Banbridge Academy Pupil Booklet

'Learning How to Learn'

Name _____

Form Class_____

Always remember

Knowledge is Power

'Learning How to Learn'

What does science tell us about how we learn?

Science can tell us a lot about the most effective ways to learn based on how our brains process new information and ideas. It can also tell us about what doesn't work. Therefore, we can optimise revision time by being well informed about the latest research and being strategic about **how** we revise.

Rereading our notes, rewriting them, highlighting them in pretty colours and even summarising without actively trying to recall them, is not an effective way to learn. Although it is quite easy (albeit time consuming) work that might make us feel good about ourselves, it won't result in the gain of long term knowledge and the proper understanding required for creative thinking, problem solving and an acquisition of the skills needed to excel in exams and in life. Scientific research has shown that time effective SAAD revision is the key.

Does revision have to be SAAD?

Yes, if we want it to count ☺. What are **SAAD** revision techniques?

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S	**S**paced practice
A	**A**ctive retrieval
A	**A**ssociations
D	**D**esirable difficulty

Spaced Practice

Hermann Ebbinghaus – 'the Father of Memory' was the first person to carry out experiments about human retention. He discovered the Forgetting Curve, which paved the way for how we think about memory retention.
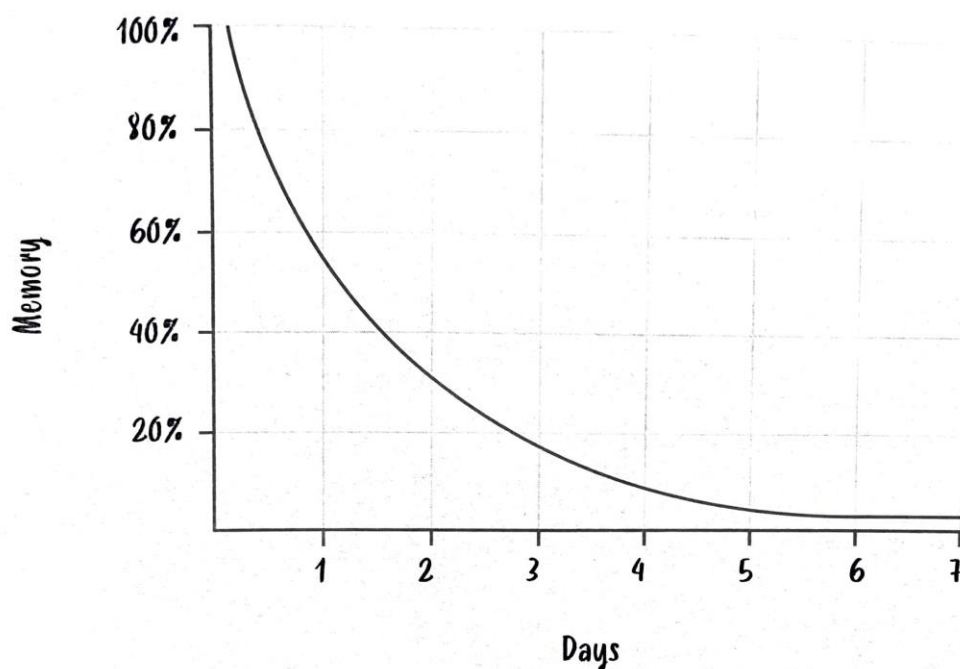
THE FORGETTING CURVE

Our memory starts strong. We learn a new fact, idea, skill or procedure in class and can understand and recall it. However, our memory decays exponentially over just seven days of not recalling this fact, idea, skill or procedure and we can't remember it. After two weeks all of the new knowledge has almost gone. How can we improve this curve? There is a solution called **Spaced Practice**. If we review information again multiple times, at set intervals from first learning it, every time we review the information we reset our memory back to one hundred percent.
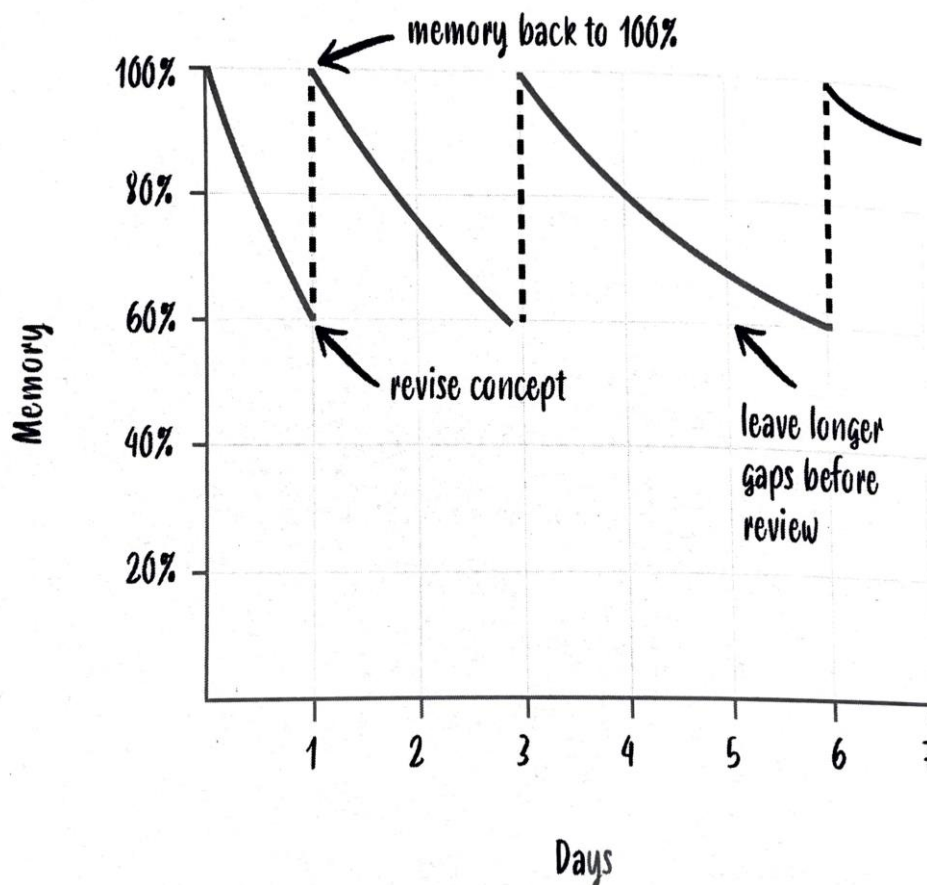
The idea is that we can 'catch' our memory, just as we are about to forget what we learned. In other words, we use the science behind forgetting to help us remember. The beauty about **Spaced Practice** is that the more we review a concept, the longer the gap we can leave before reviewing it again. Eventually the information becomes so ingrained in our long term memory that we can review it once a month, once every six weeks and so on. The secret is that **cramming doesn't work for long term memory retention**. We might remember most of what we have learned for a test the next day but this information won't be in our head for an exam we have to sit in six months' or even a year's time. Also since most subjects require us to build on knowledge and skills previously learned, putting something into our heads for just a short period of time, for example to pass a tracking test, is not only stressful but a complete waste of our time in the long run. The secret is not to cram for ten hours once in a while but to spread these ten hours out into much smaller revision sessions, over a longer period of time. Reviewing concepts for shorter periods of time with **Spaced Practice** is the scientifically backed secret to good grades and long term mastery of a subject.

Summary of Spaced Practice

● The Forgetting Curve shows ten hours spent cramming isn't as effective as ten hours spread out – it's not about revising for longer, just more frequently.

● The idea is that you catch your memory just as you're about to forget what you had learned.

● Every time you review something you reset your memory back to one hundred percent.

● The beauty of spaced practice is that the more you review a concept, the longer the gap you can leave before retrieving it again.

● Finally it becomes ingrained in long term memory and can be retrieved every month, then every six weeks and so on.

Active Retrieval

Stephen Kosslyn, a prominent psychologist and neuroscientist, split up human learning into two overarching maxims: *'Think it Through'* and *'Make and Use Associations'*. Both of these maxims capture principles of the science of learning that explain why certain revision techniques do (and don't) work. Firstly, we will deal with *'Think it Through'*. The idea is that the more we are forced to think deeply about a concept, the more we remember it. Turning over an idea in our head strengthens the synaptic connections in our brain, which are the gaps between neurons that allow the transfer of information. Continuously revisiting thoughts strengthens the neural pathways to assessing that information, just like being forced to recall facts is more beneficial than passively reading them on a page. The principle of *'Think it Through'* leads us to the **A** in **SAA**D revision: **Active Retrieval**. We don't like to think too hard, even when we revise. We prefer to reread our notes, highlight words or annotate text rather than stare at a blank page and actively write down our existing knowledge. It is human nature to look for shortcuts or an easier way. Without actively recalling information we will never actually know what we don't know.

Imagine looking at a page of notes. There is a fully labelled diagram and all the relevant definitions are neatly explained on the page. There is a step-by-step explanation of scientific processes, historical events or the analysis of a character in a novel. Everything we are reading makes sense, we understand the information and find ourself nodding along, but we are lulling ourself into believing we *know* the information, when we only understand it.

If you have ever done a Biology exam, you will know that it is one thing to understand a biological process but another to recall every step, with every keyword, without a single prompt. Yet this is what the mark scheme requires. In another type of question, we need to have that knowledge so automatically available in our brain that we can comfortably apply it to another similar bur slightly different process. Have you ever looked at your Maths teacher's neatly laid out solution and understood every single step she took, but when an exam question required you to solve another very similar calculation you have drawn a complete blank?

When we are passive in our revision techniques, it is easy, but we learn very little. When we employ active techniques, it is uncomfortable, challenging and requires mental effort, which is why it is the most effective use of our time.
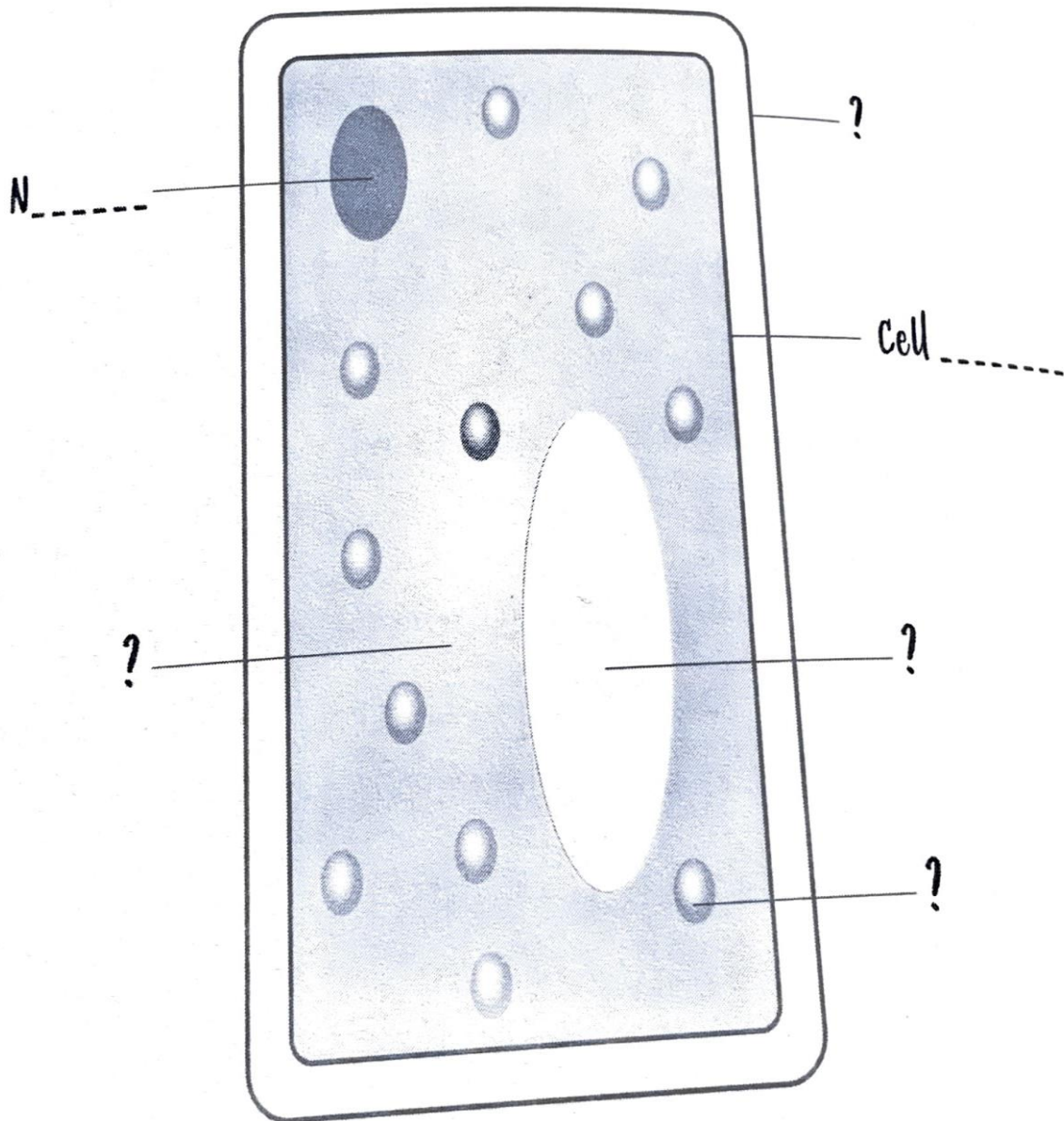
Let's look at an example of two sets of flashcards. The first one has a labelled diagram of a plant cell. You look over the diagram and check you know the details. Cell wall? Yes. Looks like a wall. Nucleus? Of course, easy, a black dot.

Flashcard 1

Nucleus

Cytoplasm

Cellulose Cell Wall

Cell Membrane

Vacuole

Chloroplast
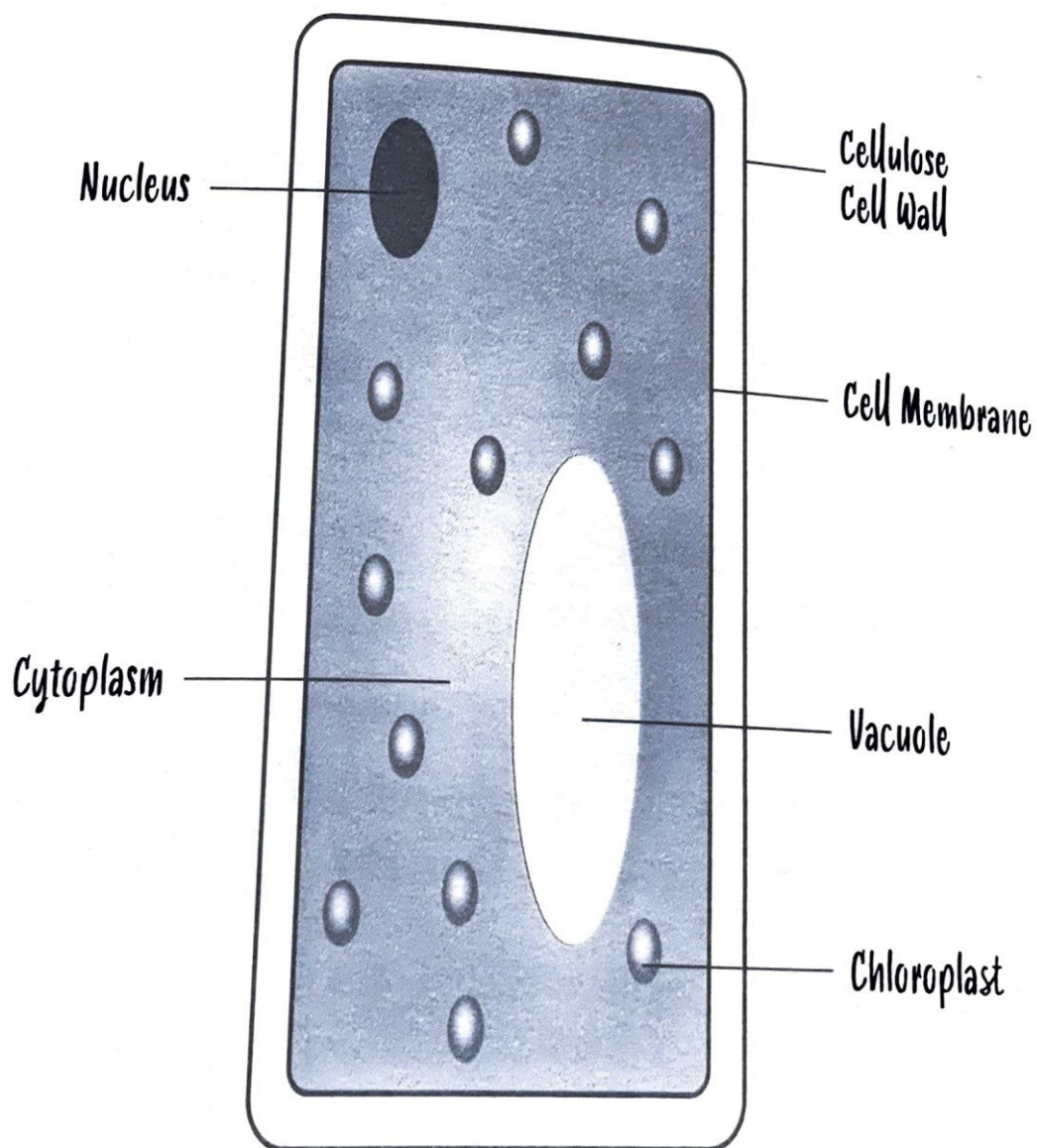
Flashcard 2

What type of cell is this?

N _ _ _ _ _

?

Cell _ _ _ _ _ _

?

?

?

Looking at the second flashcard - suddenly, with hardly any prompts, your brain has to actively recall the labels of the diagram and answer the question. This truly tests whether or not you know them.

Alternatively, on one side of the flashcard you could just write 'Draw and fully label a plant cell and explain what the cell wall is made of.' The answer would then be on the back of the flashcard, but each time you used it, you would scribble the answer down quickly on a piece of rough paper or write it on a white board. With simpler flashcards you could simply recite the answer aloud.

Before we move on, a quick question. Can you remember what the S stands for in **SAAD** revision? Have a think. Two words. One beginning with S. The other with P. Can you see why me asking is demonstrating use of this principle? If you can't remember, flick back now! I will be asking again soon.

Summary of Active Retrieval

- **Active Retrieval** is the act of **recalling** learned information (or a process) from memory, by writing it down or saying it aloud.

- **Active Retrieval** allows us to identify where there are gaps in our knowledge.

- **Active Retrieval** enhances and boosts learning because every time information is retrieved, or an answer is generated, the original memory becomes stronger, practice makes perfect.

- **Active Retrieval** strengthens connections between ideas.

- **Active Retrieval** improves transfer of knowledge to new contexts.

Associations

The second of Kosslyn's maxims, that he calls *'Make and Use Associations'*, fits into **Active Retrieval** but deserves its own mention. Why is it important? Information does not sit in our brains in isolation. We don't have an area of our brain that is reserved for historical dates, a part for equations or a group of neurons labelled 'French grammar'. Instead everything we learn is intertwined: One big ingenious mess of knowledge. Some people think that learning something distinctly different from what you already know will save you getting confused when in reality a powerful principle of learning, and therefore of revision techniques is being able to connect what we learn to existing knowledge: Making **Associations** and using and rehearsing them.

For example, when you meet someone new it can be difficult to remember their name at first, especially if you have just started a new school and everyone in your class is new to you. Picking each name one at a time and making an association to someone you know can really help. If the new name was Sarah Duke and your aunt was called Sarah, you might notice that this girl had really curly hair just like your aunt. If she also had good posture, you might think that she is quite regal like a duke, then the association if rehearsed and if strong enough would stick. Sometimes the sillier the mental image the better. For example, if one of the new people was called Jack Lockhart, you might remember two fairy tale characters, Jack from Jack and the Beanstalk and Goldilocks from Goldilocks and the Three Bears and imagine **Jack** marrying Goldi**lock**s and their life together being quite **hard** because of the interference of the 3 bears. Different associations will work for different people, that is why it is really beneficial to come up with your own. I always remember that the **CHARGE** that goes in at the top of the Blast Furnace is made up of three chemicals called **coke**, **limestone** and **iron ore**, because I imagine that I am in Tesco buying lots of highly coloured fizzy drinks for a children's party. I imagine that I buy **coke**, **lime**ade and **iron** bru and I know that when I get to the till the salesperson will **CHARGE** me.

If you can find a way to make your revision connected, meaningful and built upon past knowledge, you will create rich retrieval cues to prompt you. This is where long-term knowledge starts. Some prompts are so effective that they last for many, many years. I am sure most of your teachers remember the ancient tribal chant of **SOHCAHTOA**, that their Maths teacher shared to help them to remember some important trigonometry.

Dual Coding

Put simply, dual coding is the method of combining visuals and words. Our brain receives information through two channels, visual and auditory and so remembers information better because there are two prompts: visual and verbal. The chance for further associations with previous knowledge can also be utilised. For example, a drawing of a cation can help us remember that it is a positive ion.

Are you **pawsitive** cats are good? Too far?

Summary of Associations

● Making **Associations** allows us to 'hook'   new information on to existing knowledge and this helps new knowledge to stick.

● Making **Associations** between words and pictures is called **Dual Coding.**

● Examples of **Dual Coding** include timelines, diagrams, drawings, organisers and maps.

So to recap, our **SAAD** revision is starting to look a bit more **Spaced**, **Active** and **Associated**. Are we getting there?

Desirable Difficulty

As mentioned earlier, we love to look for shortcuts. We like to feel like we're doing hard work without actually thinking too much. This is why we need to check that our revision is **Desirably Difficult**.

If you dislike a subject, you probably find it hard. When I was at school I disliked learning Latin, mostly because I was very bad at it. I loved English Literature. I had an inspiring teacher and I found it easy to process the information taught, so I would find myself revising it much more than I needed to because it made me feel productive without too much commitment. I spent many enjoyable hours learning huge unnecessary chunks of Macbeth and pretending that I was working hard. Meanwhile, I would put off work in subjects that I found more difficult, instead of attacking it full on. I would hide from it and move the undone practice papers through my to-do list like I was shuffling cards.

Desirable Difficulty is about realising when we find something hard and deciding to do it anyway. The last thing we want to do is torture ourselves in our free time with subjects we find challenging but half the pain of revision is choosing to start. **SAAD** revision asks us to know our academic pain points and to attack them, rather than ignore them. We attack them with guns and flamethrowers and an army of flashcards. This is how we learn.

However, **Desirable Difficulty** is not just about choosing to revise the subjects that we find daunting. It is about asking ourselves during revision if we are actually having to think. More than simply doing active recall, question how hard you are finding it. If it's easy it is time to move on. Make it harder by **Interleaving**. This is a process that mixes topics, concepts, ideas or types of questions. This strategy includes mixing up retrieval questions from different topics to ensure that more than one topic is covered at a time and desirable difficulties are met. Varying the retrieval diet and switching between ideas ensures that we are not simply revising one area at one time. It supports revision and removes the potential danger of 'comfort zone learning'. Tackle

past paper questions once you have mastered content. You must seek out challenge if you want to excel. Getting better is not about just repeating what you confidently know. Ask and answer questions about **who**, **why**, **when** and **what**, as well as connecting the ideas to personal experiences, memories and daily life. Create real-world concrete examples to explain abstract ideas and check with your teacher that your thinking is correct. Having mastered content, **study mark schemes** so that you get to know the nuances of individual exam boards and how they want you to answer specific questions.

Most of all remember than exam grades do not define who you are, that making mistakes is part of the process of learning and that it is never too late to try again. Remember also that your teachers are here to help. They are one of your most valuable resources so make use of the help that they offer and don't forget to be grateful and to say thank you for all they do.

Summary of Desirable Difficulty

● **Desirable Difficulty** is about thinking harder so that we make more progress in our learning.

● **Desirable Difficulty** can be introduced by making retrieval practice more difficult and this is more beneficial for long-term learning.

● **Desirable Difficulty** is introduced when different topics are **interleaved** through one another. This is also called **switching**, and it forces us to make valuable connections between different topics.

PUT IT INTO PRACTICE

So now we know that there are four ways to really connect with the way we learn and that we can use every time we revise. Have you been doing sad, unhelpful revision? If so it is time to start doing **SAAD** revision.

We need to ask ourselves:

S: Spaced practice
 Am I repeating revision activities at spaced intervals?

A: Active retrieval
Am I revising actively? Am I thinking, or just reading?

A: Associations
Am I associating new information to knowledge I already have? How can I make links?

D: Desirable difficulty
Is this activity desirably difficult? Can I make it more challenging if necessary?

Most of these ideas are reiterated on the following YouTube site, if you would like some more information:

https://tinyurl.com/5d4a997r

Bibliography

The information in this booklet has been taken from the following resources:

*The Only Study Guide You'll Ever Need – **Jade Bowler***

*Make It Stick – **Peter C Brown***

*The Revision Revolution, how to build a culture of effective study in your school – **Helen Howell***

*Retrieval Practice – **Kate Jones***