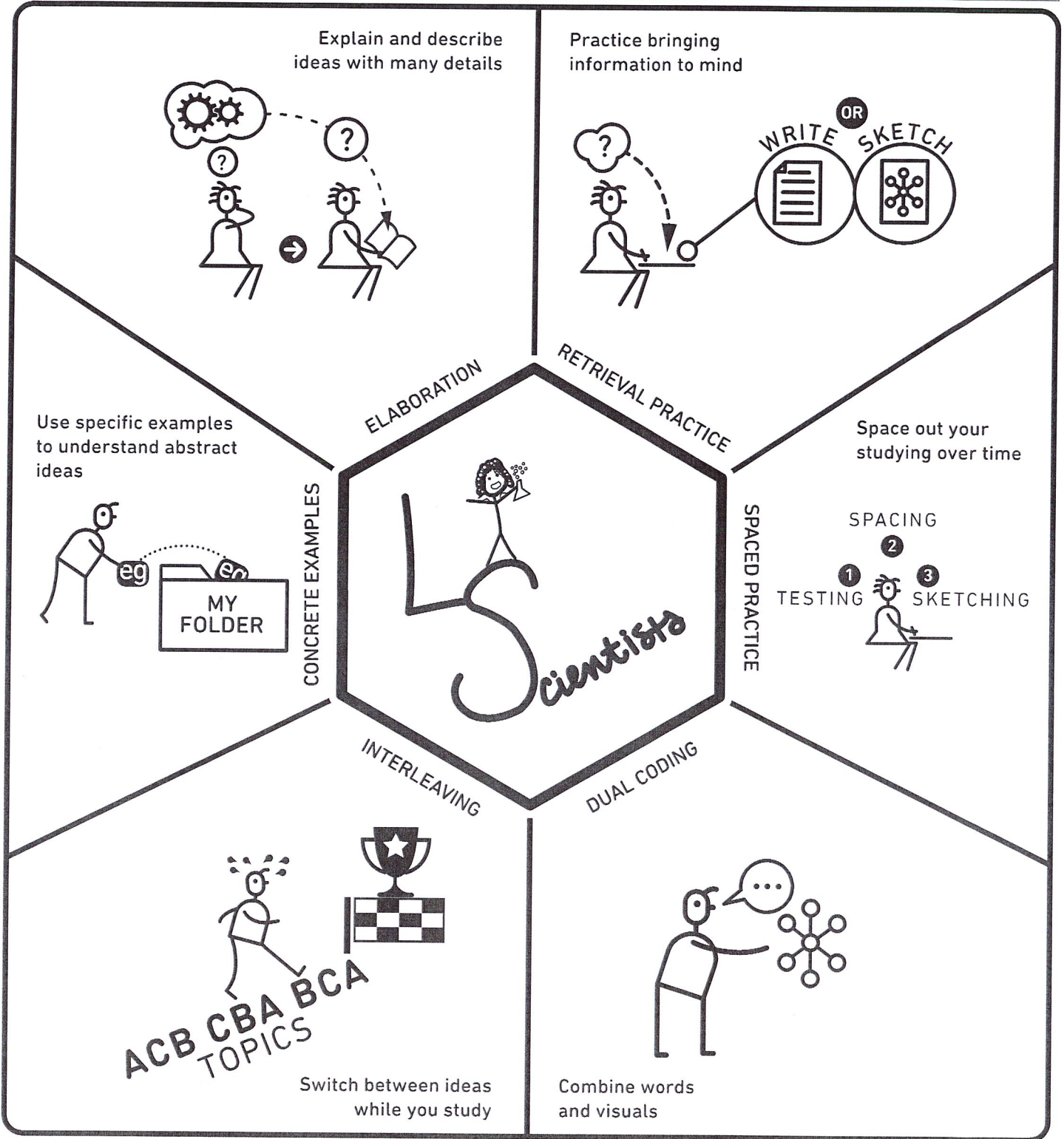




Six Strategies for Effective Learning

LEARNINGSIENTISTS.ORG

All of these strategies have supporting evidence from cognitive psychology. For each strategy, we explain how to do it, some points to consider, and where to find more information.





LEARN TO STUDY USING... Spaced Practice

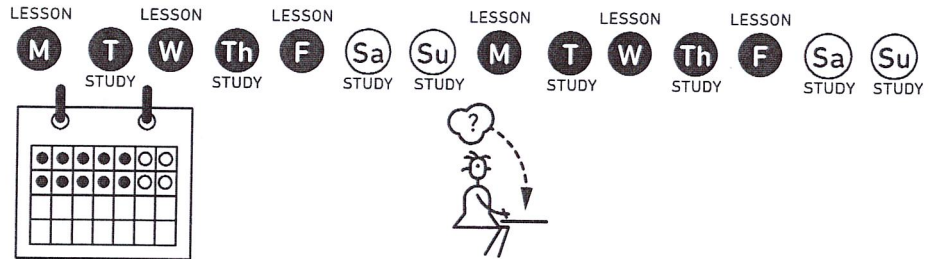
SPACE OUT YOUR STUDYING OVER TIME

LEARNINGSOCIETISTS.ORG

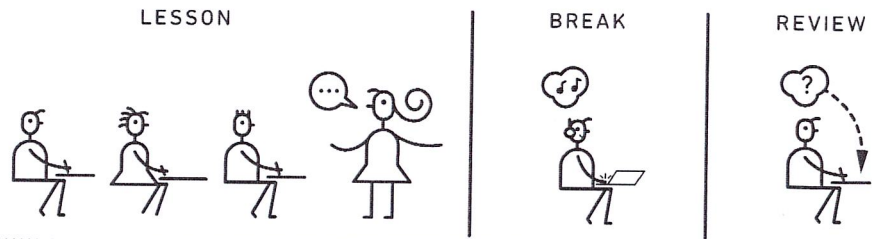


HOW TO DO IT

Start planning early for exams, and set aside a little bit of time every day. Five hours spread out over two weeks is better than the same five hours all at once.



Review information from each class, but not immediately after class.



After you review information from the most recent class, make sure to go back and study important older information to keep it fresh.



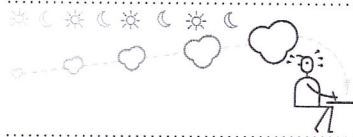
HOLD ON!

- 1 TESTING
- 2 SPACING
- 3 SKETCHING



When you sit down to study, make sure you are using effective study strategies rather than just re-reading your class notes.

This may seem difficult and you may forget some information from day to day, but this is actually a good thing! This forces you to retrieve information from memory (see Retrieval Practice poster).



Create small spaces (a few days) and do a little bit over time, so that it adds up!

RESEARCH

Read more about spacing as a study strategy

Benjamin, A. S., & Tullis, J. (2010). What makes distributed practice effective? *Cognitive Psychology*, 61, 228-247.



LEARN TO STUDY USING... Retrieval Practice

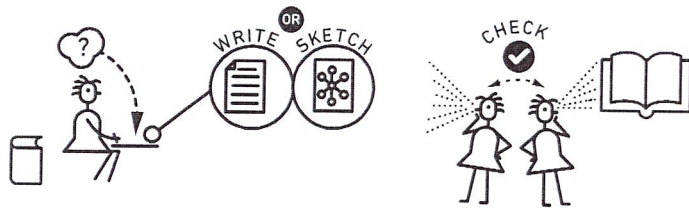
PRACTICE BRINGING INFORMATION TO MIND

LEARNINGSOCIETISTS.ORG

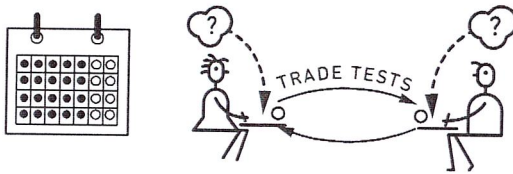


HOW TO DO IT

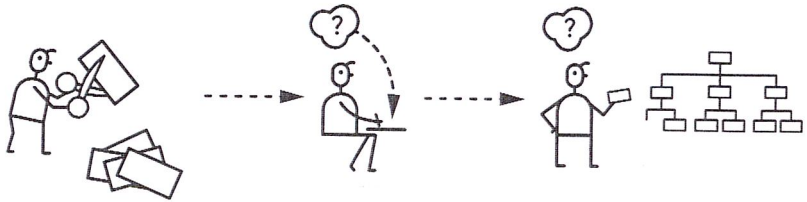
Put away your class materials, and write or sketch everything you know. Be as thorough as possible. Then, check your class materials for accuracy and important points you missed.



Take as many practice tests as you can get your hands on. If you don't have ready-made tests, try making your own and trading with a friend who has done the same.



You can also make flashcards. Just make sure you practice recalling the information on them, and go beyond definitions by thinking of links between ideas.



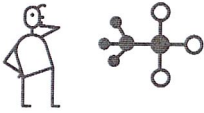
HOLD ON!



Retrieval practice works best when you go back to check your class materials for accuracy afterward.



Retrieval is hard! If you're struggling, identify the things you've missed from your class materials, and work your way up to recalling it on your own with the class materials closed.



Don't only recall words and definitions. Make sure to recall main ideas, how things are related or different from one another, and new examples.

RESEARCH

Read more about retrieval practice as a study strategy

Roediger, H. L., Putnam, A. L., & Smith, M. A. (2011). Ten benefits of testing and their applications to educational practice. In J. Mestre & B. Ross (Eds.), *Psychology of learning and motivation: Cognition in education*, (pp. 1-36). Oxford: Elsevier.



LEARN TO STUDY USING...

Elaboration

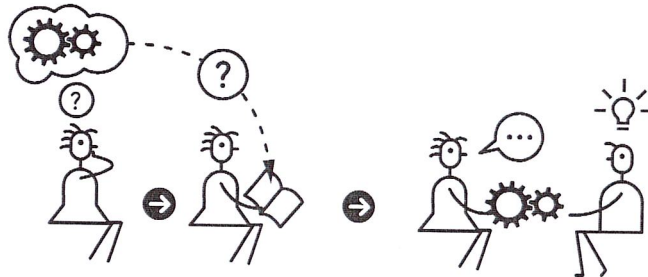
EXPLAIN AND DESCRIBE IDEAS WITH MANY DETAILS

LEARNINGSIENTISTS.ORG

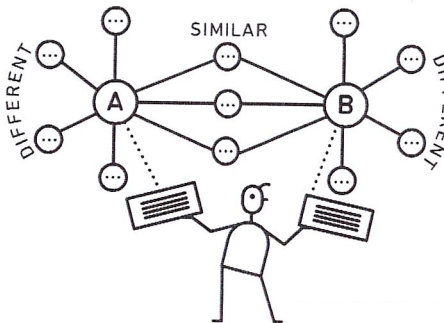


HOW TO DO IT

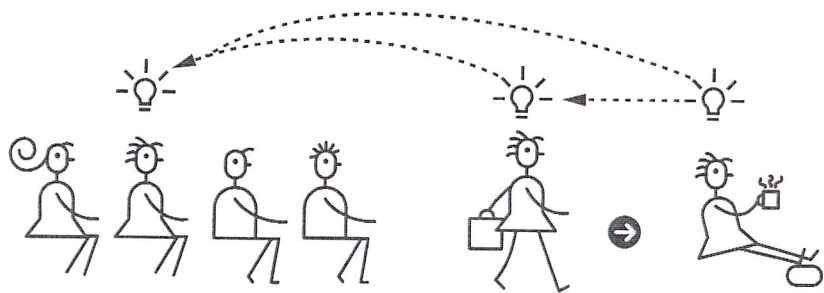
Ask yourself questions while you are studying about how things work and why, and then find the answers in your class materials and discuss them with your classmates.



As you elaborate, make connections between different ideas to explain how they work together. Take two ideas and think of ways they are similar and different.



Describe how the ideas you are studying apply to your own experiences or memories. As you go through your day, make connections to the ideas you are learning in class.



HOLD ON!



Make sure the way you are explaining and describing an idea is accurate. Don't overextend the elaborations, and always check your class materials or ask your teacher.



Work your way up so that you can describe and explain without looking at your class materials.

RESEARCH

Read more about elaboration as a study strategy

McDaniel, M. A., & Donnelly, C. M. (1996). Learning with analogy and elaborative interrogation. *Journal of Educational Psychology*, 88, 508-519.

Wong, B. Y. L. (1985). Self-questioning instructional research: A review. *Review of Educational Research*, 55, 227-268.



LEARN TO STUDY USING...

Interleaving

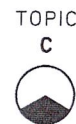
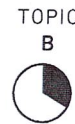
SWITCH BETWEEN IDEAS WHILE YOU STUDY

LEARNINGSOCIETISTS.ORG



HOW TO DO IT

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.

TOPICS
A B C



STUDY
SESSION
1

TOPICS
C B A



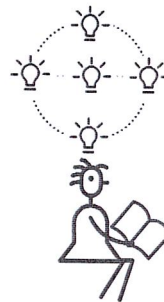
STUDY
SESSION
2

TOPICS
A C B



STUDY
SESSION
3

Make links between different ideas as you switch between them.



HOLD ON!



While it's good to switch between ideas, don't switch too often, or spend too little time on any one idea; you need to make sure you understand them.



Interleaving will feel harder than studying the same thing for a long time. But don't worry - this is actually helpful to your learning!

RESEARCH

Read more about interleaving as a study strategy

Rohrer, D. (2012). Interleaving helps students distinguish among similar concepts. *Educational Psychology Review*, 24, 355-367.



LEARN TO STUDY USING... Concrete Examples

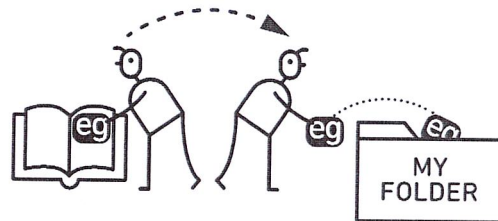
USE SPECIFIC EXAMPLES TO UNDERSTAND ABSTRACT IDEAS

LEARNINGSOCIETISTS.ORG

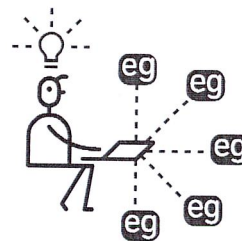


HOW TO DO IT

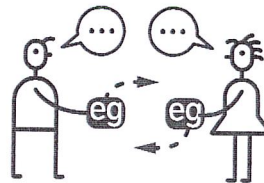
Collect examples your teacher has used, and look in your class materials for as many examples as you can find.



Make the link between the idea you are studying and each example, so that you understand how the example applies to the idea.



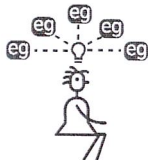
Share examples with friends, and explain them to each other for added benefits.



HOLD ON!



You may find examples on the internet that are not used appropriately. Make sure your examples are correct - check with your teacher.



Ultimately, creating your own relevant examples will be the most helpful for learning.

RESEARCH

Read more about concrete examples as a study strategy

Rawson, K. A., Thomas, R. C., & Jacoby, L. L. (2014). The power of examples: Illustrative examples enhance conceptual learning of declarative concepts. *Educational Psychology Review*, 27, 483-504.



LEARN TO STUDY USING...

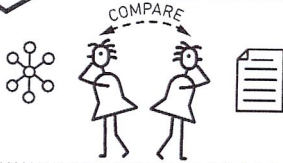
Dual Coding

COMBINE WORDS AND VISUALS

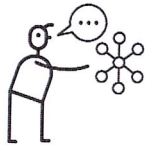
LEARNINGSCIENTISTS.ORG



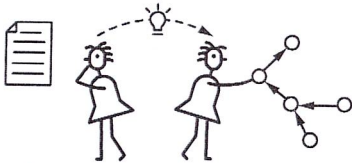
HOW TO DO IT



Look at your class materials and find visuals. Look over the visuals and compare to the words.



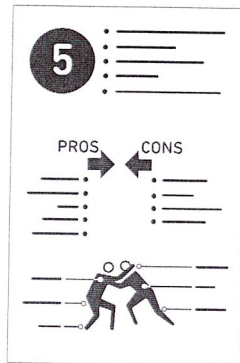
Look at visuals, and explain in your own words what they mean.



Take information that you are trying to learn, and draw visuals to go along with it.

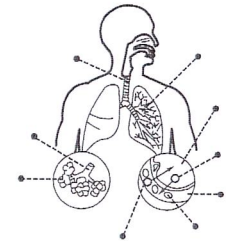
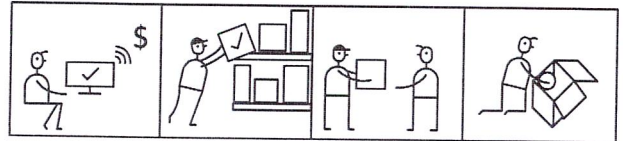
HOLD ON!

INFOGRAPHIC



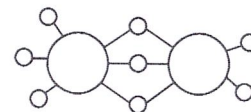
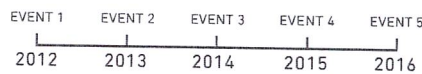
Try to come up with different ways to represent the information visually, for example an infographic, a timeline, a cartoon strip, or a diagram of parts that work together.

CARTOON STRIP



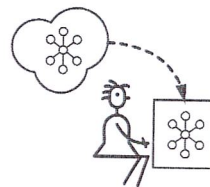
DIAGRAM

TIMELINE



GRAPHIC ORGANIZER

Work your way up to drawing what you know from memory.



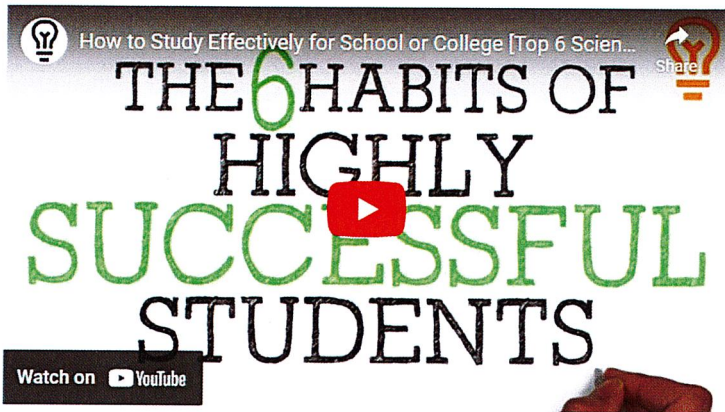
RESEARCH

Read more about dual coding as a study strategy

Mayer, R. E., & Anderson, R. B. (1992). The instructive animation: Helping students build connections between words and pictures in multimedia learning. *Journal of Educational Psychology*, 4, 444-452.

LEARNING SCIENTISTS ON YOUTUBE

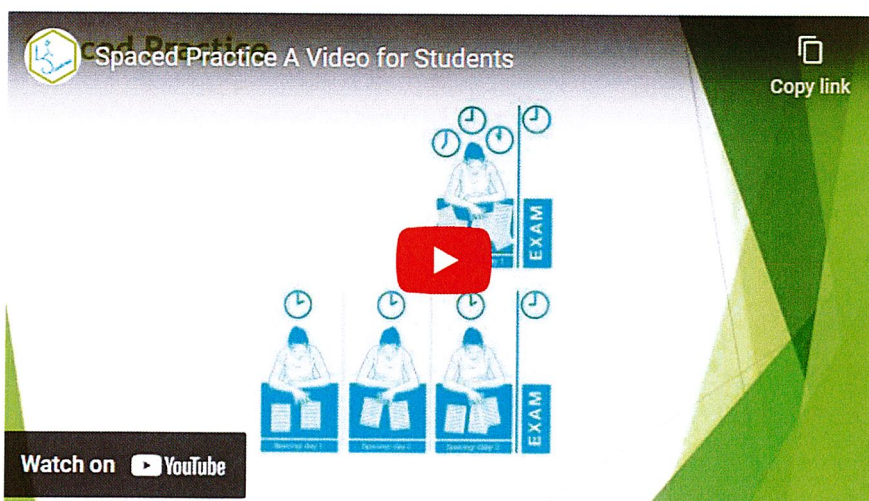
Overview of All Six Strategies



Each Technique in More Detail

Spaced Practice

Spaced Practice



Interleaving

Interleaving

The video player shows a slide titled "Interleaving" with three study sessions. Each session involves a student studying a set of topics (A, B, C) in a specific order. Below the sessions are three lightbulb icons labeled B, C, and A, representing the topics studied during each session. A red play button is centered over the second session. The video player interface includes a "Watch on YouTube" button at the bottom left and a "Copy link" button at the top right.



Elaboration

Elaboration

(Specifically, elaborative interrogation)

The video player shows a collage of four student portraits. A speech bubble from one of the students says, "We use science to figure out the best way to learn!". A red play button is positioned over the portraits. The video player interface includes a "Watch on YouTube" button at the bottom left, a "Copy link" button at the top right, and the website address "www.learningscientists.org" at the bottom.




Concrete Examples

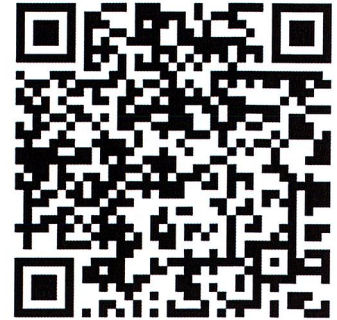

Concrete Examples

Algorithm

Definition: a set of rules or steps that leads to the solution of a problem or task



5:08





Dual Coding

Dual Coding

Dual Coding: A Video For Students

Copy link



Watch on  YouTube



Retrieval Practice

Retrieval Practice

