Cognitive Science and Executive Function Skills

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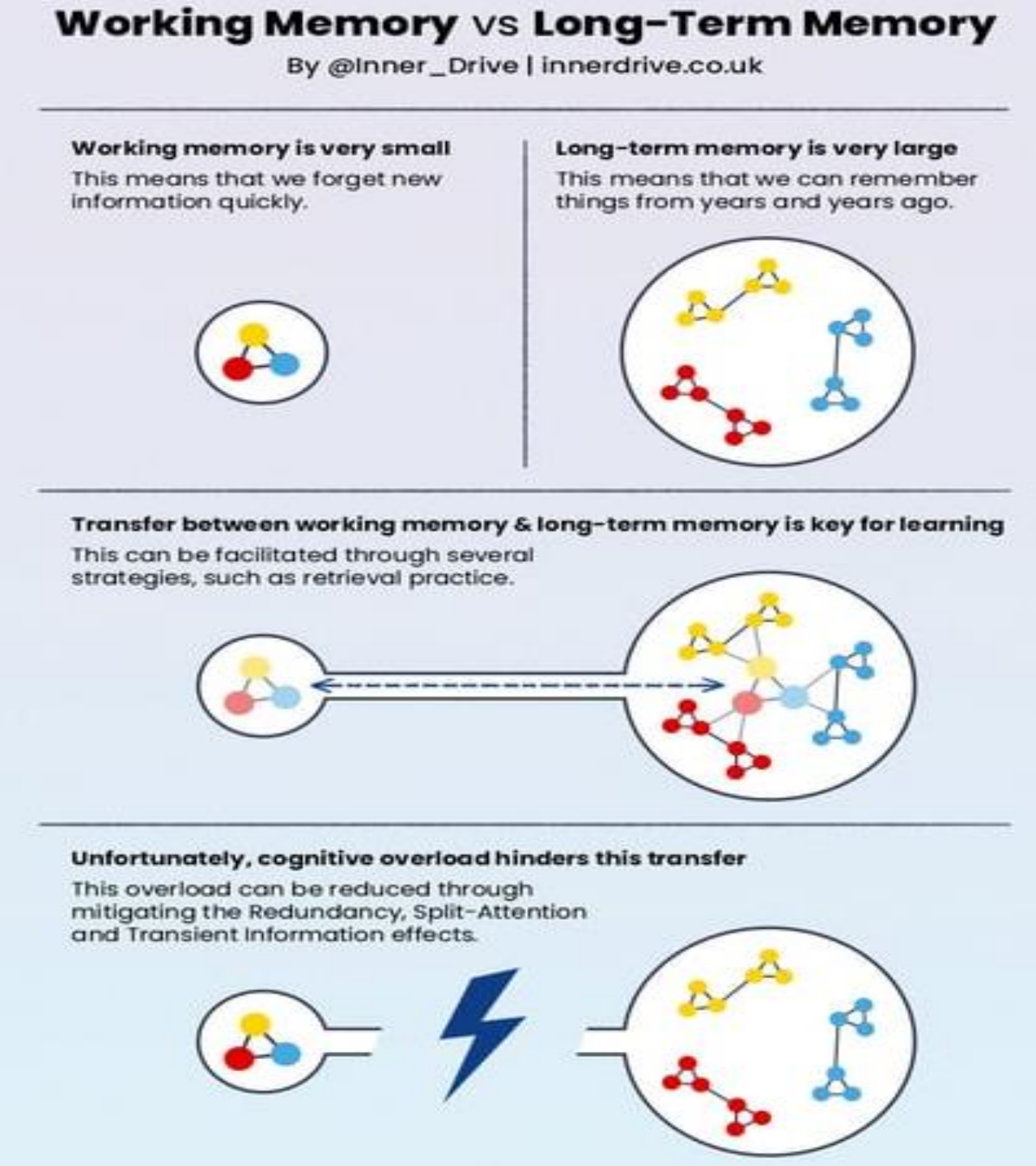
Some Cognitive Science

Cognitive science is the study of cognition, which refers to the mental processes involved with acquiring and understanding information.

Our memory


Working Memory vs Long-Term Memory
By @Inner_Drive | innerdrive.co.uk
Working memory is very small
This means that we forget new information quickly.
Long-term memory is very large
This means that we can remember things from years and years ago.
Transfer between working memory & long-term memory is key for learning
This can be facilitated through several strategies, such as retrieval practice.
Unfortunately, cognitive overload hinders this transfer
This overload can be reduced through mitigating the Redundancy, Split-Attention and Transient Information effects.

Short term memory

Short-term memory has a very short duration, only storing information for a brief period of time. Research suggests that this number is around **15 to 30 seconds**. Our short-term memory also has a very small capacity. Researcher George Miller suggested that people can only store around **7 items at a time** in this memory structure.

Long term memory

Long term memory allows us to learn information and has a huge capacity. It also has a massive duration, with memories being stored from a few days to decades.

Working memory

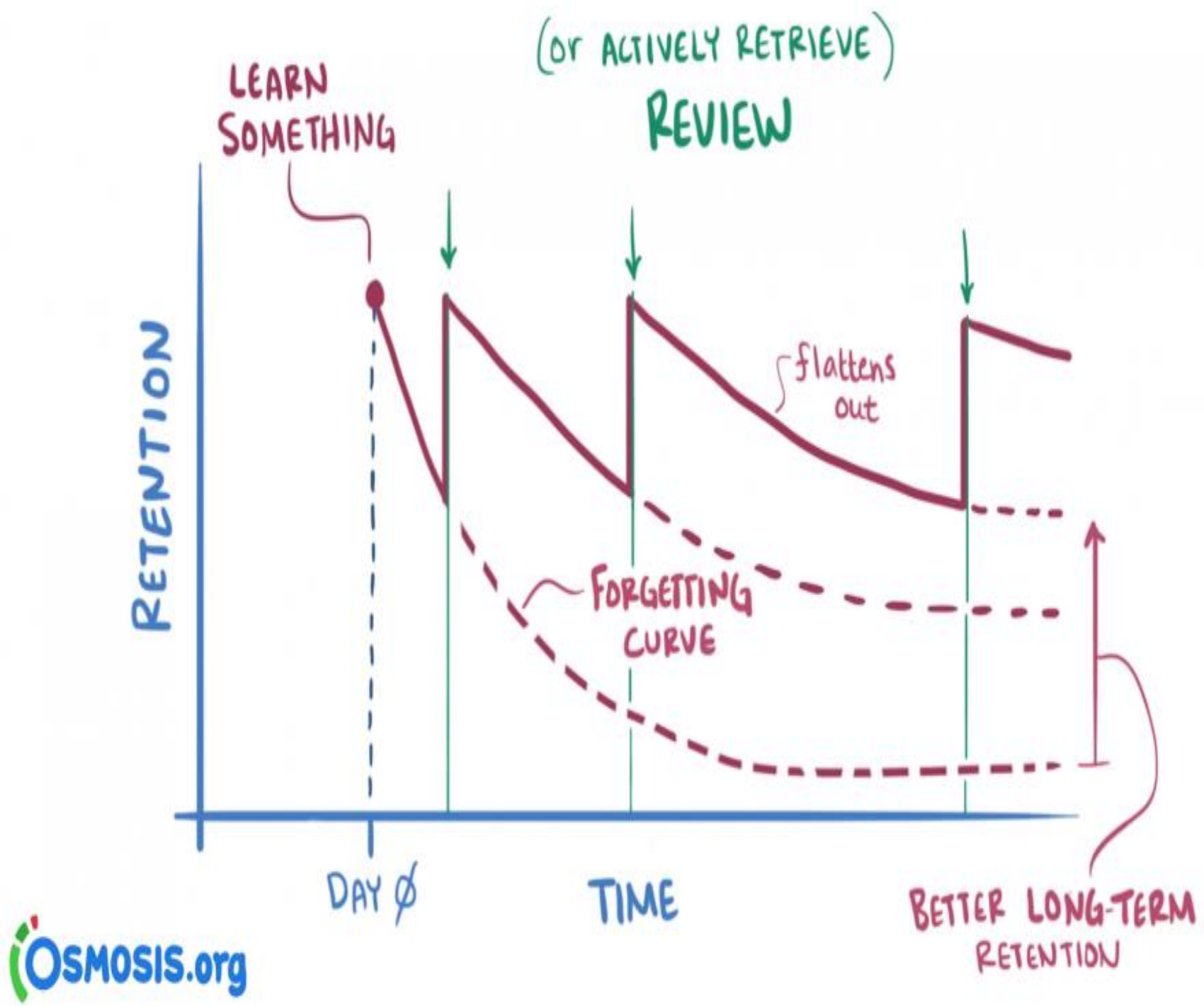
Working memory combines multiple components together and is used to plan and carry out behavior. It can be described as the ability to keep information 'online' in our minds, manipulate it and use it in some way.

Cognitive Load Theory highlights the limited capacity of our working memory. The theory suggests that we can only hold a certain amount of information in our working memory at one time, and processing too much information can lead to forgetting.

Managing cognitive load

Spacing

This is the idea that spacing out revision sessions when trying to learn information is more effective than revising all of the information in one go.



Retrieval Practice

Retrieval practice is a form of self-testing. It requires us to produce answers to questions that we are asked or that we ask ourselves. Retrieval practice boosts learning by pulling information **out** of students' heads, rather than cramming information into students' heads.

Dual coding is the process of blending both words and pictures while learning. This allows us to retain information in two different ways, resulting in better long memory.

Dual Coding

What are executive function skills?

Executive functions refer to a set of higher-level mental skills we use to control and coordinate our cognitive abilities and behaviours.

Task Initiation

The ability to begin projects without undue procrastination, in an efficient or timely fashion.

Response Inhibition

The capacity to think before you act; this ability to resist the urge to say or do something.

Flexibility

The ability to revise plans in the face of obstacles, setbacks, new information, or mistakes.

Organisation

The ability to create and maintain systems to keep track of information or materials.

Goal Directed Persistence

The capacity to have a goal, to follow through to completion, and not be put off or distracted.

Metacognition

The ability to stand back and take a bird's-eye view of yourself in a situation, to see how you problem solve.

Sustained Attention

The capacity to keep paying attention to a situation or task in spite of distractibility, fatigue, or boredom.

Planning & Prioritisation

The ability to create a roadmap to reach a goal or to complete a task. Also to make decisions.

Emotional Regulation

The ability to manage emotions to achieve goals, complete tasks, or regulate and direct behaviour.

Working Memory

The ability to hold information in memory while performing complex tasks.

Time Management

The capacity to estimate how much time one has, how to allocate it and how to keep within deadlines.

PLANNING

What should I do first, next and last?

DO YOU FIND YOURSELF...

- Rushing into a long piece of work and not planning it
- Not allowing enough time to meet deadlines
- Not completing tasks in a logical order

STRATEGIES

- Check your timetable, prep diary or Teams
- Create a mindmap or a 'To Do' list
- Give yourself thinking time before you start

SUCCESS WITH THIS SKILL

- You feel confident about starting and completing schoolwork
- You are on top of your workload

ORGANISING

Right thing.
Right place.
Right time.

DO YOU FIND YOURSELF...

- Having a satchel full of unnecessary equipment
- Bringing your cricket kit in when you have football
- Arriving at school without eating breakfast

STRATEGIES

- Keep your locker, bag or tray tidy
- Label your equipment
- Put your belongings in the correct place at home and at school

SUCCESS WITH THIS SKILL

- You remember to bring in your homework on the correct day and hand it in
- You have the right equipment in your bag for today's lessons

MEMORY

Strategies to help me to remember

DO YOU FIND YOURSELF...

- Forgetting books for class / thinking you haven't got an item and finding it in your bag after all
- Not looking at the board for instructions
- Forgetting correct spellings or facts after you have learned them

STRATEGIES

- Use mnemonics (eg. **N**ever **E**at **S**hredded **W**heat to remember North, South, East, West)
- Write lists
- Revise and consolidate learning

SUCCESS WITH THIS SKILL

- You remember to revise for a test
- You ensure that all your equipment is packed and ready to use

FOCUS

Remaining on task and not becoming distracted

DO YOU FIND YOURSELF...

- Feeling overstimulated just after play time?
- Being unsure of what the task is, or where to find it?
- Feeling stressed or upset after an event, perhaps unable to get it out of your thoughts?

STRATEGIES

- Make sure you are aware of the tasks and seek help from your teacher
- Ensure you are in the correct 'zone' to learn
- Recognise what, or who, distracts you and distance yourself from them or the object

SUCCESS WITH THIS SKILL

- You can stay on task during a Science experiment regardless of what your peers are doing
- You can complete your homework in a busy household

EMOTIONS

Use your head and your heart

DO YOU FIND YOURSELF...

- Taking offence too quickly
- Calling out in class
- Saying something out loud even though it is rude (blurting out)

STRATEGIES

- Reflect on your actions
- Verbalise how you're feeling
- Take time out before responding or ask to put something 'on hold'

SUCCESS WITH THIS SKILL

- You can work through a difficult situation and verbalise how you are feeling
- You walk away from a situation that is making you feel really angry to have a time out

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Strategies to help me to remember

EMOTIONS

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ORGANISING

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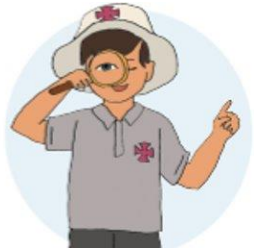

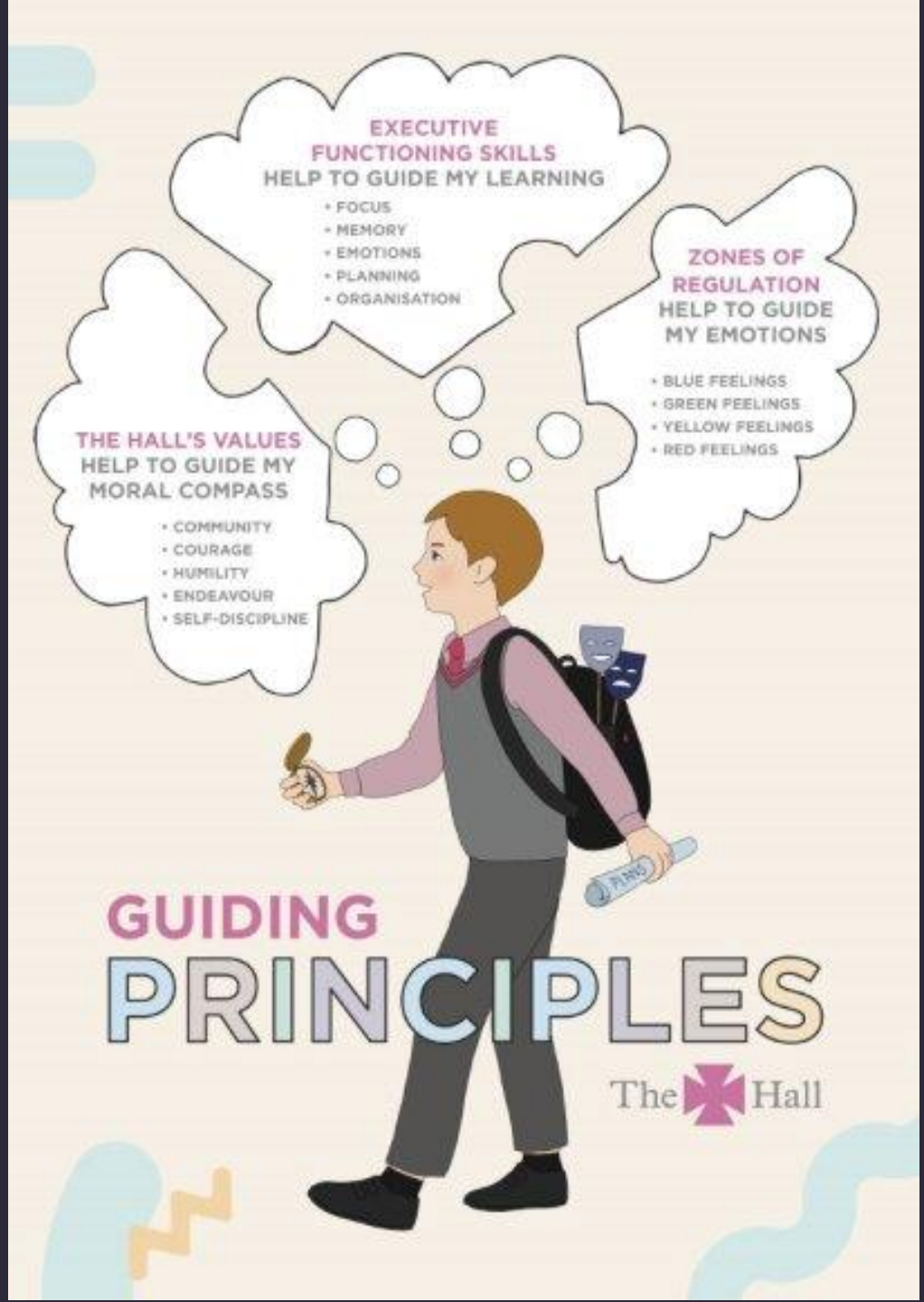
EXECUTIVE FUNCTIONING SKILLS HELP TO GUIDE MY LEARNING
• FOCUS
• MEMORY
• EMOTIONS
• PLANNING
• ORGANISATION
ZONES OF REGULATION HELP TO GUIDE MY EMOTIONS
• BLUE FEELINGS
• GREEN FEELINGS
• YELLOW FEELINGS
• RED FEELINGS
THE HALL'S VALUES HELP TO GUIDE MY MORAL COMPASS
• COMMUNITY
• COURAGE
• HUMILITY
• ENDEAVOUR
• SELF-DISCIPLINE
GUIDING
PRINCIPLES
The Hall

Sources/further reading

How the human memory works (braingymmer.com)

A beginner's guide to cognitive science (innerdrive.co.uk)

ADHD & Executive Function Coaching Specialists | Connections in Mind

Dual coding: A teacher's guide (structural-learning.com)

What is retrieval practice? – Retrieval Practice

Spaced Learning (teachwithmrst.com)

What's the difference between short-term, working and long-term memory? (innerdrive.co.uk)

8 Ways to Reduce Cognitive Load in Children (thechaosandtheclutter.com)