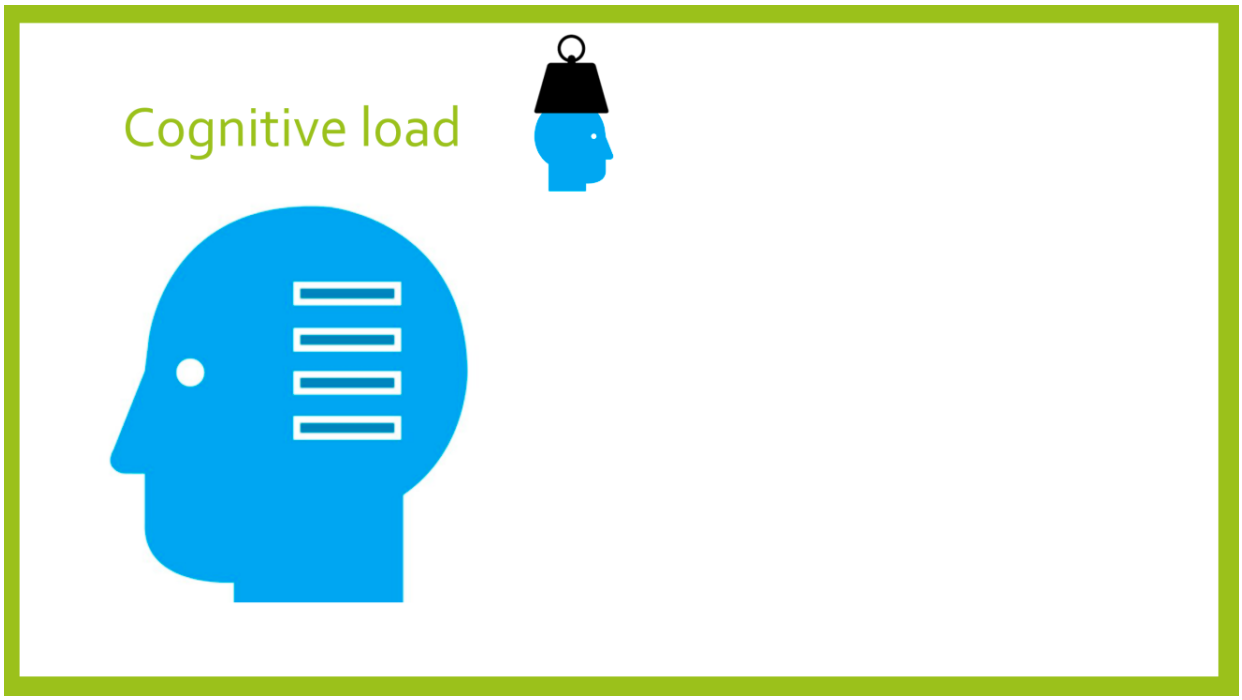
The second hurdle to be cleared is making sure that the information in the working memory makes it to the long term memory, without leaking out. As Peps McCrea writes in 'Memorable Teaching'

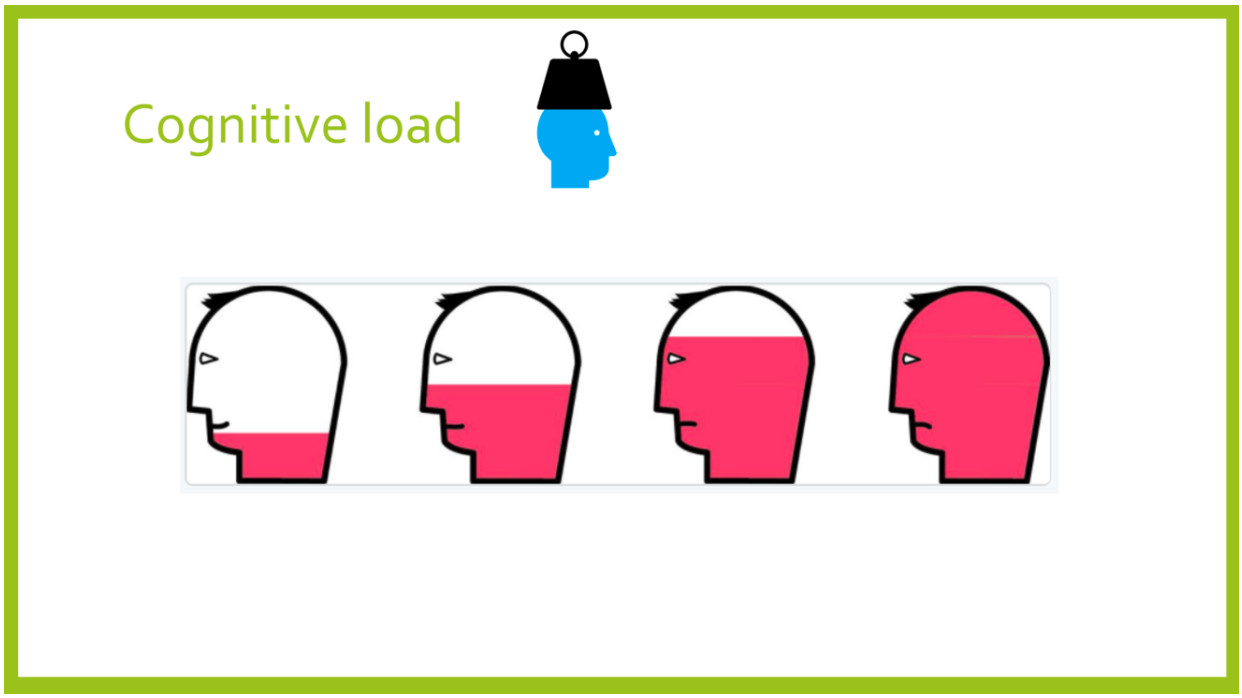
Our WM is a high maintenance mechanism. Give it too little to play with and it begins to look for more interesting fodder. Give it to much to juggle and it'll drop all the balls.'

This is the basis of Sweller's Cognitive Load Theory.



Cognitive overload occurs when we overwhelm the limited working memory with too much new information at once. Since most of us can only handle about 4 new items of information at once, stuff will start to leak if we try and put too much in at once.

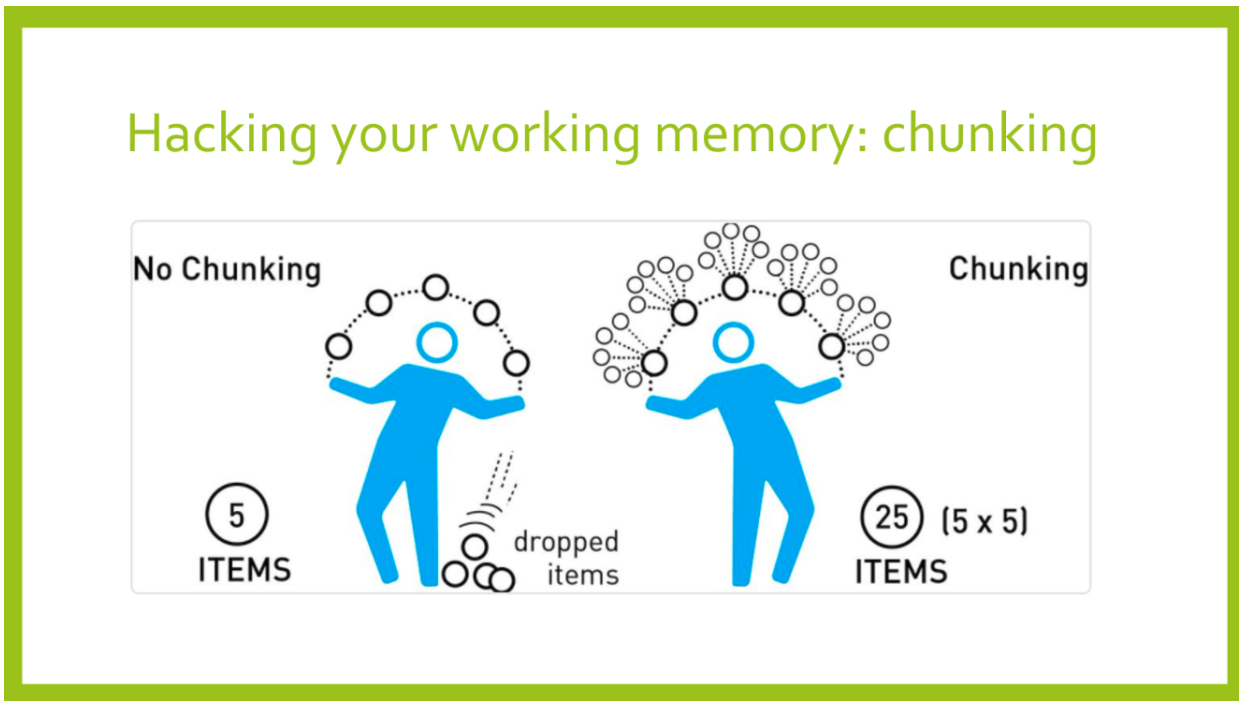




We can avoid cognitive load by breaking stuff down into small steps. Unfortunately the ‘curse of knowledge’ makes us forget quite how complicated certain concepts are. See this series of excellent blogs by Kristopher Boulton where he explores breaking down the concept of simultaneous equations into tiny steps to make sure no-one gets lost along the way.

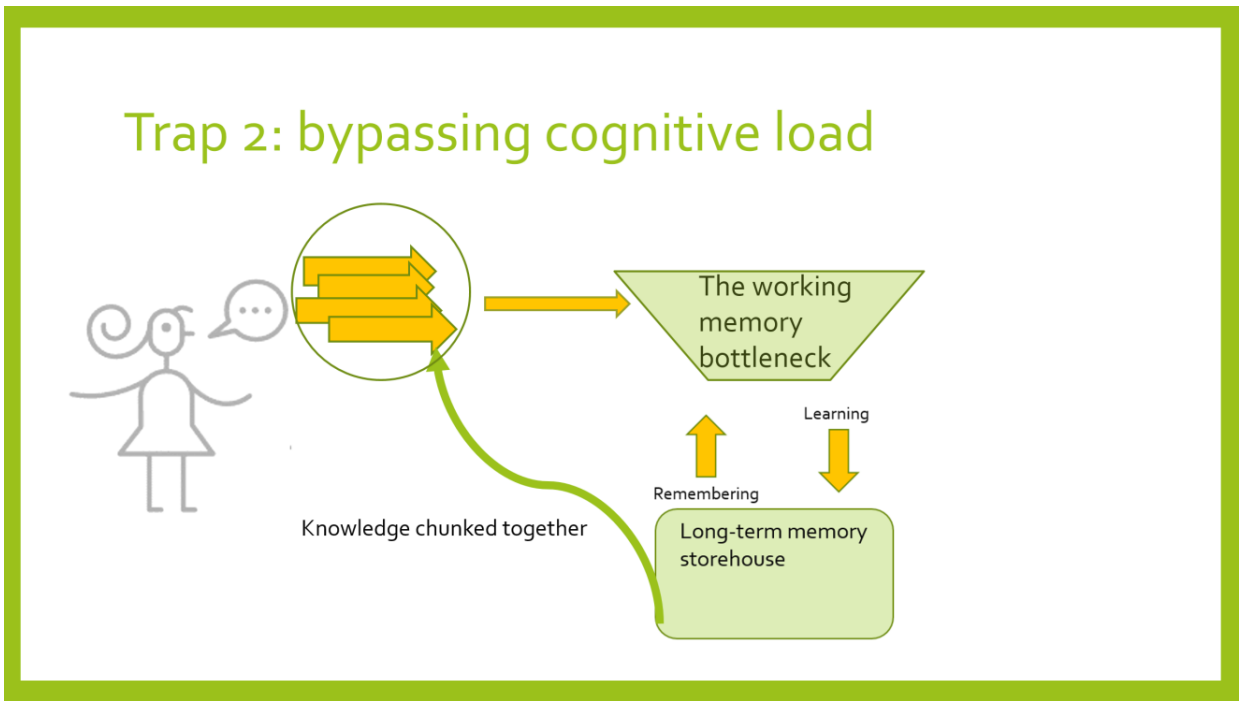
Fortunately, we can ‘hack’ the limits of our working memory. Our brains

like to connect together related ideas into chunks. The great news about this our working memory then regards the big ‘chunk’ as one item, occupying one slot.

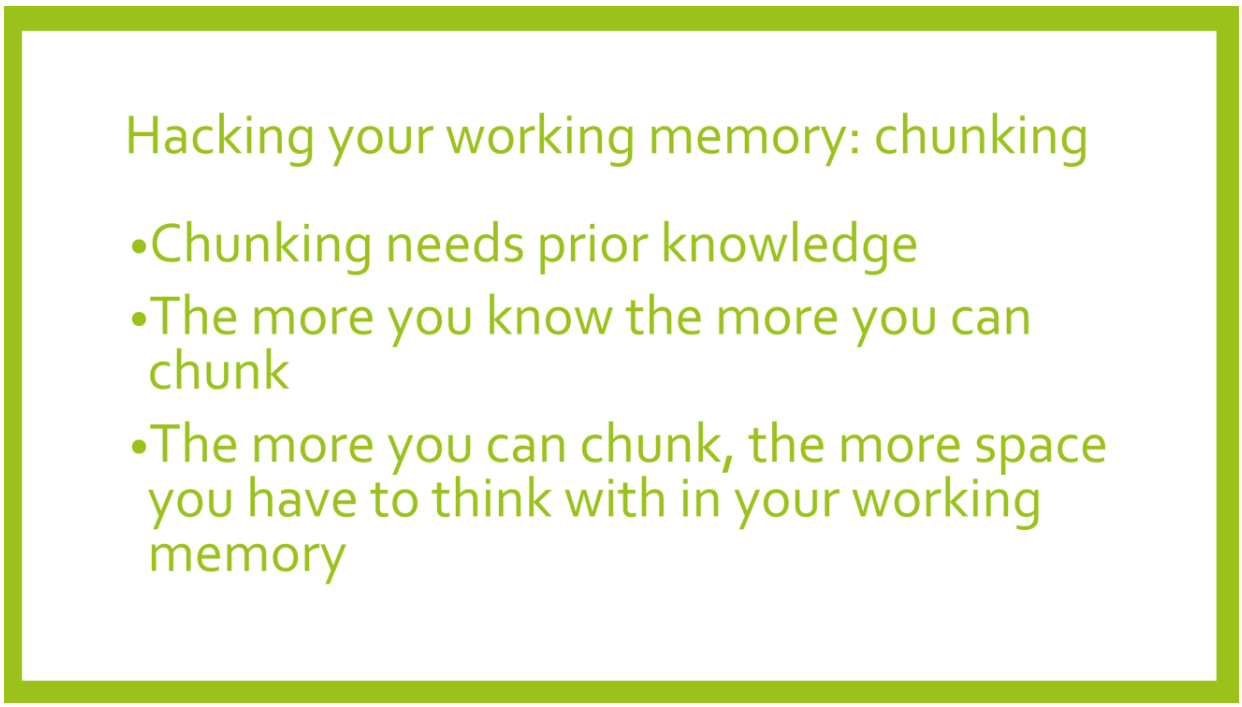


So for example, when children begin to learn to read, each individual letter had to be decoded, so reading is slow and hard work. If the text is too demanding, the child cannot attend to the meaning of the text at the same time. Later, the child can decode more fluently because through practice, phoneme-grapheme correspondences have formed a great big chunk called ‘reading’ and getting words of the page takes up very little working memory. The child’s working memory is now fully available to think about what they are reading, rather than thinking about what the words say.
 Having secure recall of number bonds and times tables helps students in a similar way have the brain space to think about the new maths they are learning. How many times have children failed to understand vertical addition, for example, because so much brain power is going into adding two 1-digit numbers together that all that stuff about columns and place value you are trying to impart falls by the wayside. When students go to secondary school and learn about the Norman Conquest, they will do so much more easily if the concept of invasion already has some flesh on its bones because they already know about Viking and Roman invasions and

World War 2. Invasion, resistance, conquest and defeat will already be chunked together and understood.

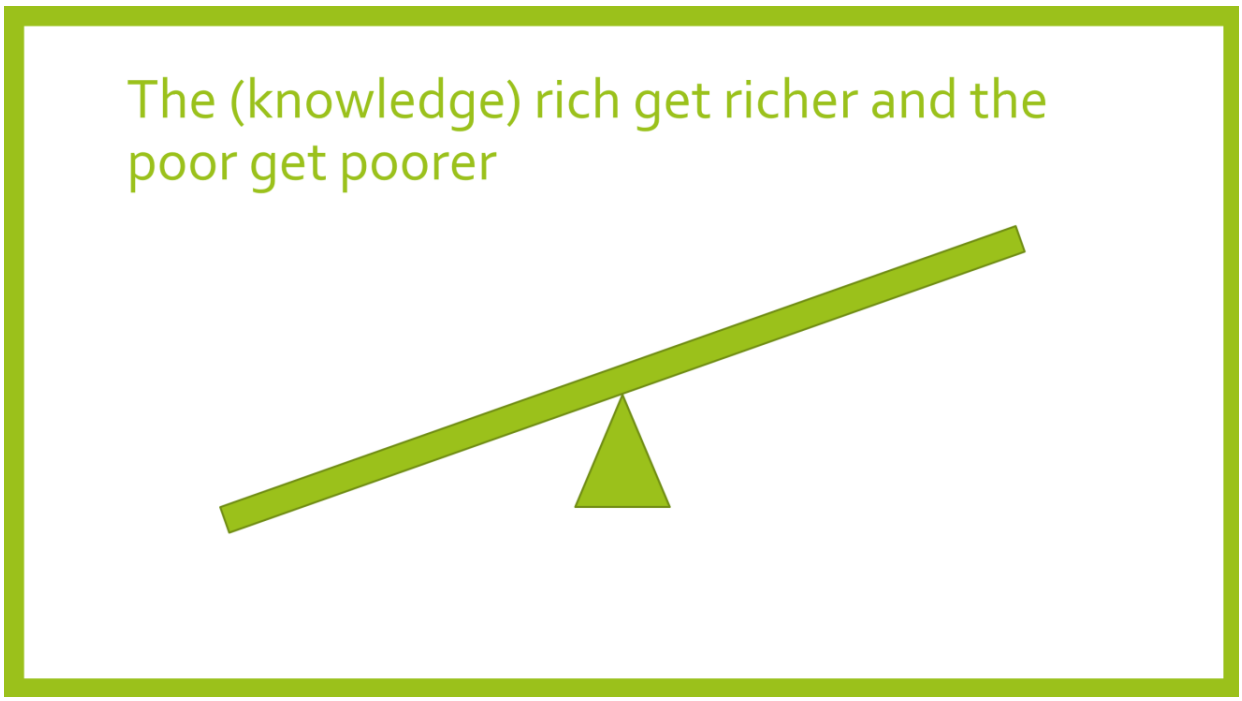


Having a rich store of knowledge available in one's long term memory ready to be drawn upon by the working memory is therefore crucial.



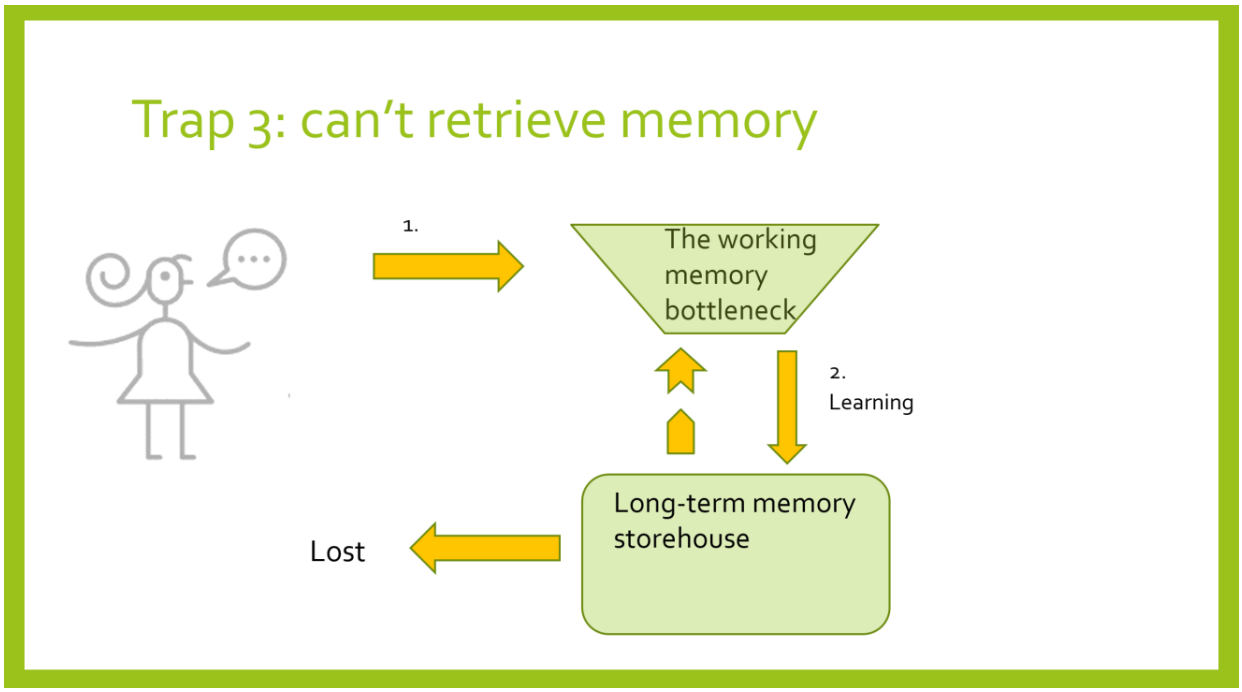
This is why having lots of rich knowledge is so important. The limitations of the working memory can be bypassed by using the resources of the long

term memory. Those with limited knowledge are unable to do this, so are much more likely to experience cognitive overload.



This has big implications for our curriculum design. If we want successful learners, instead of over focusing on the quality of teaching, we need to pay attention to the quality of what gets taught. Is it suitably knowledge-rich? If instead we focus too much on giving children fun-filled 'memorable' experiences, we are depriving them the vital 'nutrients' they will need later. It's equivalent to feeding children on happy meals rather than balanced, nutritious meals. That's not to say children should *never* have 'fun lessons' at school, anymore than children should never eat junk food or birthday cakes or sweets.

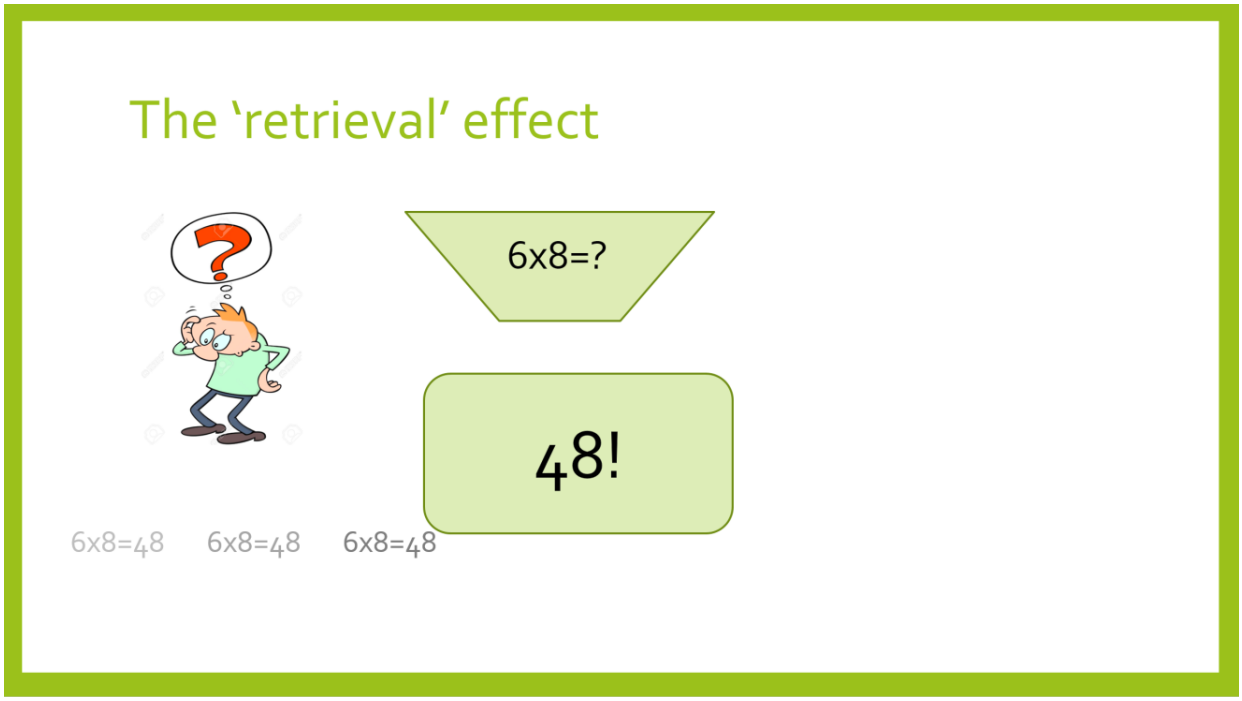
The third and final hurdle is all about retrieval. Knowledge might have got into to our long term memory, but how easily can we find it?



You know that exasperating feeling when you know you know something but you just can't remember it right now? Or you remember (episodically) that you did know something, but can't bring that thing to mind when you need it. That's a bit like when you've saved something on the staff drive but didn't name it properly, let alone put it in a folder where you might stand the faintest chance of relocating it again. Not that that sort of things happens at St Matthias. Oh deary me no.

Let's hope 'Doc 6' wasn't anything important.

Fortunately, we can do something about this. (About long-term learning that is. The staff drive is beyond help, I fear). We can strengthen our ability to recall long-term memories by retrieving them. The more you search for a memory, the easier it becomes to find it. This simple concept – the retrieval effect' – should become the bedrock of our teaching for long term learning.



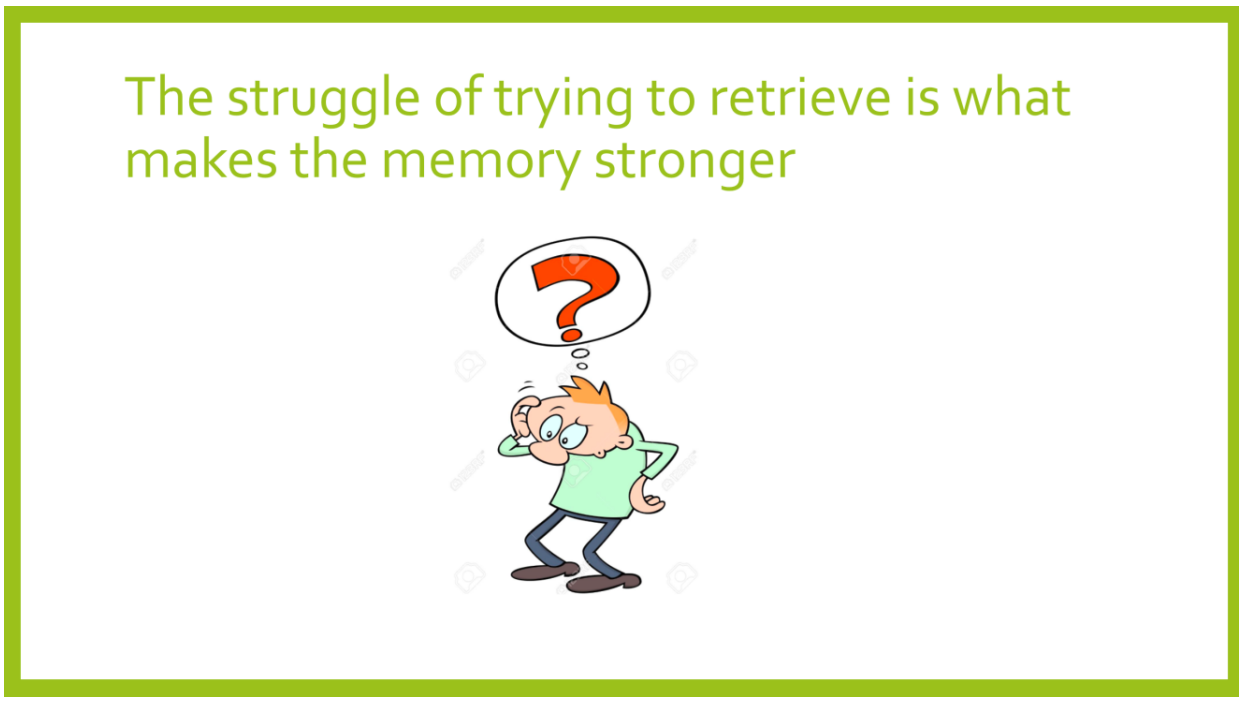
Unfortunately this effect is also known as the 'testing effect' which puts some teachers off and confuses others – myself included until recently – so that we see this as an assessment tool. **It is not an assessment tool, it is a learning tool.** I fear my previous blogs on knowledge organisers might have reinforced that misunderstanding. You might get some assessment data as a by product from *some* retrieval practice but that is not its prime purpose. Its prime purpose is to make memories stronger.

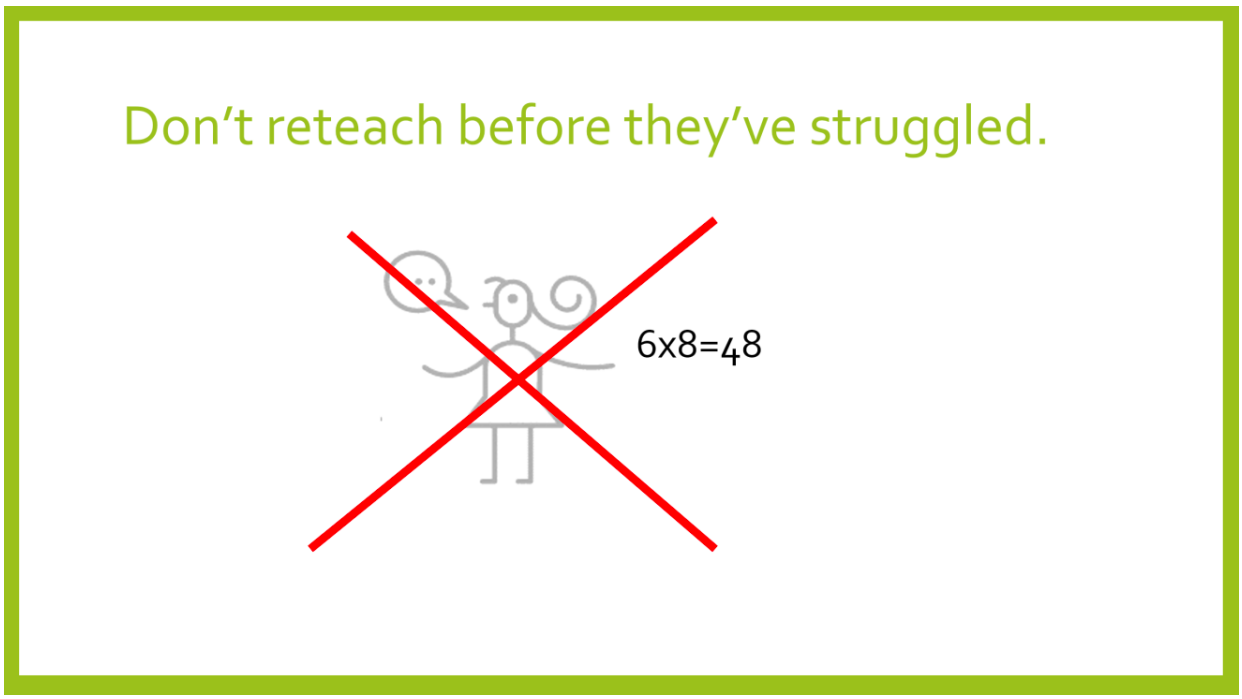
Also known as the 'testing effect'

But is isn't a test. It's not about assessment, it's about improving memory.

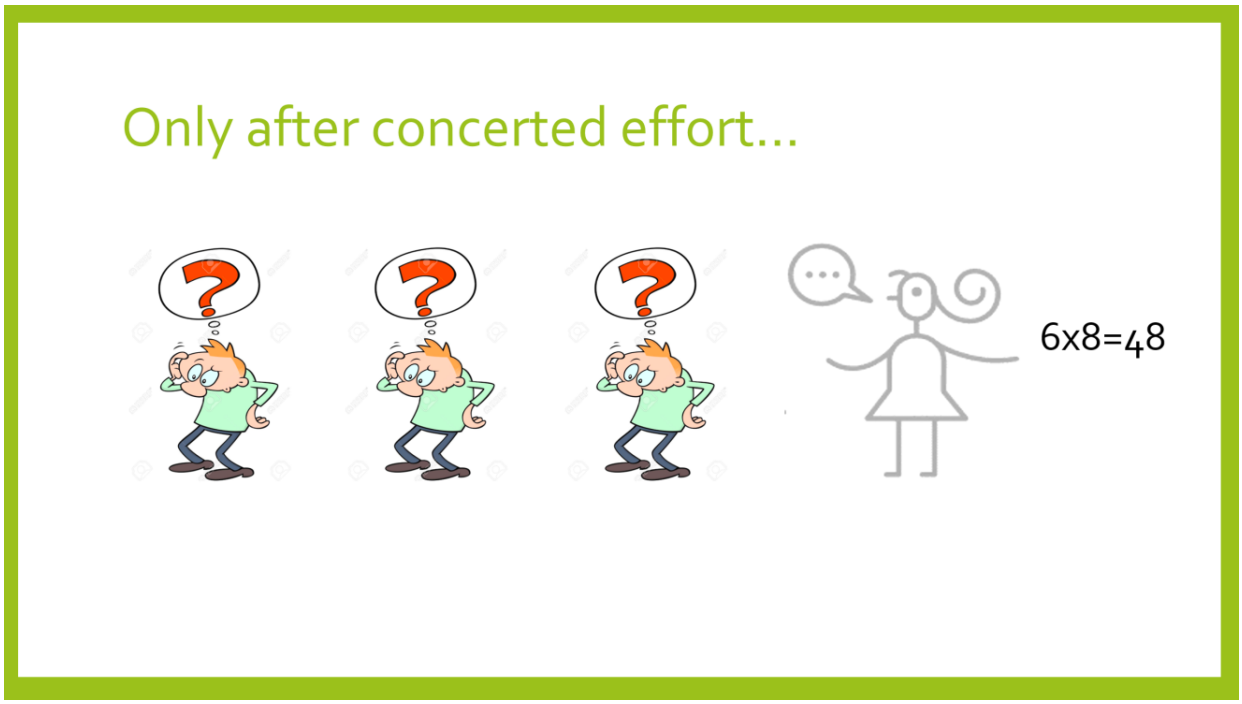
When we struggle to remember something, this primes our brain to remember it more easily the next time we look. The brain gets the message that this memory must be important because we are looking for it. The more times we try and retrieve something, the stronger the memory gets. But it is the struggle that is important. If we reteach content instead of getting children to try and retrieve stuff they've probably forgotten, the memory does not get strengthened in the same way. It seems kinder but actually does the children no favours. We need to explain this to them and

help them understand that struggling to remember something is good – it means their memory is getting stronger.





Some children will fail in their attempt at retrieval. That's fine. Once they've struggled, then you reteach.



One way of helping deal emotionally with the stress of not knowing something is by calling retrieval a game of hide and seek. That pesky knowledge is trying to hide from you, but you are going to try really hard to track it down.

And this is what you can say to children who can't remember!

And then reteach, to help them get better at finding, next time.

The retrieval effect is stronger if we allow a bit of forgetting to happen before getting children to retrieve. Using our hide and seek analogy, if you only count to 5 before you go and 'seek', your friends will be pretty easy to find but your 'seeking skills' won't have had much of a work out. Count to 50 and your friends will be well hidden and you will have to work hard to find them. It's the same with memory. Our memories get stronger once retrieved if we have had time to forget them – bizarre as that sounds.

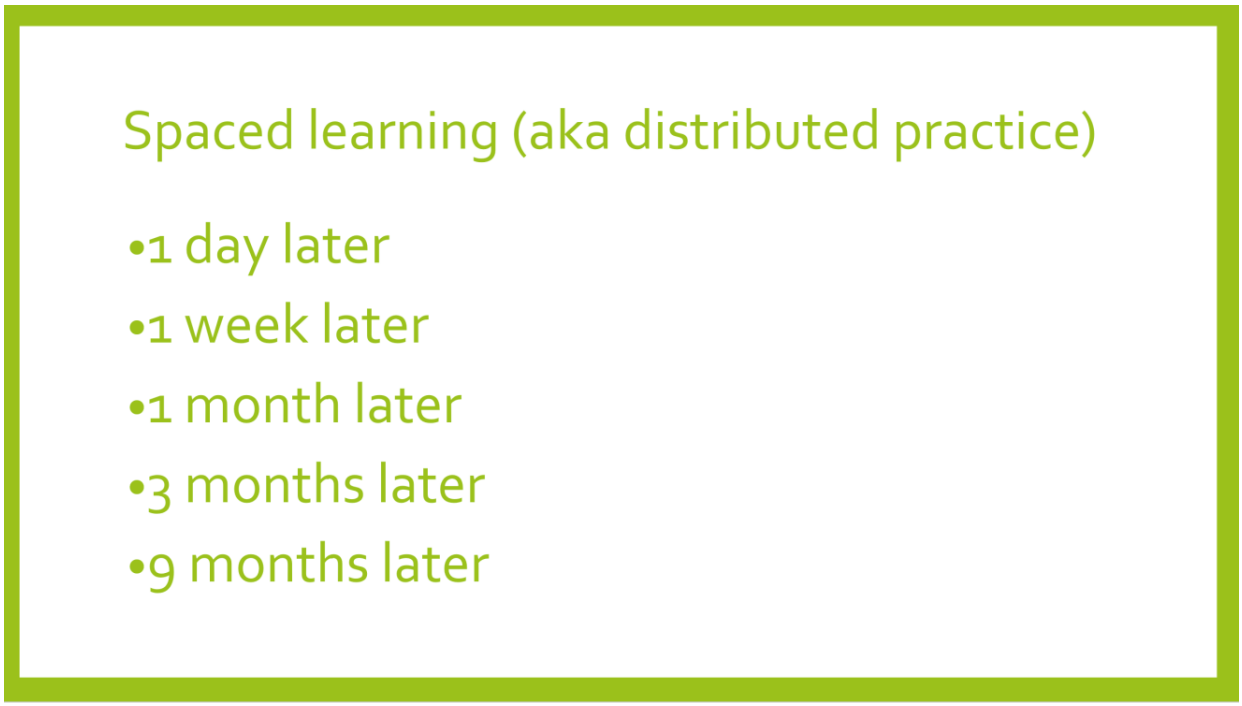
This is one limitation of some AfL techniques. If we assess whether children can remember something at the end of a lesson before they have had a chance to forget it then while we get get useful feedback about if they understand something or not – and I'm not knocking that – obviously that's very important to know – what exit tickets, plenaries and the like can't tell us is if this new learning will be remembered long term (or even tomorrow). Afl techniques can tell us about what has been understood, but to know what has been remembered we need something different, we need assessment for long term learning.

Allow forgetting **before** retrieving

Having retrieval tasks at the start of lessons, be they 'do now' tasks, entry tickets, start of lesson plenaries or any other retrieval tasks are more likely to strengthen the learning from the previous lesson than and end of lesson retrieval task.

What is more, to make memories really strong, come back to them at gradually increasing intervals. This is known as 'spaced learning.'

Assessment for long term learning



At St Matthias, one way we do this is by giving children multiple choice quizzes weekly during a 3 week block (in humanities or science) and then by giving them another quiz about 6 weeks later when they are deep in the middle of a completely different block. And then at the end of the year (after a period of revision time when they can self-quiz using their knowledge organisers), giving them a final quiz that covers all the areas of learning in that subject that year. This final end of year quiz does have an assessment purpose too, but it will also provide further retrieval practice and help the knowledge learned that year endure in the long term.

	Question	Answer A	Answer B	Answer C
1	When did World War 2 start	1918	1939	1945
2	Which of these was President of the USA for most of the war	FDR Roosevelt	Benito Mussolini	Joseph Stalin
3	Which of these countries was one of the Allies	Soviet Union	Republic of Ireland	Japan
4	Which of these countries was one of the Axis forces	Poland	Switzerland	Italy
5	Which of these is **NOT** a reason why the war started?	Because Germany had been defeated in World War 1 and felt humiliated	Because the Great Depression led to terrible money problems, particularly in Germany	Because Hitler wanted to invade Britain as revenge for the defeat in World War 1
6	Which of these did **NOT** happen in England during World War 2	Bombing of Pearl Harbor	Rationing of food, clothes and fuel	Evacuation of children from cities

Here's a year 6 example

Where would I find the Qu'ran?	Cathedral	Church	Mosque
Jewish people worship in a special building called a	Gurdwara	Church	Synagogue
Which is true?	Muslims wash before they go into the mosque.	Men and women sit separately in church	People listen to the Imam when they go to the synagogue.

And here's one from year 2.

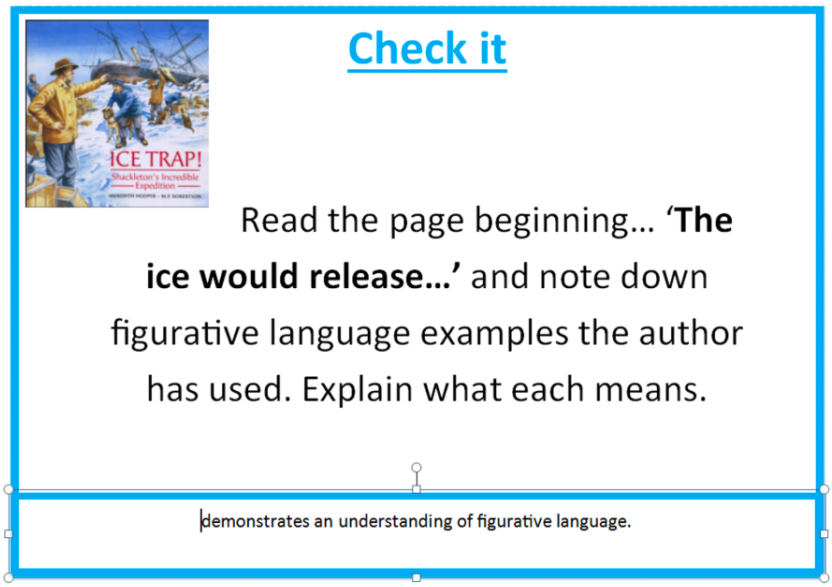
Another way of maximising the benefit of retrieval practice is by mixing up the content of what you are asking children to retrieve. For example, giving children a fractions question from a unit you did a month ago in the middle of a unit on perimeter.

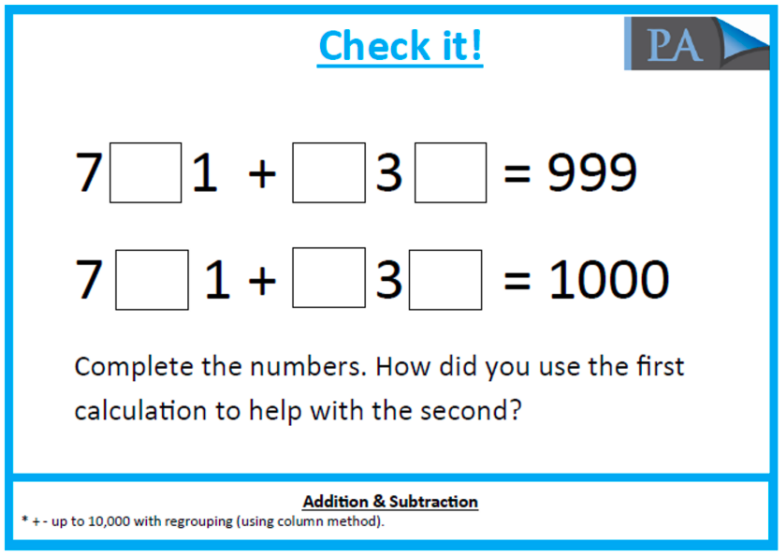
Interleaved practice

Blocked	Interleaved
• Fractions	• Fractions
• Fractions	• Perimeter
• Fractions	• Time
• Perimeter	• Fractions
• Perimeter	• Perimeter
• Perimeter	• Time
• Time	• Fractions
• Time	• Perimeter
• Time	• Time

I stress, this is the pattern for **retrieval practice,** and not for the initial teaching of concepts.

We use 'check its', an idea we got from the Primary Advantage Federation. These are short questions from an area that has been taught at least three weeks previously, without any reteaching of the concept beforehand. For example:





Again, while you could see these as primarily being about assessing what has been retained, we should also remember that as well as helping check what might need reteaching, it also strengthens the memory of what has previously been learned.

Time spent retrieving previous learning is self evidently time not spent learning new stuff. But ploughing ahead with the new without devoting quality time to remembering the old is a false economy. The curriculum is

not so much stuff to be covered, it is knowledge for long haul learning. It will pay off in the long term, with less frantic time as high stakes statutory tests approach. And anyway, the pay off should be for the learner who now has a rich store of knowledge in their long term memory rather than for schools grasping after the badges and stickers of high exam honours, as [Amanda Spielman reminds us.]

Categories: Uncategorized

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