




# Metacognition, Memory and Recall



# Filter?



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@taylor\_teacher

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- DRAGONFLY APP •

You will be able to receive educational updates, access inspirational blogs, download well-being tips, resources and enjoy a quick and easy way to view and book a Dragonfly course. Plus receive alerts for early-bird and loyalty booking discounts.



**Dragonfly**  
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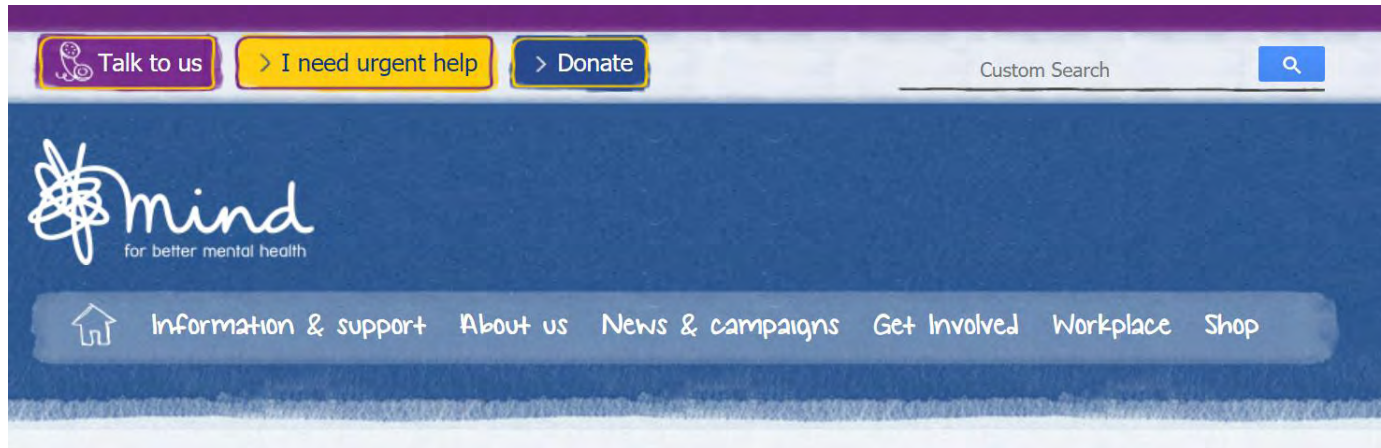
**Re:vision**  
Dragonfly's unique perspective on the teaching landscape

ABOUT US

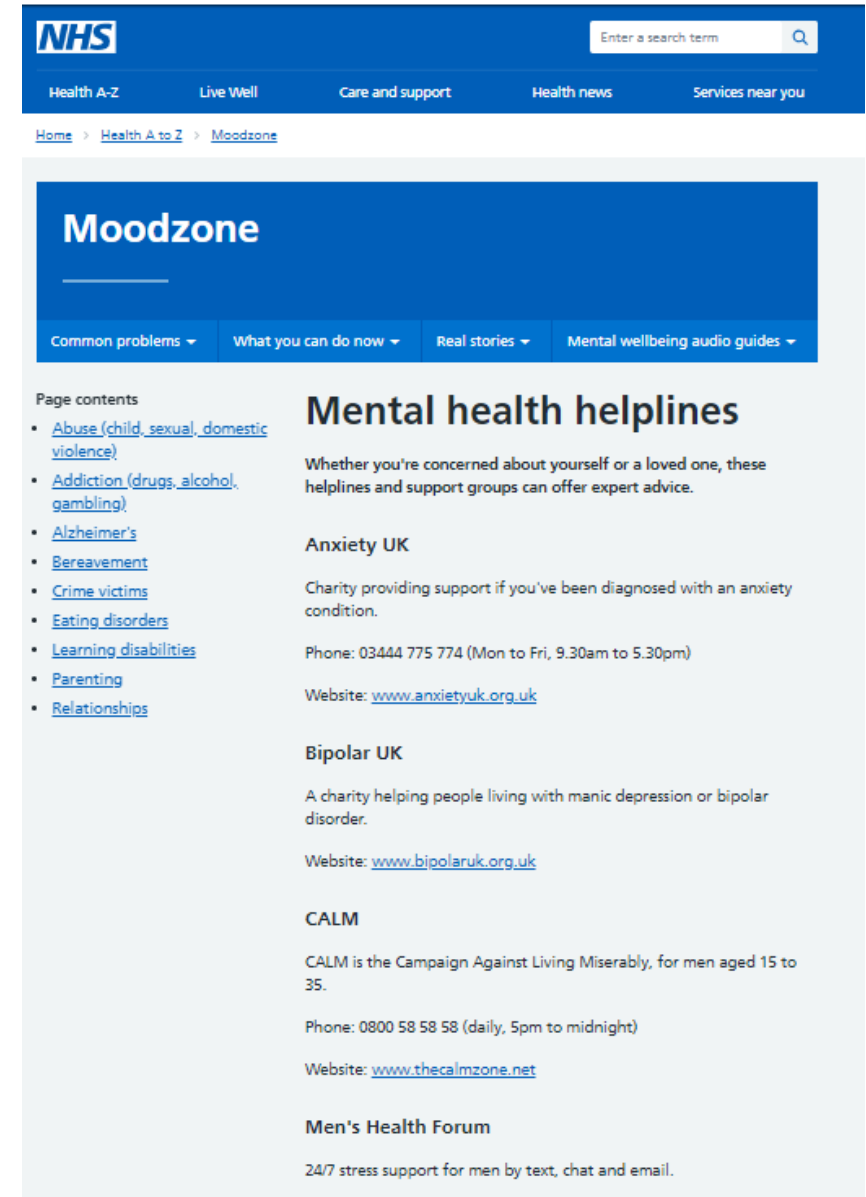
VENUE DATES

Educational Insights and Updates

## mind.org.uk



## headstogether.org.uk



## Fighting for young people's mental health

We're leading the fight for a future where all young minds are supported and empowered, whatever the challenges

[Who We Are](#) >

#FightingFor  
**YOUNGMINDS**

## YoungMinds Crisis Messenger

If you are a young person experiencing a mental health crisis, you can text the YoungMinds Crisis Messenger for free, 24/7 support.

[YoungMinds Crisis Messenger](#)

[How does it work?](#)





# Dragonfly

TRAINING



over 300,000 teachers trained



at more than 5,000 schools



in over 50 countries

Proud to be working with:



# Who is Dave Taylor?



Secondary English teacher

Head of English

Assistant Headteacher T&L

Deputy Headteacher (x2) T&L

Vice Principal of MAT (primary and secondary)

Director of MAT (primary and secondary)

English teacher, consultant and trainer

- Discover how educators can harness the ‘plasticity’ of the teenage brain to improve knowledge retention and linear exam performance
- Examine classroom practice and whole-school strategies which optimise neural health, knowledge retention and effective revision and recall for your students
- Synthesise the research evidence on effective revision practices with the practical experience of how to embed best practice in your classroom and your school
- Acquire a variety of practical activities and resources to share with students, parents and colleagues to ensure knowledge is retained and retrieved by your students

If you understand how your students' brains store and recall information, and use that understanding to help them learn, revise and prepare for exams, they will achieve significantly higher grades across their subjects





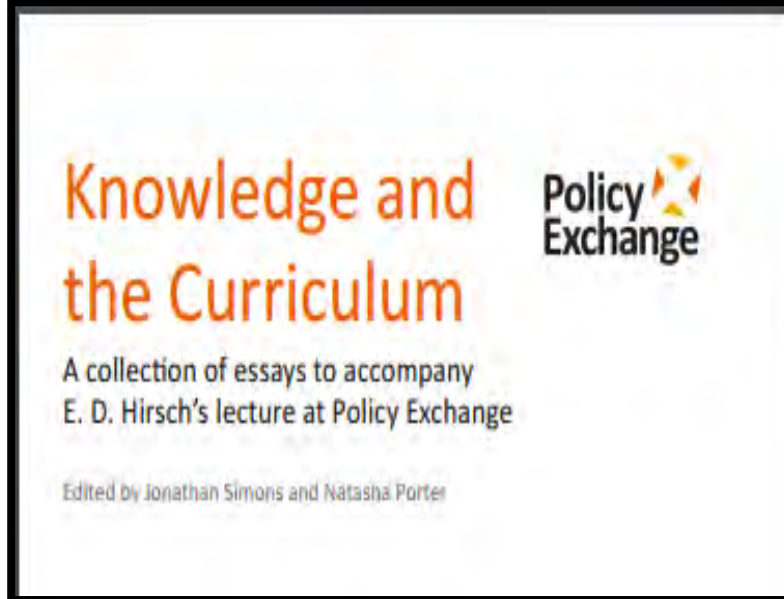
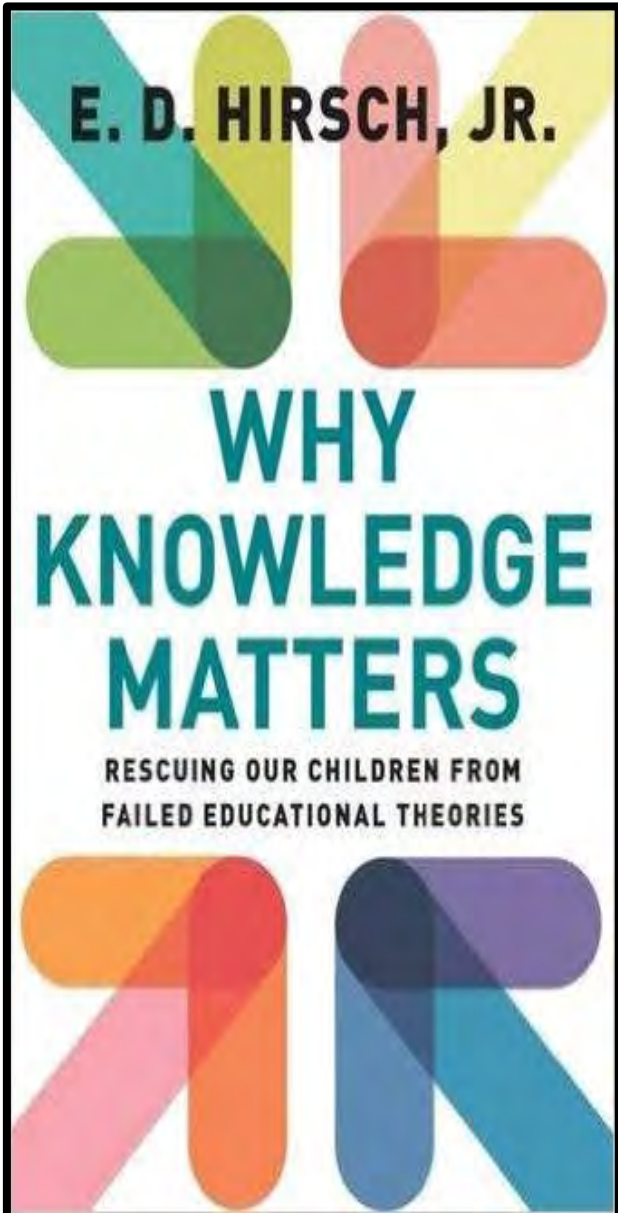
Myelination

Semantic

Rosemary

Schema

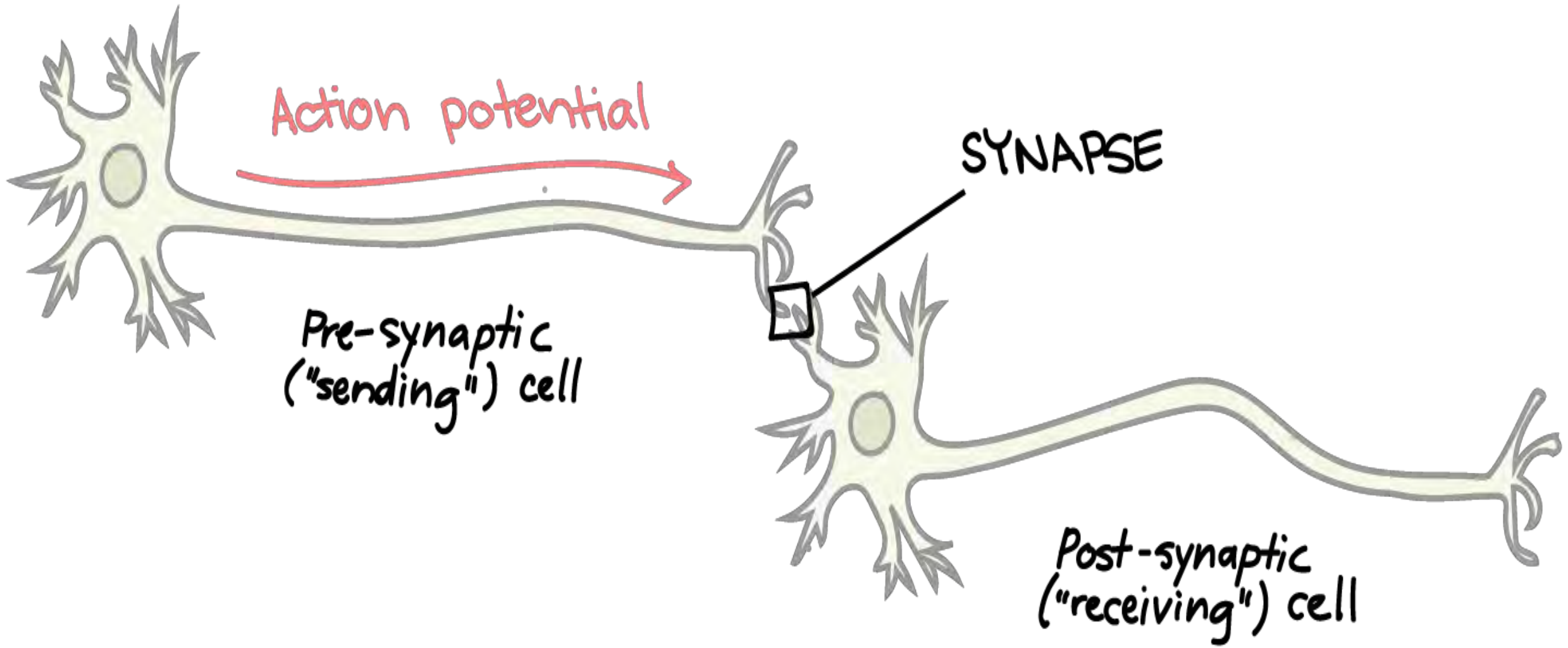
Elaboration



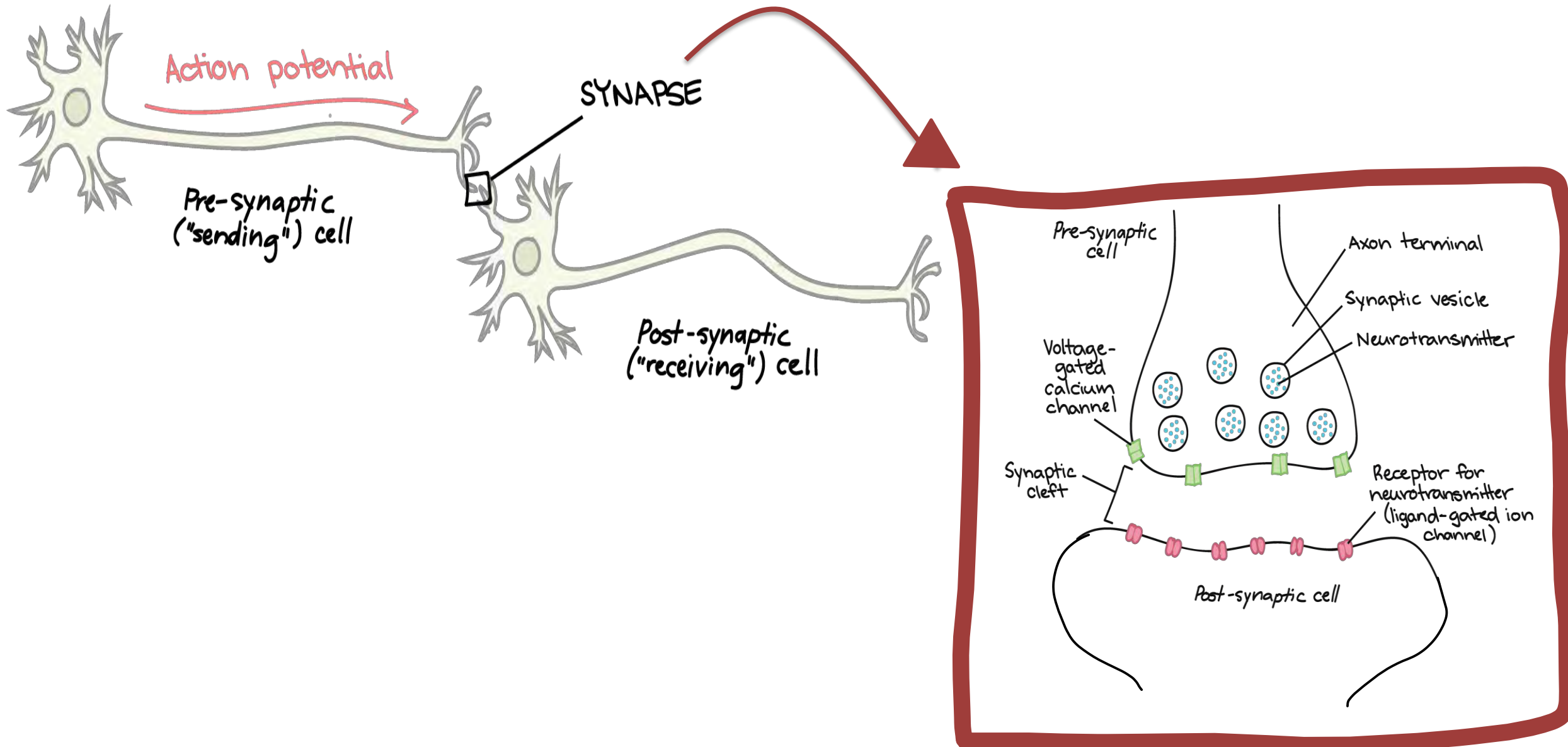
- Curriculum designed around the 'acquisition and retention of knowledge'
- Shift away from Coursework & Controlled Assessment
- Reduce modules & AS Levels
- 'Harder' grading systems
- More closed-book exams & fewer formula sheets



# What *'is'* knowledge?



# Evidence-based practice to improve Memory, Retention and Recall



# Evidence-based practice to improve Memory, Retention and Recall

## ADRENALINE

Fight or flight neurotransmitter



Produced in stressful or exciting situations. Increases heart rate & blood flow, leading to a physical boost & heightened awareness.

## DOPAMINE

Pleasure neurotransmitter



Feelings of pleasure, and also addiction, movement, and motivation. People repeat behaviours that lead to dopamine release.

## SEROTONIN

Mood neurotransmitter



Contributes to well-being & happiness; helps sleep cycle & digestive system regulation. Affected by exercise & light exposure.

## ACETYLCHOLINE

Learning neurotransmitter



Involved in thought, learning, & memory. Activates muscle action in the body. Also associated with attention and awakening.

## GLUTAMATE

Memory neurotransmitter



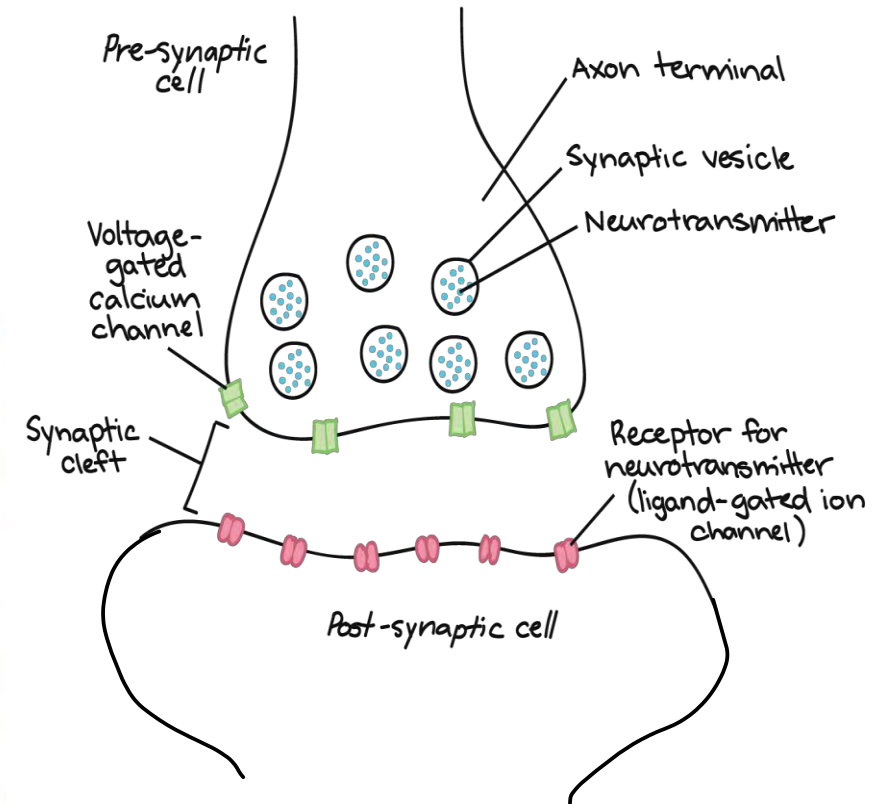
Most common brain neurotransmitter. Involved in learning & memory, regulates development & creation of nerve contacts.

## ENDORPHINS

Euphoria neurotransmitters



Released during exercise, excitement, & sex, producing well-being & euphoria, reducing pain. Biologically active section shown.



## ACETYLCHOLINE

Learning neurotransmitter



Central to 'thought', learning and memory.  
Also associated in attention and awakening.  
Central to the study of dementia.

## GLUTAMATE

Memory neurotransmitter



The most common brain neurotransmitter.  
Involved in learning and memory, regulates  
development and creation of nerve contacts.

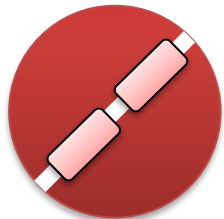
# Three Key Learning Processes



**Proliferation** - New synaptic networks form and get consolidated with repetitive exposure

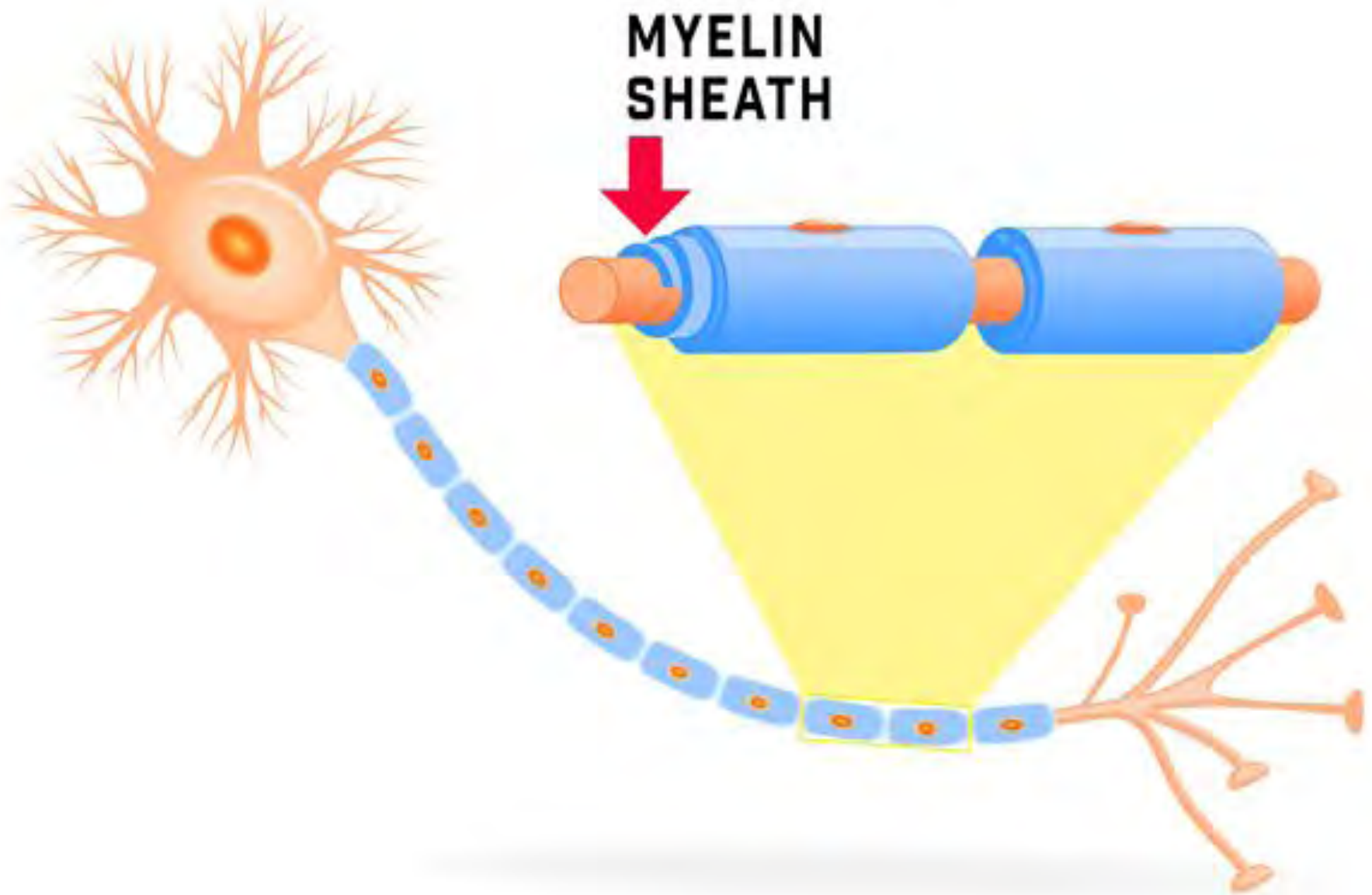


**Elimination** – Synaptic networks will be ‘pruned’ unless consolidated



**Myelination** - Consolidated networks build insulation (myelin) that makes the synaptic network faster and more efficient





Draw a house



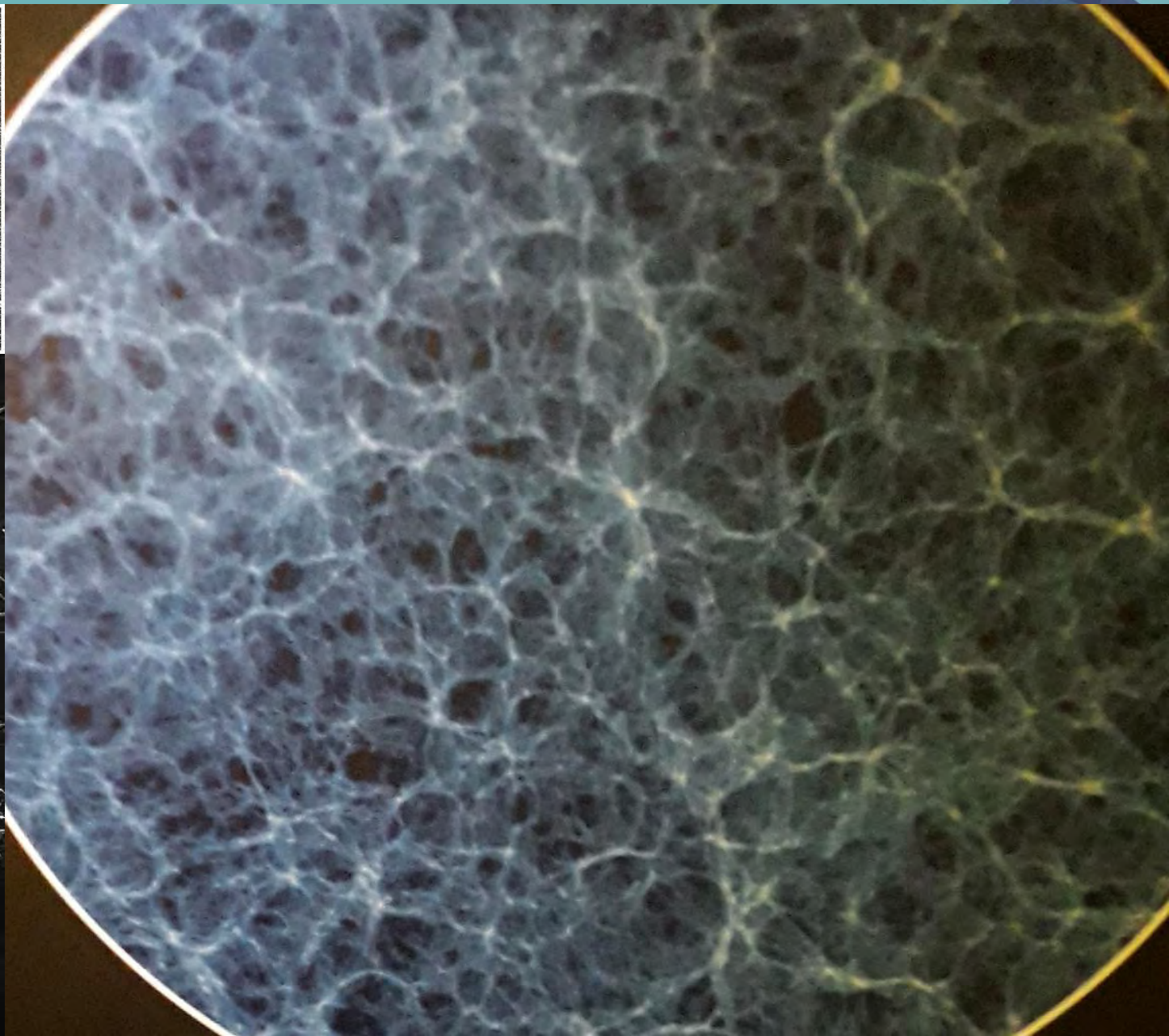
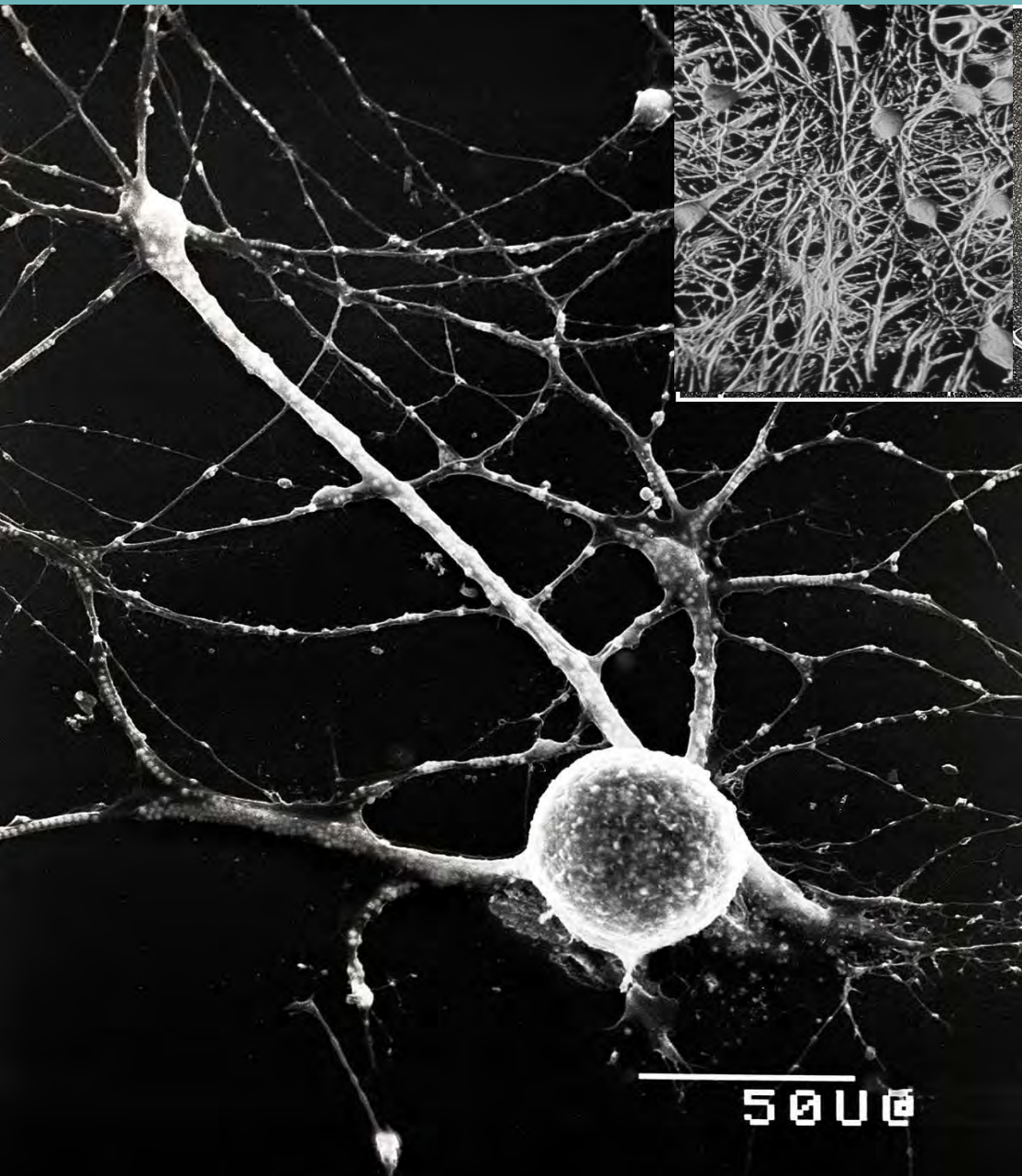
Draw the house you grew up in...

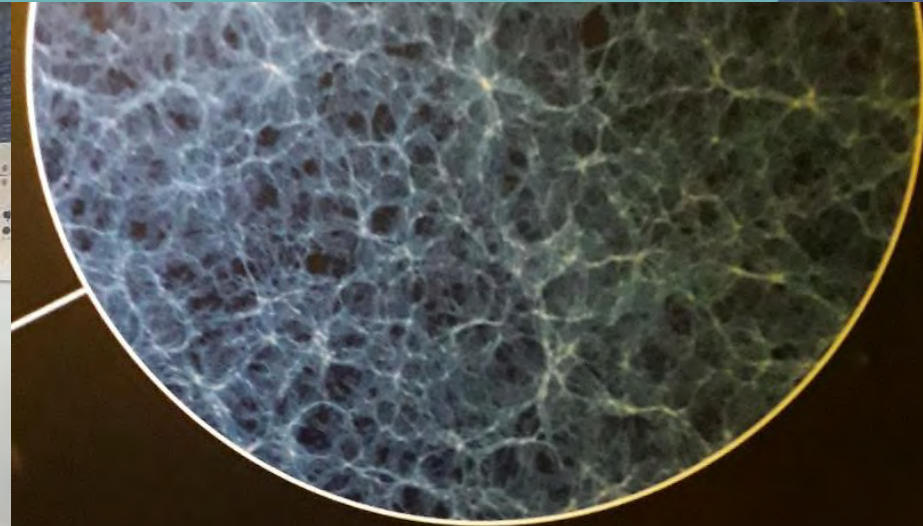


# Evidence-based practice to improve Memory, Retention and Recall



# Evidence-based practice to improve Memory, Retention and Recall





100 million light-years

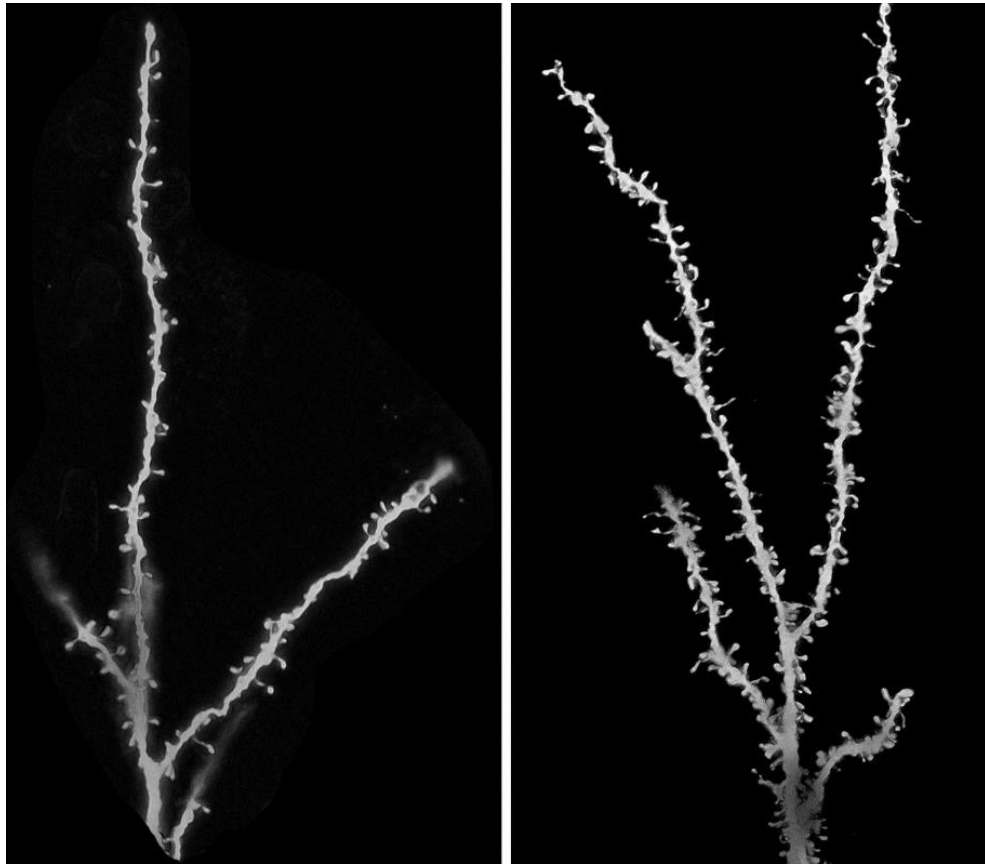
## COSMIC WEB

Superclusters lie along filaments, separated by immense voids, forming a sponge-like web of cosmic matter.

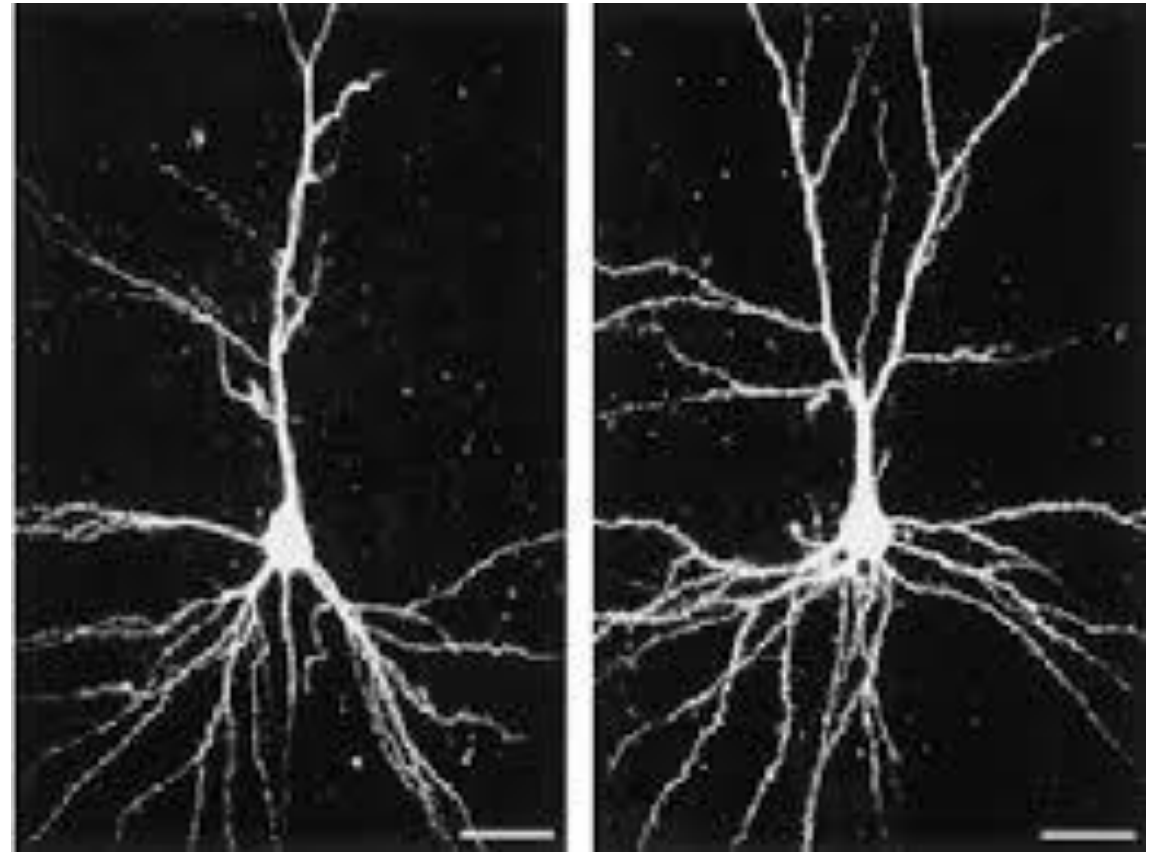
This cosmic web formed from the dense pools of matter that clumped together shortly after the Big Bang.



## Autism and synaptic 'pruning'

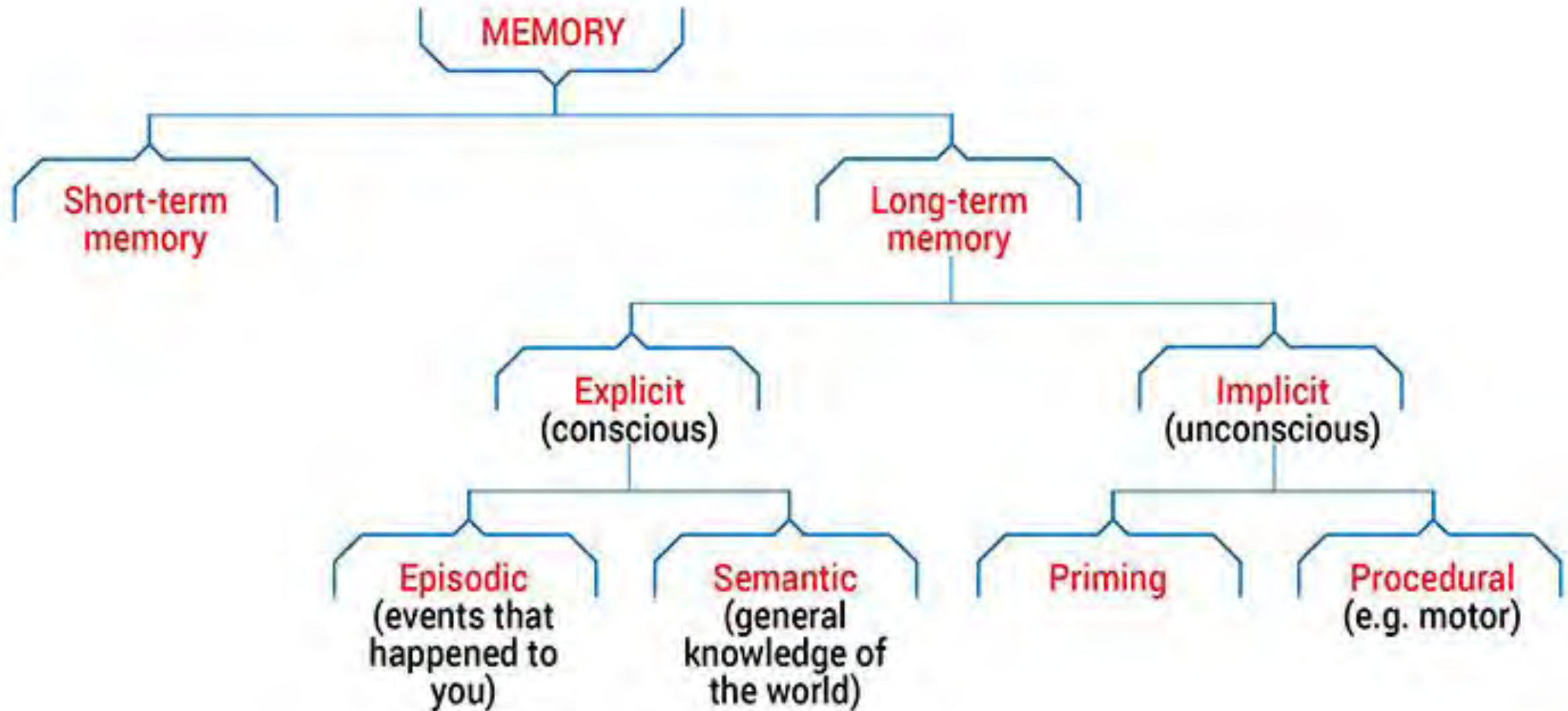


Neurotypical synaptic activity

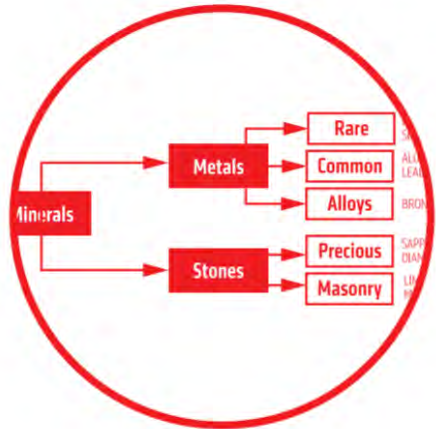


Autistic synaptic activity

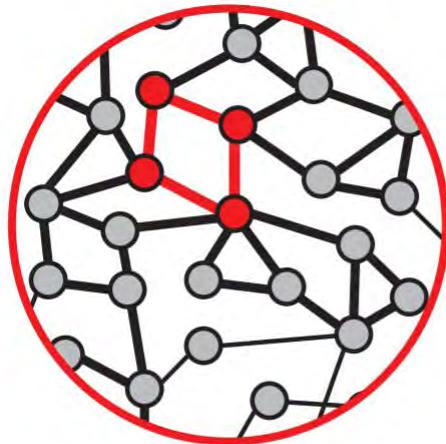








BOWER et al, 1969



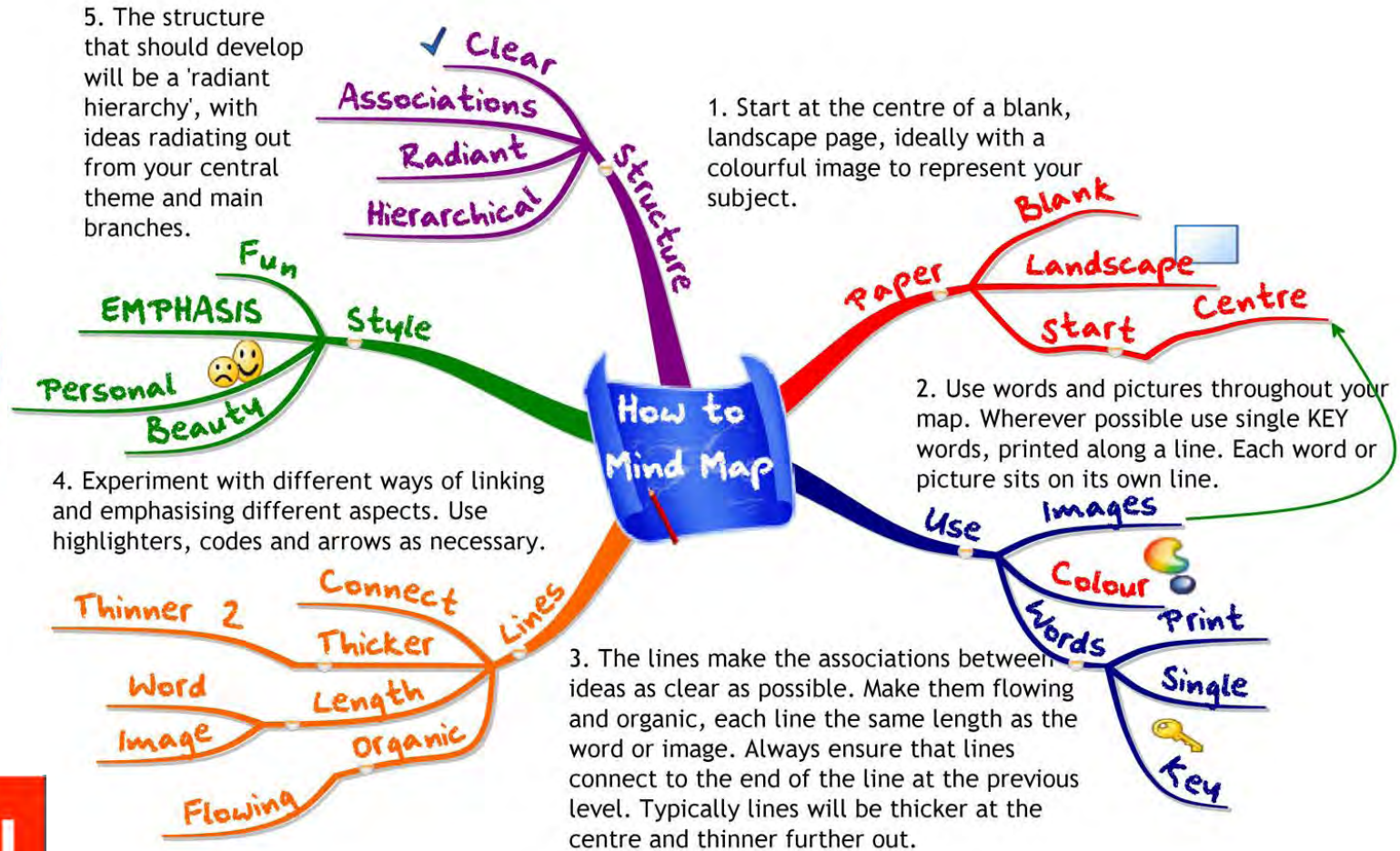
EFRAT FURST, 2018



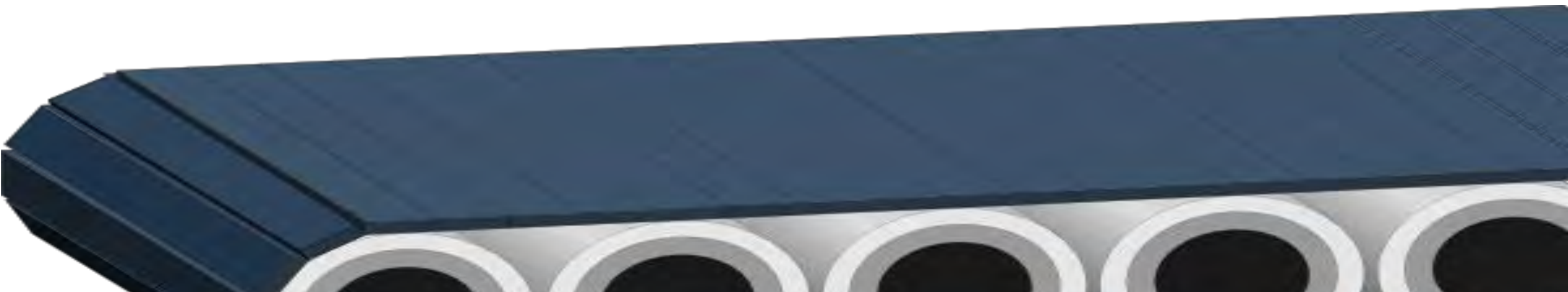
DAVID DIDAU, 2018



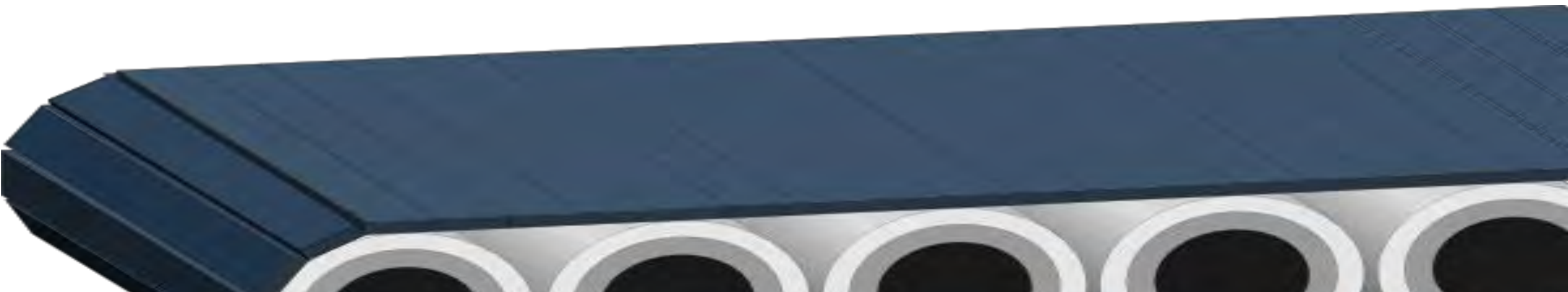
5. The structure that should develop will be a 'radiant hierarchy', with ideas radiating out from your central theme and main branches.



# Evidence-based practice to improve Memory, Retention and Recall



# Evidence-based practice to improve Memory, Retention and Recall



*Making  
Learning  
Stick*

*Ideas For  
students*

# Make Learning Stick – For Students

## #1 Get Organised

- Avoid multi-tasking
- Block distractions
- Plan what you are memorising
- Set time and quantity limits



# Revision Timetable - February

- Maths
- En Lan
- En Lit
- Chem
- Physics
- Bio
- Span
- Hist
- Art

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1	Maths	En Lan		Span	Maths	Hist	Art
2	Hist	Chem		En Lit	Bio	Physics	Art
3	Span	Maths		Bio	Chem	Chem	
4	En Lit	Physics		En Lan	En Lit	Maths	
Bonus							
Reward	Xbox	Film	Netball	Film	Pizza	Out!	Ice Skating

# Evidence-based practice to improve Memory, Retention and Recall

**REVISION**

\* = revise if possible  
// = no revision/break

TIME	MON	TUES	WED	THURS	FRI	SAT	SUN
8:30-4:30	school	school	school	school	school	*	*
4:30-5:00	media	chemistry	media	maths	english	maths*	//
5:00-5:30	english	chemistry	media	maths	english	maths*	//
5:30-6:00	//	//	maths	english	media	//	//
6:00-6:30	english	english	//	//	//	//	//
6:30-7:00	maths	english	//	//	chemistry	//	//
7:00-7:30	//	//	english	chemistry	//	*	biology
7:30-8:00	//	//	physics	chemistry	//	*	media
8:00-8:30	maths	biology	//	//	chemistry	english	//
8:30-9:00	maths	maths	maths	biology	physics	english	//
9:00-9:30	//	//	//	//	//	//	//
9:30-10:00	biology	maths	biology	biology	phys*	//	//
10:00-10:30	media	physics	biology	media	phys*	//	//







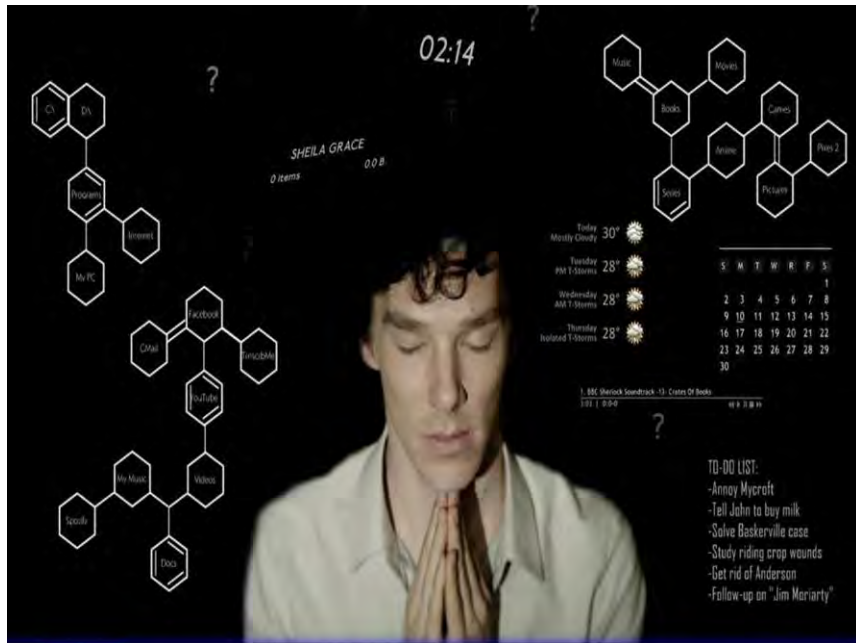
# Make Learning Stick – For Students

## #2 Find Your Techniques

- Practise a range of memory techniques to see which ones work best for you.



## Memory Palaces



Kings	Play	Chess	On	Fine	Glass	Sets
K I N G D O M	P H Y L U M	C L A S S	O R D E R	F A M I L Y	G E N U S	S P E C I E S

## Mnemonics

$H_2 \rightarrow$ Hydrogen $N_2 \rightarrow$ Nitrogen $F_2 \rightarrow$ Fluorine $O_2 \rightarrow$ Oxygen $I_2 \rightarrow$ Iodine $Cl_2 \rightarrow$ Chlorine $Br_2 \rightarrow$ Bromine		Have <u>No</u> Fear <u>Of</u> Ice <u>Cold</u> Beer
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	----------------------------------------------------------------------

# Evidence-based practice to improve Memory, Retention and Recall

Connectives – to begin your points		
Immediately	Perhaps	Considering
Initially	Surely	Unusually
Arguably	Interestingly	Throughout
Clearly	Firstly	Curiously
Conceivably	Moreover	Before the

Verbs to embed evidence – instead of 'shows'		
Portrays	Indicates	Ascertains
Suggests	Signifies	Constructs
Alludes to	Represents	Establishes
Illustrates	Reveals	Epitomises
Implies	Demonstrates	Develops

Imagery and sound
Metaphor, simile
Extended metaphor
Personification
Alliteration & assonance
Repetition & anaphora
Hyperbole
Sibilance and fricative
Pathetic fallacy

Construct your poetry analysis with **VIEWFILM**



**VOICE**  
*Who is the speaking voice of the poem? What is their relationship with the subject?*

**IDEAS**  
*What is the main idea of the poem? What is the voice trying to express*

**EMOTIONS**  
*What are the main emotions expressed in the poem? Do they change throughout the poem?*

**MEANING**  
*What meanings have you taken from the poem? What impact has it had on you? What has it made you think about*



**WHY?**  
*Explain the effect of the poem. What is the poet trying to express?*

Effect on reader
Evoke sympathy
Support argument
Share frustration
Empathise with
Gain understanding
Recognise intellect
Enjoy the humour

**LANGUAGE**  
*Explain and analyse the main language feature and one other language feature*

**IMAGERY**  
*Explain and analyse the main (extended) metaphor and one other piece of imagery*

**FORM**  
*Explain the effect of the overall form and one aspect of structure*

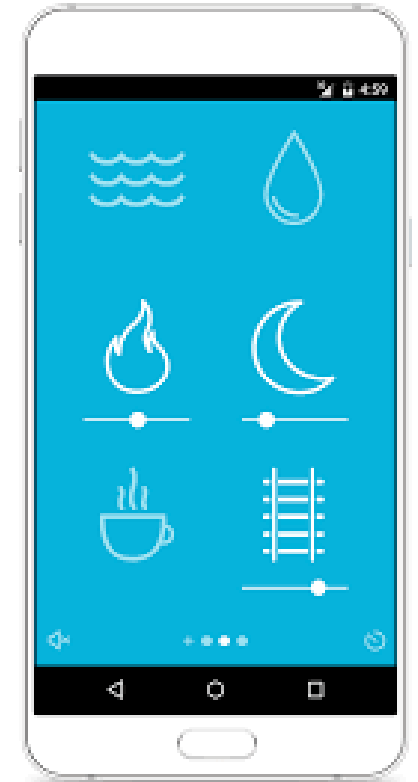
Language
Noun incl proper, abstract
Verb incl imperative, modal
Personal Pronouns
Semantic fields
Tense & person
Emotive language

Form and Structure – don't just 'feature-spot', always explain the effect				
Sonnet	Dramatic monologue	Pastoral poem	Lyric poem	Ghazal
Ballad	Enjambment	End-stopped line	Caesura	Couplet
Quatrain	Meter	iambic	trochaic	pentameter
tetrameter	Half-rhyme	Blank verse	Refrain	Stanza

# Make Learning Stick – For Students

## #3 Use Your Senses

- Familiar sounds – subliminal
- Familiar scents – rosemary
- Visual reminders



# Evidence-based practice to improve Memory, Retention and Recall

Noisli



Favorites

Set Timer

Random

Productivity

Relax



FAVORITE COMBOS

Y13 Shakespeare

Y13 Keats & Coffee

Y13 Exam Conditions

Y11 Language

Y11 Lit Poetry

## Rosemary Oil Sales Triple As Students Stock Up On 'Memory-Boosting' Herb Ahead Of Exams

A study claimed it can boost pupils' brain power.

🕒 18/05/2017 12:09

Lifestyle > London Life

## Students are bulk buying rosemary because it can improve memory

According to Holland and Barrett, sales of the aromatic herb have increased by 187 per cent

The research from Northumbria University, presented at the British Psychological Society's annual conference, backed up historical associations between rosemary and memory.

It suggested that pupils who worked in a classroom with the aroma of rosemary oil achieved 5% to 7% better results in memory tests.

Rosemary has been connected with memory for centuries.

In ancient Greece, students wore garlands of rosemary in exams and in Shakespeare's Hamlet, Ophelia says: "There's rosemary, that's for remembrance."



# Evidence-based practice to improve Memory, Retention and Recall



# Make Learning Stick – For Students

## #4 Nutrition and Health

- Eating 'Brain Food'
- Hydration
- Sleeping
- Exercise





## Eating

- Omega-3: oily fish (salmon, tuna, sardines); soybeans; coconut oil
- Curry, celery, broccoli, cauliflower, and walnuts
- Fresh vegetables
- Dark chocolate
- Berries

### Brain-boosting recipes

35 Recipes

Packed with nutrients to help you feel more focused, refreshed and alert, Good Food's brain-boosting recipes will give your grey matter some TLC.



One-pan salmon with roast asparagus

★★★★★ (348 ratings)

For an easy side dish to complement a spring roast, just cook this recipe without the salmon

1 HOUR AND 20 MINS EASY



Salmon & spinach with tartare cream

★★★★★ (138 ratings)

Ever-versatile salmon is as popular on our shopping lists as chicken. Make the most of it with this impressive recipe

15 MINS EASY



Basque-style salmon stew

★★★★★ (53 ratings)

Heart-healthy salmon tops this simple one-pot which will help towards your five-a-day

35 MINS EASY HEALTHY



Sardines & watercress on toast

★★★★★ (4 ratings)

A low-fat lunch that's high in omega 3. You could use any oily fish if you don't have sardines

10 MINS EASY



Salsa spaghetti with sardines

★★★★★ (15 ratings)

Storecupboard canned fish is a convenient source of omega-3 oils. Serve with wholewheat pasta, tomatoes, olives, onions and chilli

30 MINS EASY

## Sleeping

We are 33 percent more likely to retain connections among distantly related ideas after sleeping.

Dreaming retains and strengthens synaptic connections and increases plasticity



## Exercise

Exercise stimulates nerve cells in the brain, strengthening their interconnections and protecting them from damage.

Brain-derived neurotrophic factor (BDNF), triggers numerous other chemicals that promote neural health, and directly benefits cognitive functions, including learning.

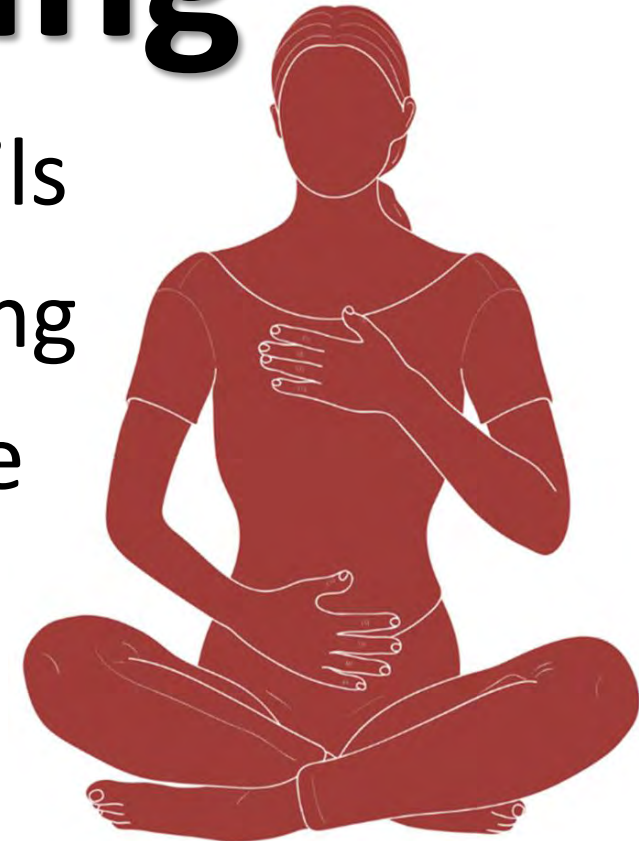


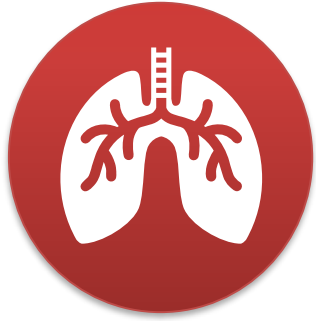


## Make Learning Stick – For Students

# #5 Focus and Breathing

- Pay close attention to difficult details
- Avoid overcomplicating your thinking
- Meditation and breathing to reduce stress and clarify thinking

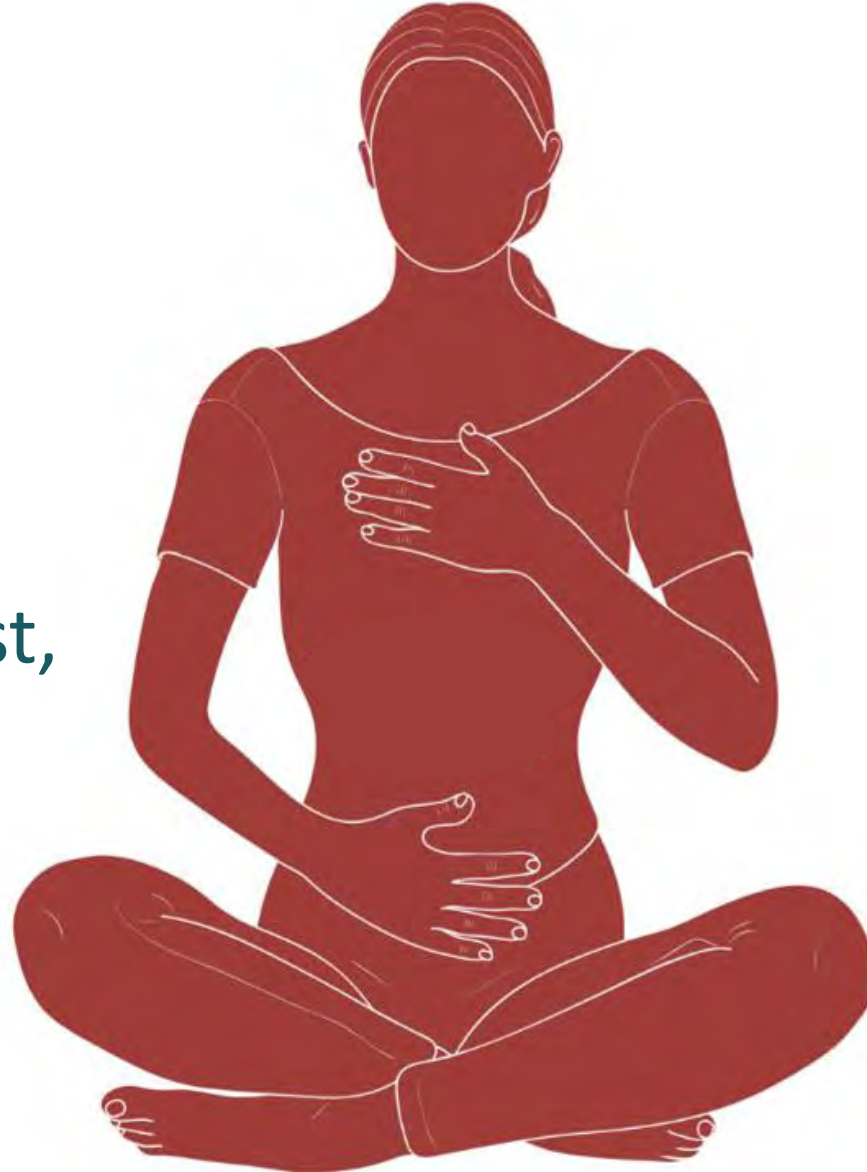




## Inhale for four

Belly expands first,  
then chest

Then pause



## Exhale for four

Belly contracts first,  
then chest

Then pause



# Make Learning Stick – For Students

## #6 Visualise Concepts

- Pay attention to images, photographs, charts, and other graphics in your textbooks. If there are none, try creating your own.
- Draw charts, timelines or figures in the margins
- Highlight in different colours to group & index





## Juliet Capulet

I've drawn what, to me, is Juliet Capulet's resting corpse with symbolic adjustments.

A white lily (drawn on the left of her ribcage) represents multiple things; devotion, humility and most importantly - restored innocence after death. Juliet's devotion was vehement and unconditionally towards her own feelings and Romeo Montague himself. My decision to include a flower which is known for devotion was mainly to represent Juliet; a young, dependant girl being able to stay faithful to her emotions despite consequences. (I deeply respect her as a character due to how much action she took on something she wanted)

The rose placed on her right of her ribcage shows Romeo's part of Juliet; the love, sorrow and restored innocence after death. Of course the innocence connotes to both of their youth but also how Romeo set his sight on a girl five years younger. Deep sorrow is presented after seeing Romeo commit suicide unnecessary which is Juliet's fault. Devastatingly she too commits suicide yet before she does, a sad comfort is revealed by his suicide - that he was deeply in love with Juliet and only Juliet.

The lack of colour was deliberate to reflect Lord Capulet's emotions as he did say she was 'the hopeful lady of my world'. I infer that she was either an only child or the last alive. Pieces of her were missing because part of her is at peace to be with her siblings.

A white lily (drawn on the left of her ribcage) represents multiple things; devotion, humility and most importantly - restored innocence after death. Juliet's devotion was vehement and unconditionally towards her own feelings and Romeo Montague himself. My decision to include a flower which is known for devotion was mainly to represent Juliet; a young, dependant girl being able to stay faithful to her emotions despite consequences. (I deeply respect her as a character due to how much action she took on something she wanted)

Flowers that lay in her pelvic and hip area are veratrum rubrum; poisonous flowers that before killing replicate a violent interpretation of butterflies in stomach and an increased heart beat. Veratrum rubrum is a physical representation of Shakespeare's Romeo and Juliet. The <sup>placement</sup> place obviously links to her inability to carry a capulet which she can't do because she is dead. That leads to the death of both the Montagues and Capulet family.





## Make Learning Stick – For Students

# #7 Vocalise Details

- Repetition strengthens connections
- Expressing ideas clarifies them
- Helps to hear & create patterns
- Record and playback – hearing yourself aids retention and builds confidence




# Making Learning Stick

Ideas For  
Teachers

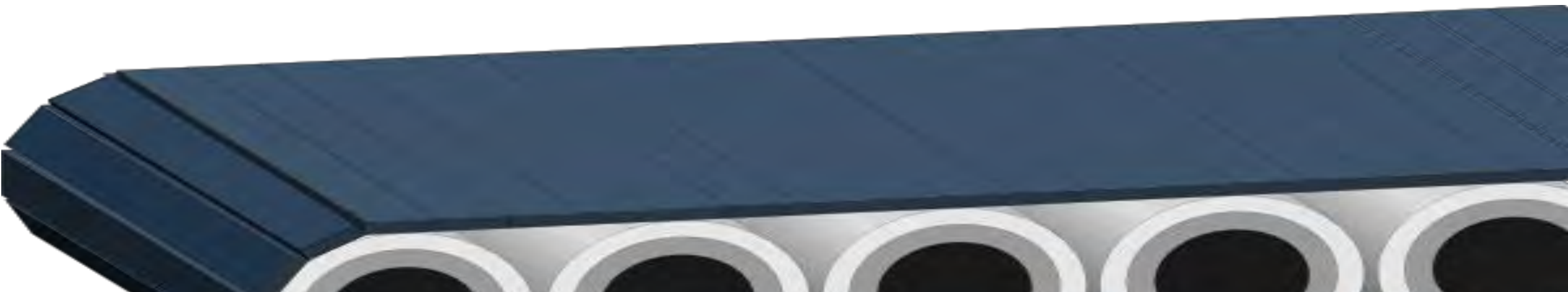


## Make Learning Stick – For Teachers

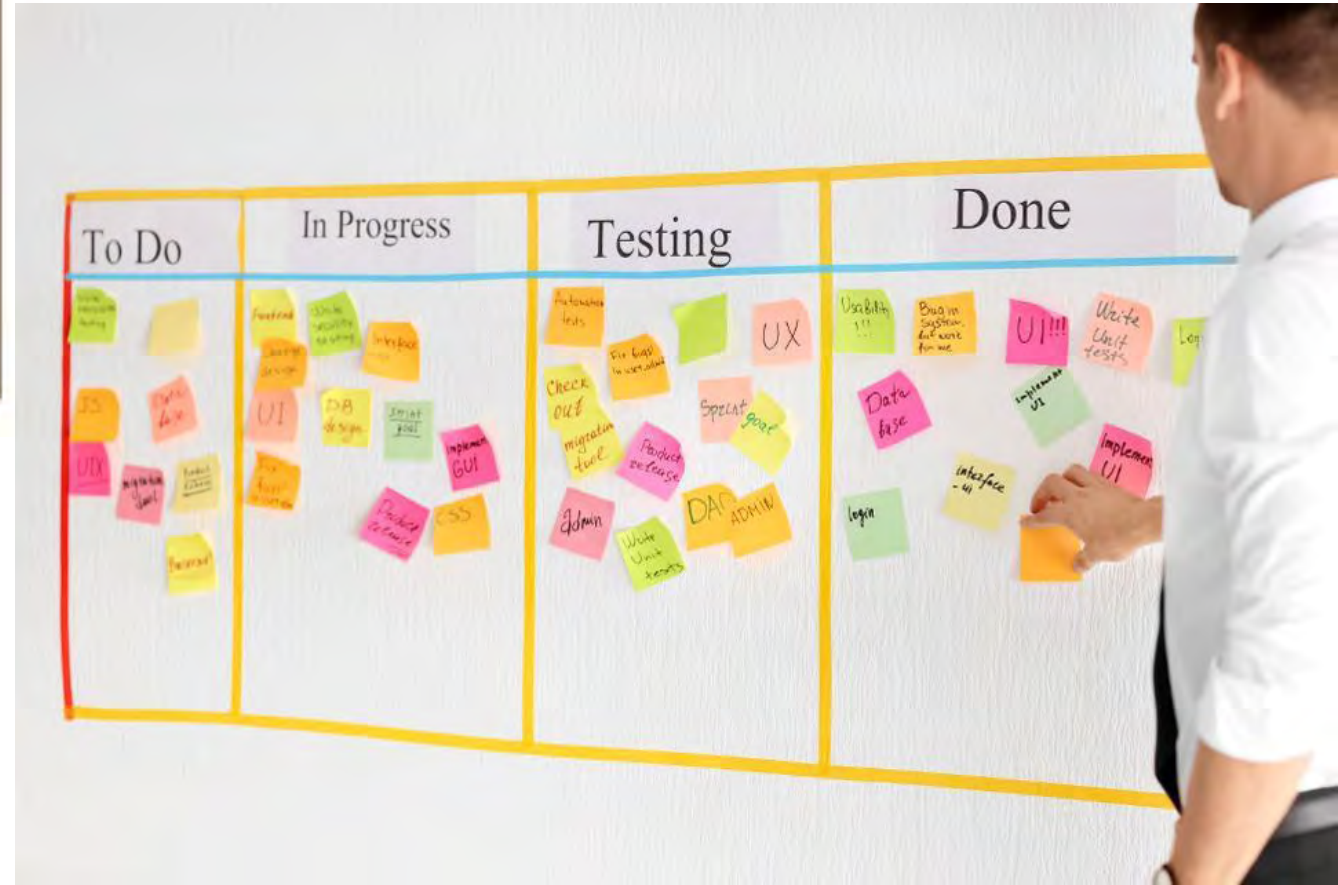
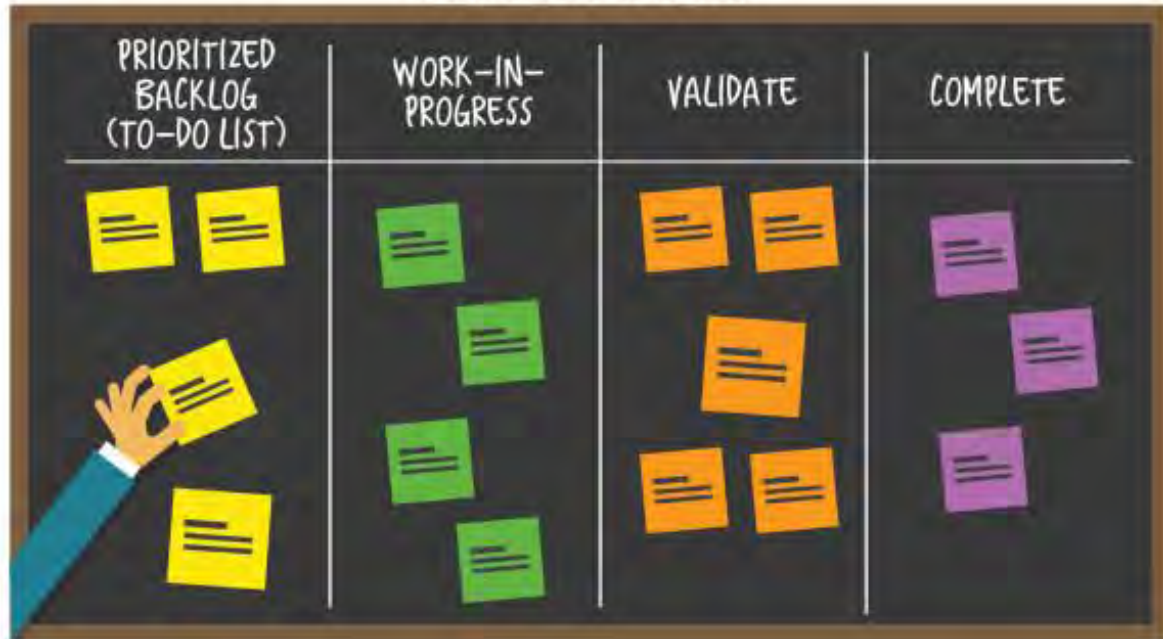
# #1 Set Memory Challenges

- Great starter activity - ‘around the room’
- Online memory games like 
- Memory challenges in tutor time
- Most benefits in 5-7 minute bursts

# Evidence-based practice to improve Memory, Retention and Recall



## KANBAN BOARD



<b>To Learn</b>	<b>Learning</b>	<b>Learned</b>
<p><b>Arteries</b> carry the blood away from the heart</p> <p><b>Capillaries</b> enable the exchange of water and chemicals between the blood and the tissues</p> <p><b>Veins</b> carry blood from the capillaries back toward the heart</p>		

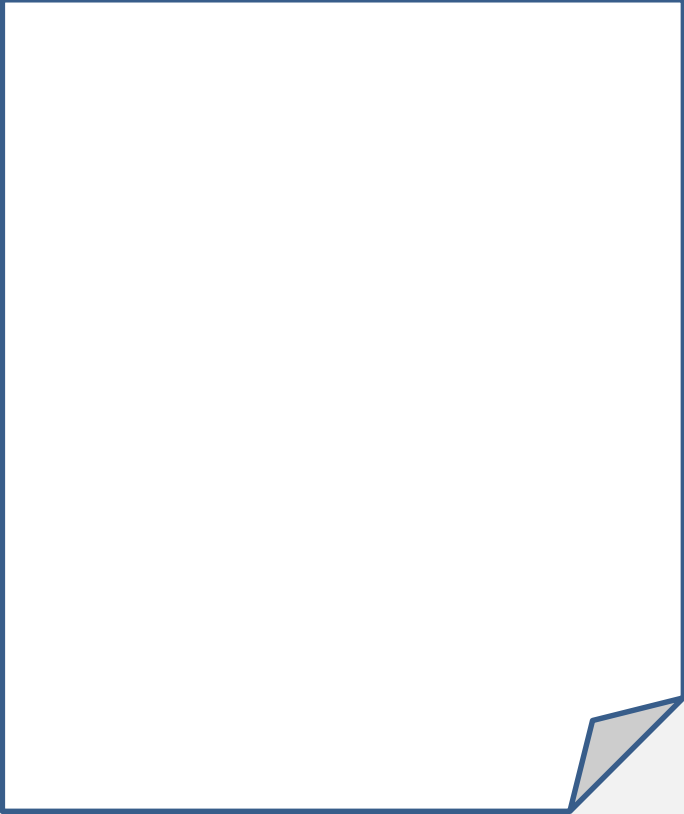
<b>To Learn</b>	<b>Learning</b>	<b>Learned</b>
<p><b>Capillaries</b> enable the exchange of water and chemicals between the blood and the tissues</p> <p><b>Veins</b> carry blood from the capillaries back toward the heart</p>	<p><b>Arteries</b> carry the blood away from the heart</p>	

<b>To Learn</b>	<b>Learning</b>	<b>Learned</b>
<p><b>Capillaries</b> enable the exchange of water and chemicals between the blood and the tissues</p> <p><b>Veins</b> carry blood from the capillaries back toward the heart</p>		<p><b>Arteries</b> carry the blood away from the heart</p>



<b>To Learn</b>	<b>Learning</b>	<b>Learned</b>
<p><b>Veins</b> carry blood from the capillaries back toward the heart</p>	<p><b>Capillaries</b> enable the exchange of water and chemicals between the blood and the tissues</p>	<p><b>Arteries</b> carry the blood away from the heart</p>

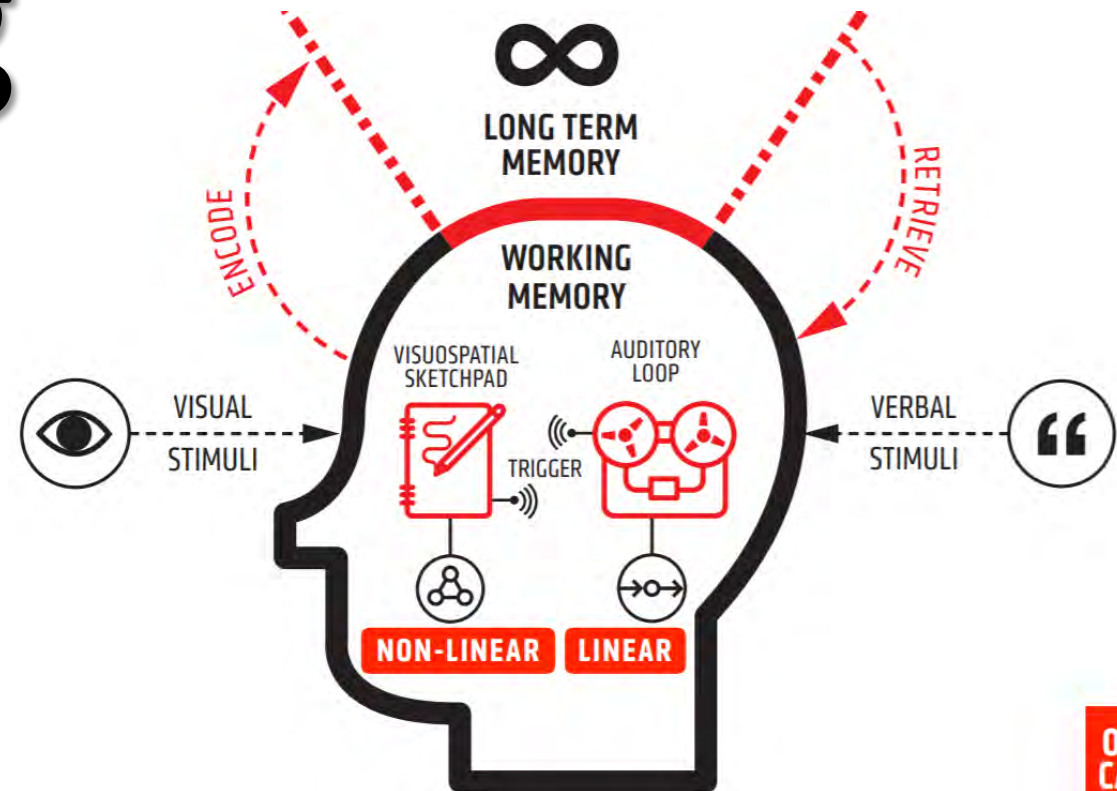
<b>To Learn</b>	<b>Learning</b>	<b>Learned</b>
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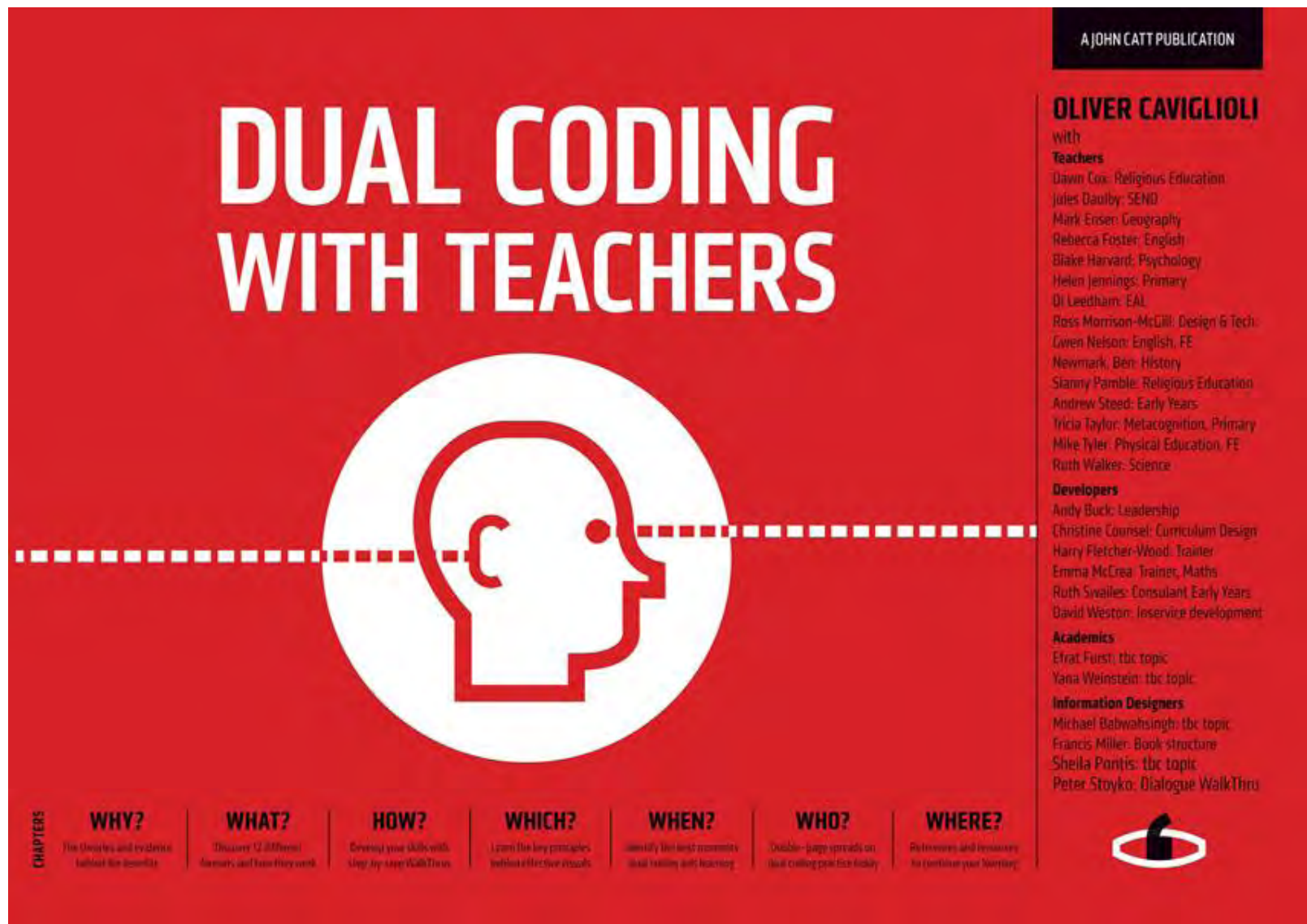
<b>To Learn</b>	<b>Learning</b>	<b>Learned</b>
		

# Make Learning Stick – For Teachers

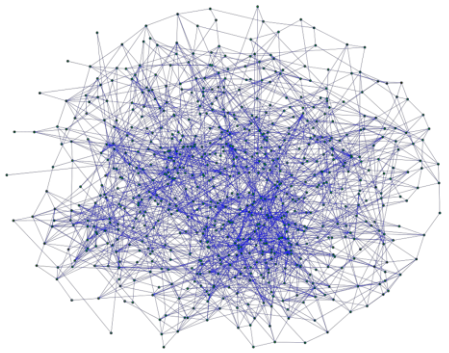
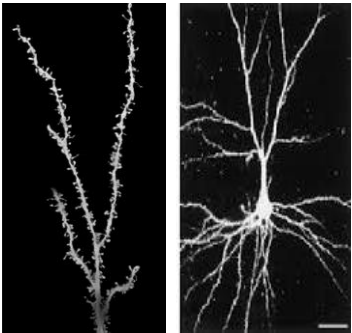
## #2 Dual Coding

- Using Visual and Verbal stimuli to aid retention and retrieval



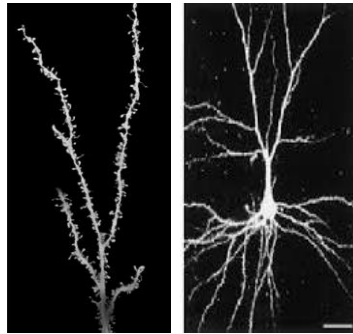


# Evidence-based practice to improve Memory, Retention and Recall



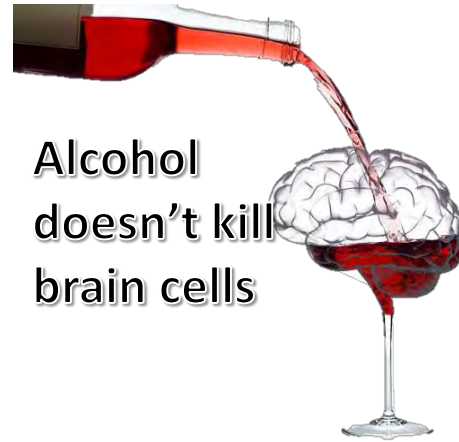
R

Autistic brains are deficient at pruning synapses



Non-autistic

Autistic



Alcohol doesn't kill brain cells

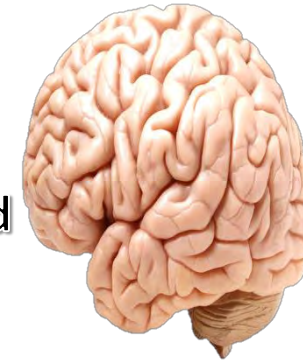
Brains cannot feel pain



Men have bigger brains, even relative to cranium size



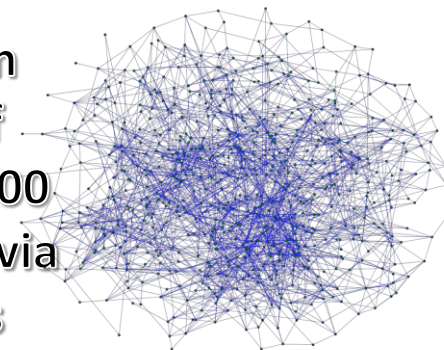
Your brain is constantly changing and growing.



Changes in your brain become permanent through process, not correctness

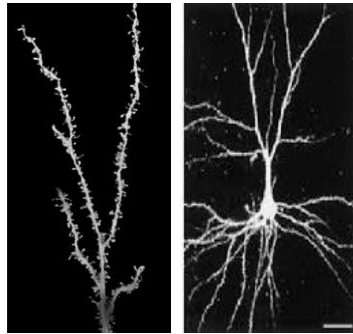


A piece of your brain the size of a grain of sand contains 100,000 neurons connected via one billion synapses



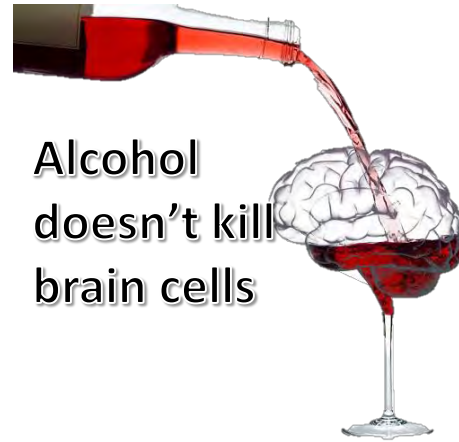
# Evidence-based practice to improve Memory, Retention and Recall

Autistic brains are deficient at pruning synapses



Non-autistic

Autistic



Alcohol doesn't kill brain cells

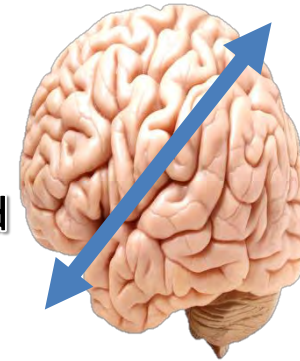
Brains cannot feel pain



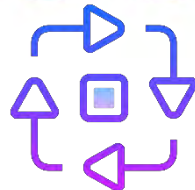
Men have bigger brains, even relative to cranium size



Your brain is constantly changing and growing.



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A piece of your brain the size of a grain of sand contains 100,000 neurons connected via one billion synapses





1

## Two streams of information

There are two information channels that feed our working memory — the visual and verbal. According to Paivio, the verbal stores logogens and the non-verbal (ie the visual), imagens. Baddeley and Hitch's memory model gives us the stronger metaphors of the visuospatial sketchpad and the auditory loop.

2

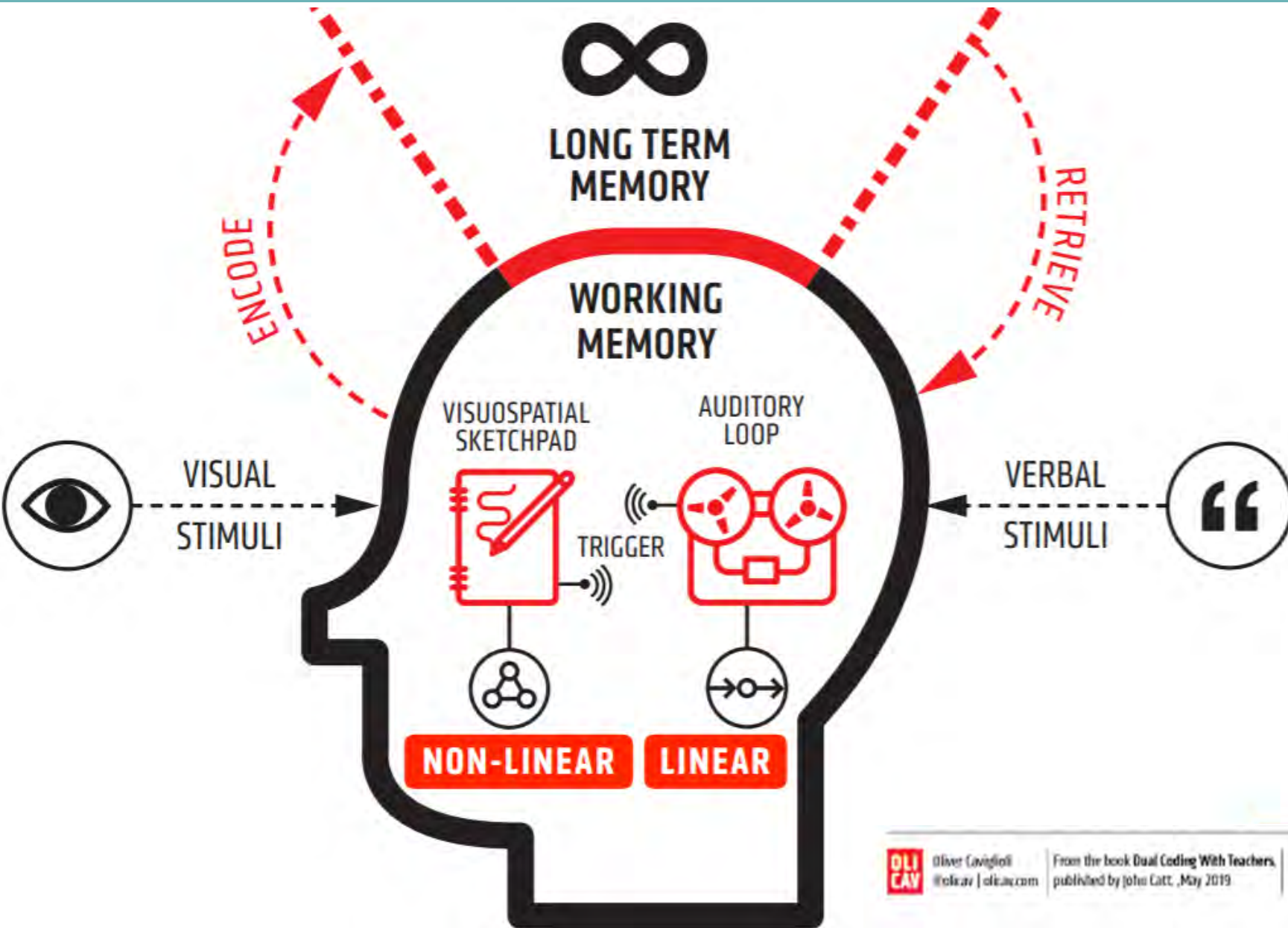
## Separate yet connected

While the two channels are separate and independent of each other, there is a mechanism that ensures they can work in tandem. This tethering of visual and verbal does not involve any transfer of information from one to the other. Instead one channel triggers a connection with the other.

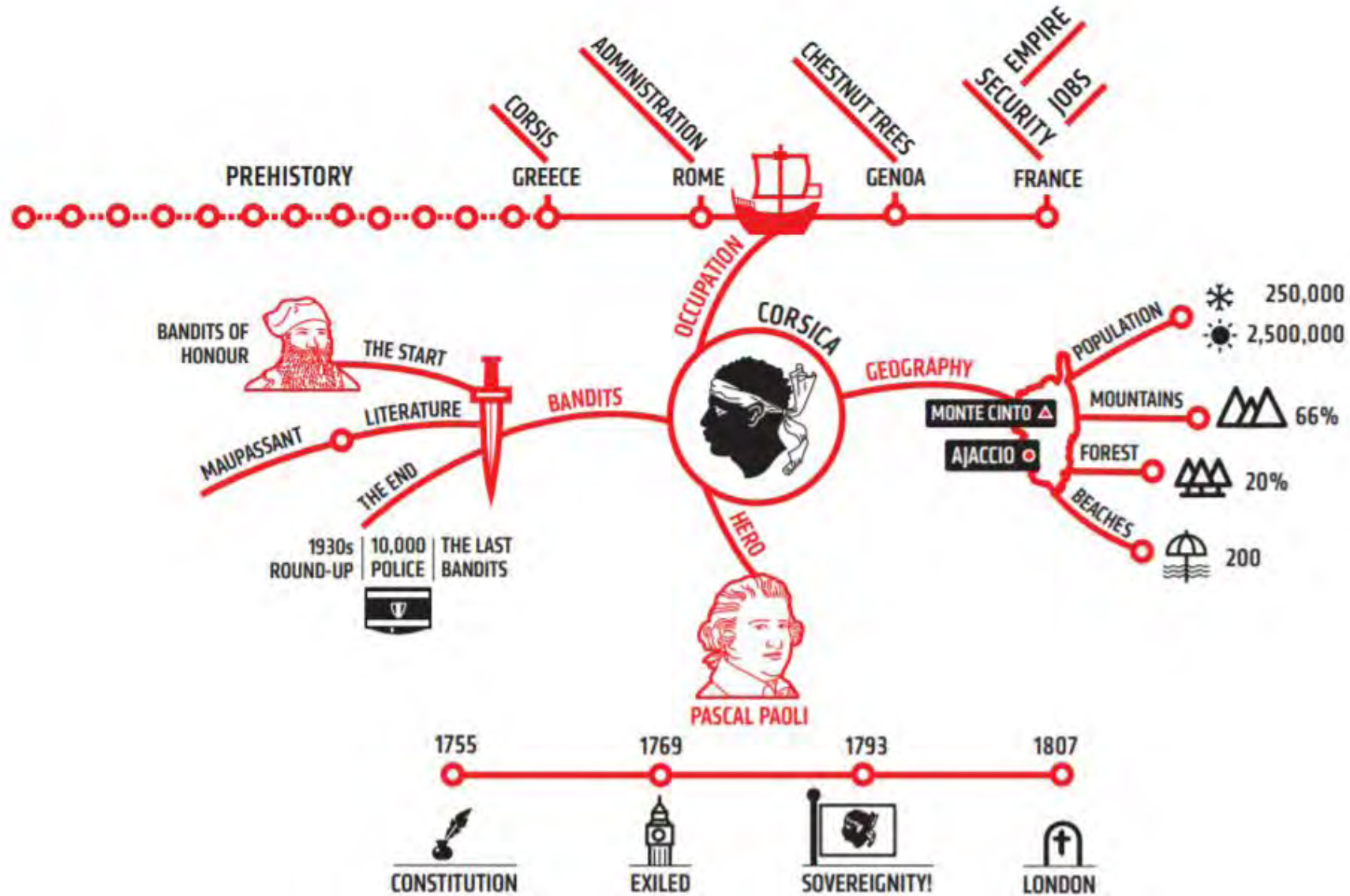
3

## Two different structures

The two channels differ in another, significant way. Verbal information must be processed sequentially, with all the constraints and effort that entails. Visual information, by contrast, is organised synchronously — which means details, their links and the big picture can be perceived simultaneously.



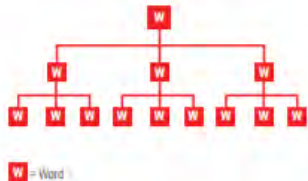
# Evidence-based practice to improve Memory, Retention and Recall



## CHUNK

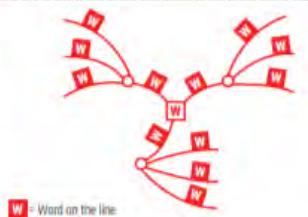
### Tree Diagram

The quintessential hierarchical structure, used for everything from management to animal taxonomies. Their only problem is the space it needs at its base as it broadens.



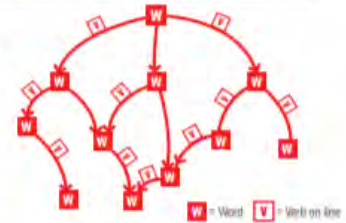
### Mind Map

Once the hippies' map of choice, its organic aesthetic disguises the fact that it is merely a tree diagram radiantly emanating from a central point. This solves the space issue.



### Concept Map

Hierarchical, connected mini-sentences, of subject-verb-object structure, form the basis of concept maps. They are very precise and, therefore, quite difficult to create.



## COMPARE

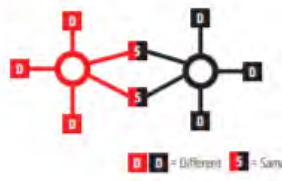
### Venn Diagram

The visual depiction of set theory. Agreed attributes determine inclusion in a set. An overlap of circles highlights the similarities.



### Double Spray

Like a Venn diagram, the double spray shows which attributes are different and which are shared. The central, linked features highlight the similarities.



### Crossed Continua

Used to compare two or more topics against two sets of criteria each on a continuum. Placing the topics against these two continua immediately reveals differences.



## SEQUENCE

### Flow Chart

The simplest way to show the flow of a process by a series of factors or events joined by arrows. Too many such nodes makes understanding more difficult.



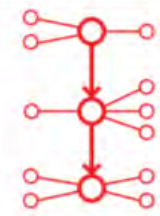
### Cycle

The same as a flow chart but instead of a one-way direction, a cycle is established.



### Flow Spray

Too many nodes make flow charts overly complex. Breaking it down to its main events and showing the attached subsidiary ones retains clarity.



## CAUSE & EFFECT

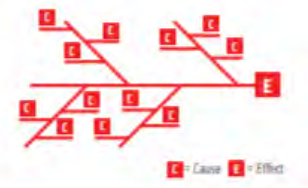
### Input-Output Diagram

Multiple factors are involved in a cause and effect dynamic. This diagram allows you to show them centred around a catalyst.



### Fishbone Diagram

Situations are rarely explained by a simple line of causes. In such cases, causes are chunked into similar themes to indicate a more subtle sphere of influence.



### Relations Diagram

This resembles a concept map but is not hierarchical and is only related to causal links. Any factor can influence another. The linked arrows indicate the line of influence.



## Make Learning Stick – For Teachers

# #3 Elaboration Practice

- Retrieve and verbalise learning with ‘barriers’ in the way
- Strengthens retrieval





**TABOO**

# The Fall of the Soviet Union

**Cannot say**

**Russia, Cold War, Berlin**

**TABOO**

**Hexagon**

**Cannot say**

**shape, sides, six  
(five, seven, etc),**

**TABOO**

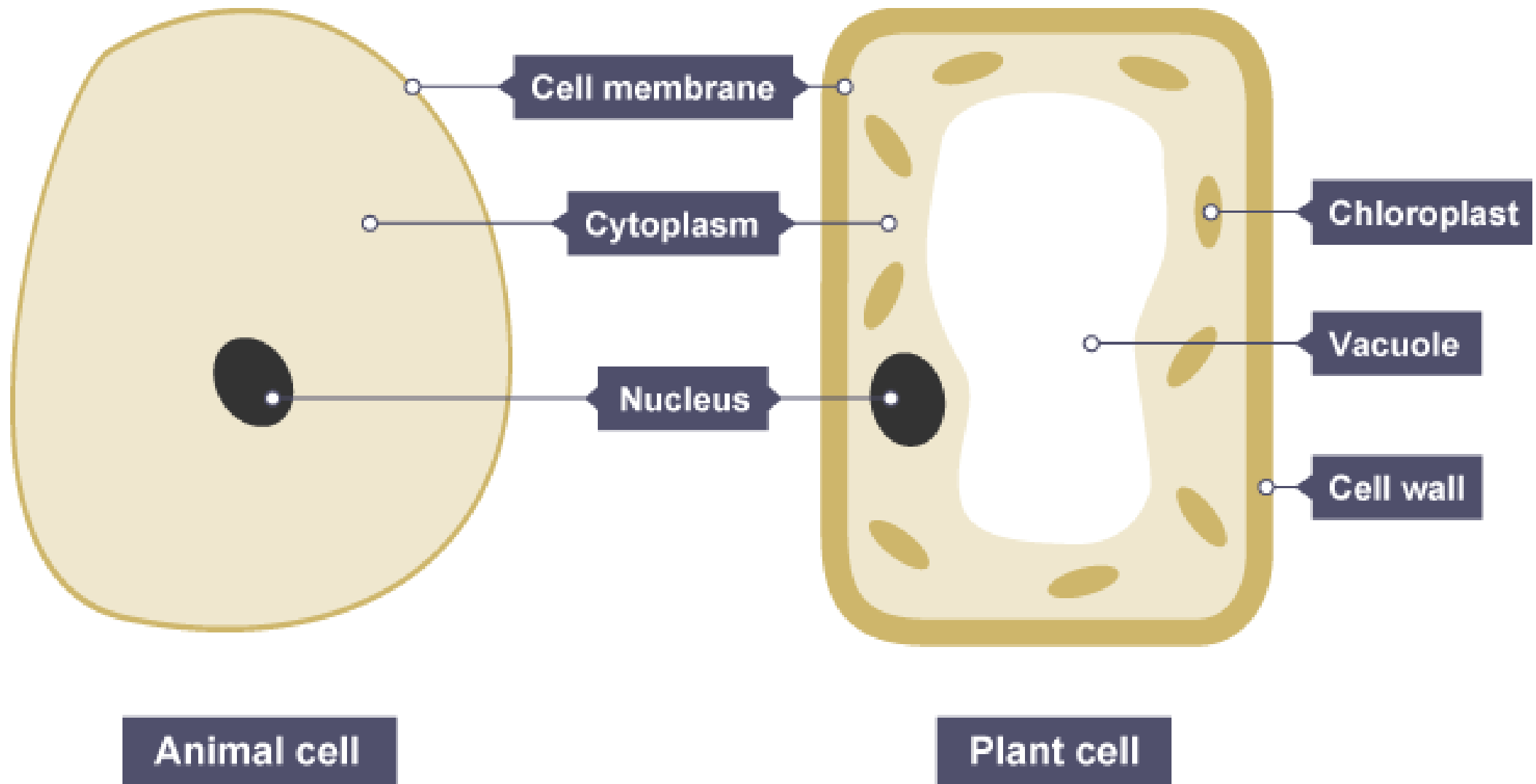
# The Divine Right of Kings

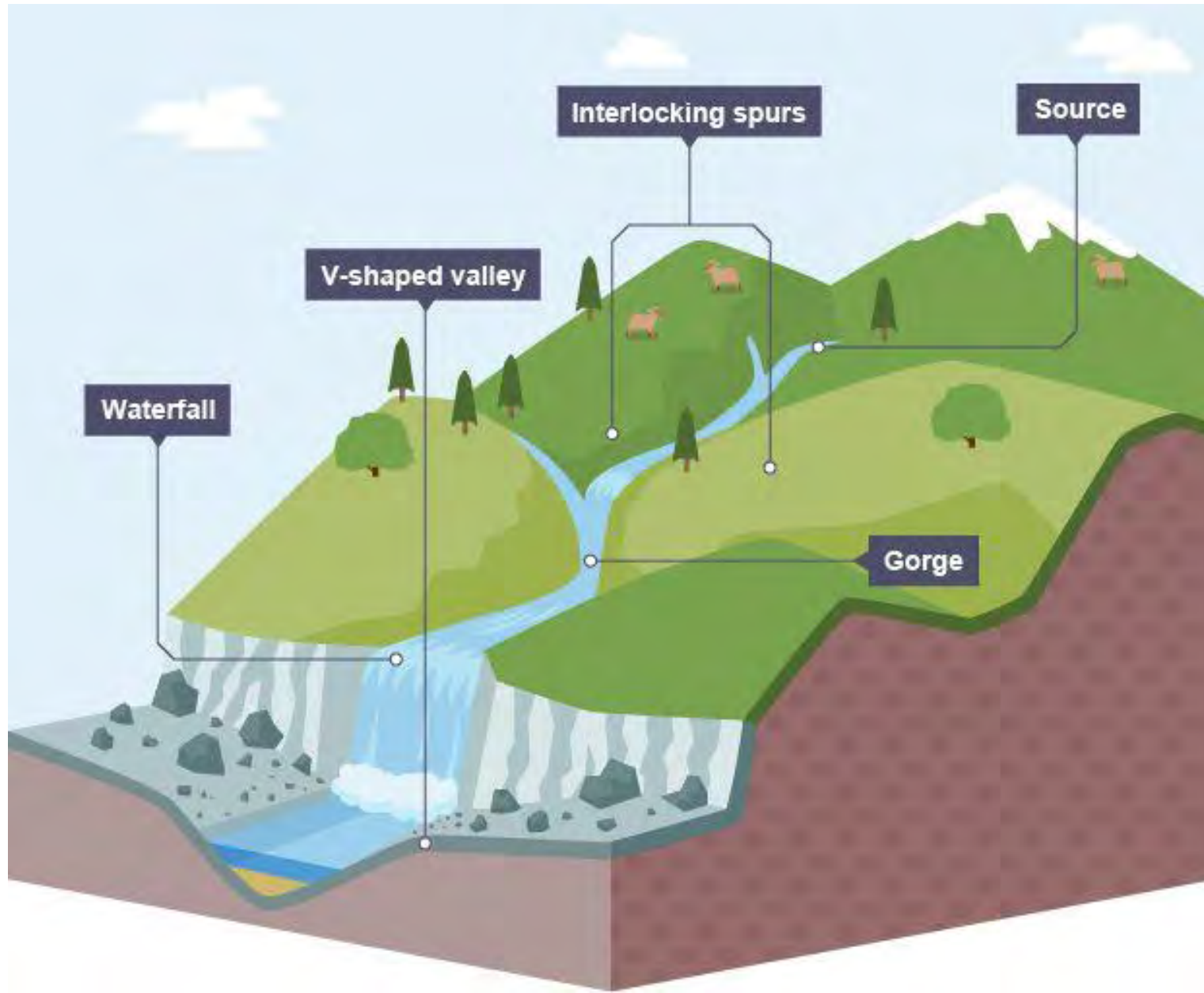
**Cannot say**

**Shakespeare, Macbeth, Monarchy**











**Just a Minute<sup>®</sup>**

**Buzz for:**

**Repetition**

**Deviation**

**Hesitation**

**Non-standard English?**

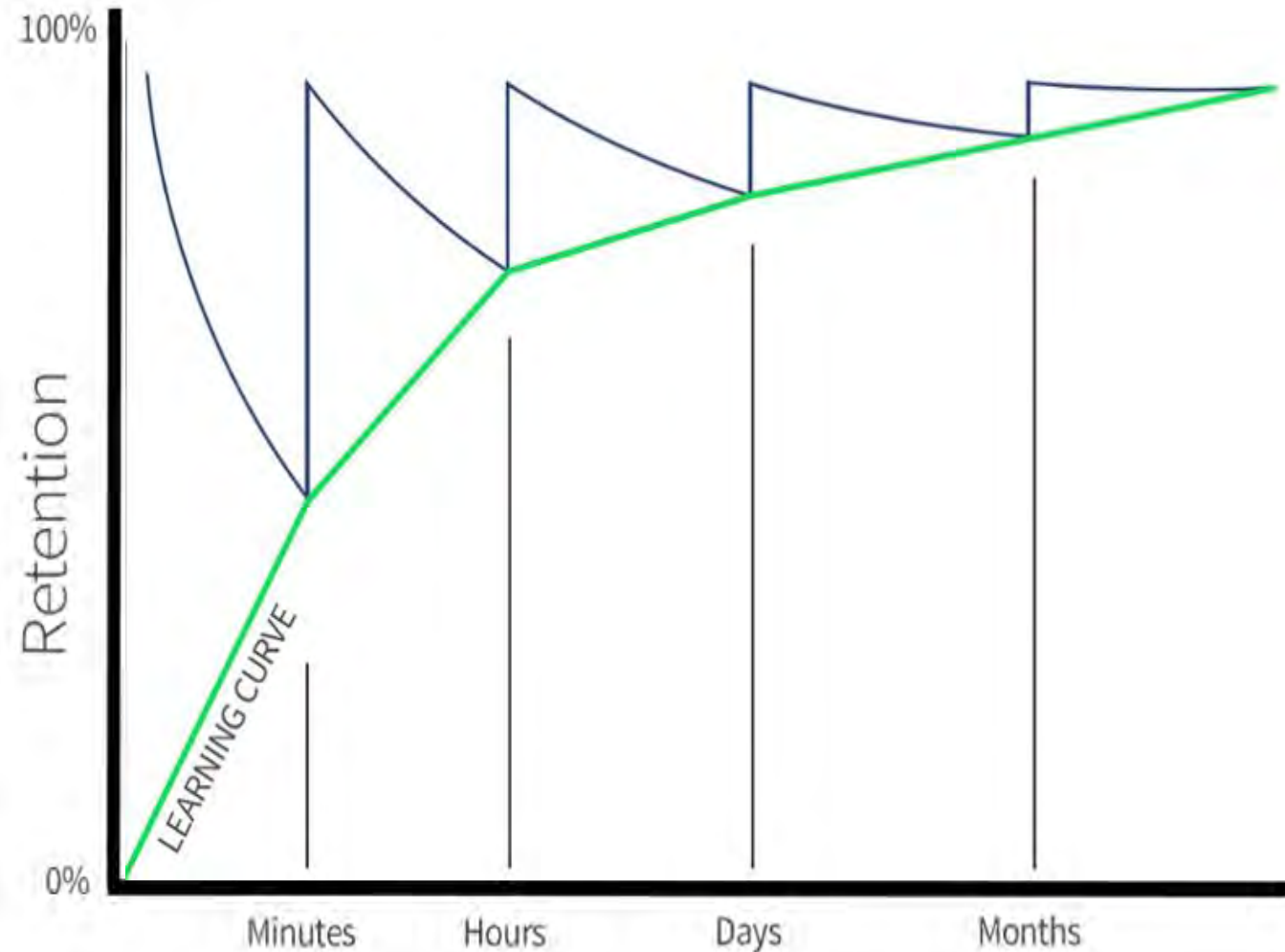
# Make Learning Stick – For Teachers

## #4 Spaced Retrieval

- Avoid multi-tasking
- Block distractions
- Plan what you are memorising
- Set time and quantity limits



# Ebbinghaus Forgetting & Learning Curve



**Title:** How does the structure of a population vary?

**05 January 2018**

## Starter

How many points can you score in 5 minutes?

State two factors would change the birth rate of a country?	What is fertility rate? Why might it decrease as a country develops?	Why is the Scottish highlands a sparsely populated area?
What is urbanisation? Why did it impact the population density and distribution in the UK?	Why does the death rate decrease as a country develops? Use an example for a bonus point.	Define infant mortality rate? What is the difference between that and child mortality rate?
Describe the growth of world population in the last 150 years. Try and include figures where possible.	Describe the difference between sparsely and densely populated. Can you name 3 examples of each in the UK?	Explain why HICs have a lower birth rate than LICs. Try and include more than one reason.
<b>Last lesson – 1 mark</b>	<b>Last week – 2 marks</b>	<b>2 weeks ago – 3 marks</b>

### Key Words

Youthful, ageing, structure, population pyramid,

### Homework

Choose a task off the menu.

**How does this link to Geography?**



## Retrieval Practice Challenge Grid!



What's your score?



Who was Head of the Cheka in 1917?	Explain the term bourgeoisie.	Who was Anatoly Lunacharsky?	List four different enemies of the Cheka.
Describe Khrushchev's attitude towards religion.	Explain the term 'Proletkult'.	List three aims of the NEP.	What was the October 1917 Decree on Land?
Explain the term 'show trial'.	Who was Patriarch Tikhon?	What were the aims of agitprop?	Describe one strength and one weakness of War Communism.

Last lesson (1)

Last week (2)

Two weeks ago (3)

Further back! (4)



# Evidence-based practice to improve Memory, Retention and Recall

## Knowledge Retrieval Grid (Year 10)

8 MARKS = 30 PTS

12 MARKS = 40 PTS

24 MARKS = 50 PTS

Use your knowledge of DT this term to answer or find out the answer to these key questions about the topic we have been studying.

<p>What is the natural defect that natural timbers have that manufactured boards don't?</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>What can you add to cheaper timbers to improve the overall look of it?</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>Explain what is meant by a 'managed forest'.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>What is the technical term for cutting down a tree?</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<p>(2 marks)</p>	<p>(2 marks)</p>	<p>(2 marks)</p>	<p>(2 marks)</p>
<p>State and justify one physical or working property of larch that make it suitable for exterior cladding.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>In the construction of a timber framed house, identify and justify <u>three</u> timber based materials you might use to build it.</p> <p>1) _____ _____ _____ _____</p> <p>2) _____ _____ _____ _____</p> <p>3) _____ _____ _____ _____</p>	<p>Write all that you know about softwood trees.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>Write all that you know about hardwood trees.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<p>(2 marks)</p>	<p>(6 marks)</p>	<p>(4 marks)</p>	<p>(4 marks)</p>

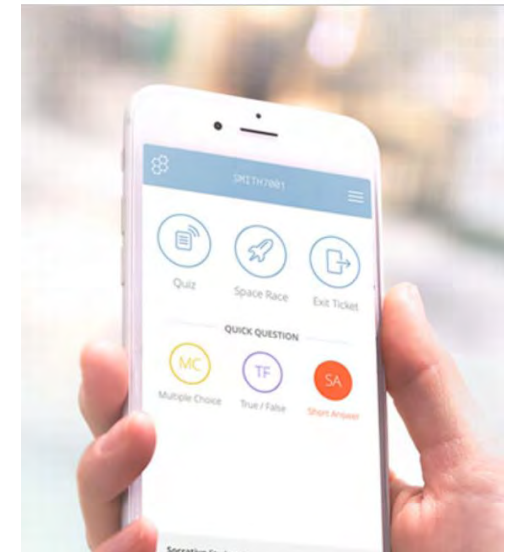
## Biology Retrieval Quiz

1. What is the function of the nucleus? **Last week**
2. The MMR vaccine was introduced in 1998. What does it immunise against? **Last month**
3. Enzymes are used in many industrial processes. What is an enzyme? **Last term**
4. In sexual reproduction, both the egg and the sperm contain genetic material. What is it made of? **Last year**

# Make Learning Stick – For Teachers

## #5 Low Stakes Tests

- Quick, easy low stakes tests to check the memory and recall



## Find it and Fix it



### I Teach Boys

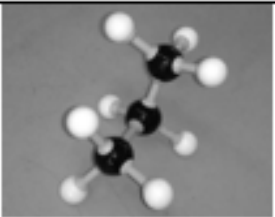
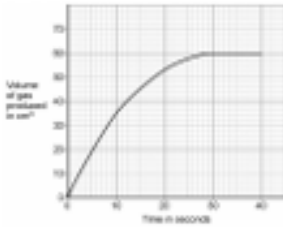
@ITeachBoys92

Science Teacher in London | Interested in raising boys attainment and new teaching and learning ideas

📍 London, England

📅 Joined January 2019

[Tweet to I Teach Boys](#)

 <p>The figure represents a molecule of ethane</p>	<p>Methane is an alkane.</p> <p>The general formula for an alkane is <math>C_nH_{2n}</math></p>	<p>The complete combustion of methane can be shown in the following equation.</p> $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
<p>A lifecycle assessment (LCA) is done to calculate the carbon footprint of a product.</p>	<p>The percentages of carbon dioxide in today's atmosphere have changed from the Earth's early atmosphere because the carbon dioxide condensed to form the oceans</p>	<p>The difference between pure water and potable water is that potable water is safe to drink.</p>
<p>Sodium chloride and potassium chloride are simple covalent structures. They have low melting points because the intermolecular forces are strong.</p>	<p>Students investigated the effect of the size of marble chips on the rate of the reaction between marble chips and hydrochloric acid. Below shows the word equation for this reaction.</p> $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$	 <p>The graph shows that there is a rapid increase in the products in the first 28 seconds of the reaction.</p>

	A	B	C
1	Shakespeare was born 23rd April 1564 in Stratford upon Avon and died there on the same day in 1626.	Shakespeare's company was awarded a royal patent by the new King James I and changed its name to 'It's Reigning Men'	Shakespeare's plays are usually separated into three main divisions: Comedies, Tragedies and Hysterectomies
2	In 1599, Shakespeare's company built their own theatre, The Globe on the north banks of the River Thames.	Romantic poet Mark Keats kept a bust of Shakespeare near his desk in the hope that Shakespeare would spark his creativity	Many of Shakespeare's plays were based on historical accounts from classical writers such as Plutarch and Holinshed.
3	Playwright Ben Johnson wrote a preface in the Fixed Folio with the quote 'He is not of an age, but for all time	Macbeth is often said to be unlucky in theatrical circles, and actors and directors avoid naming the play, referring to it as 'the Proclaimers Play'	Many consider Shakespeare's tragedies to be his greatest works, especially King Lear, Othello, Hamnet and Romeo and Juliet.

# DITLOIDS

1. S M B > S F B

2. 1 B = S C I A P O Y B T S O A G O S

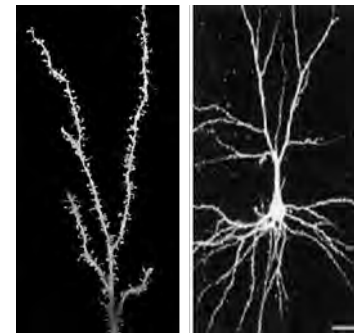
3. S P = D I A A B

# DITLOIDS

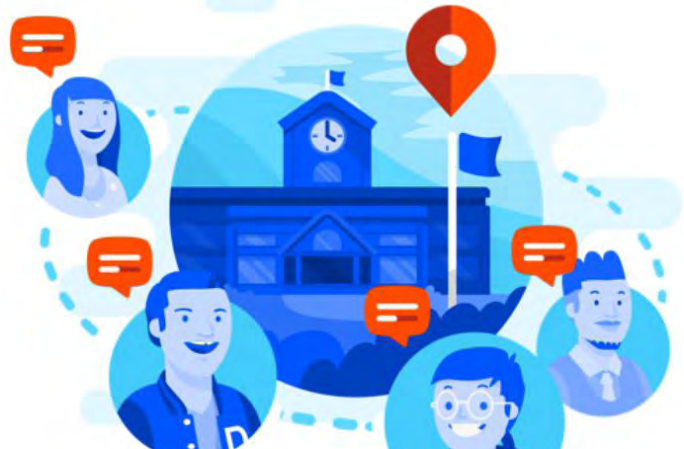
1. S M B > S F B

2. 1 B = S C I A P O Y B T S O A G O S

3. S P = D I A A B



# Evidence-based practice to improve Memory, Retention and Recall



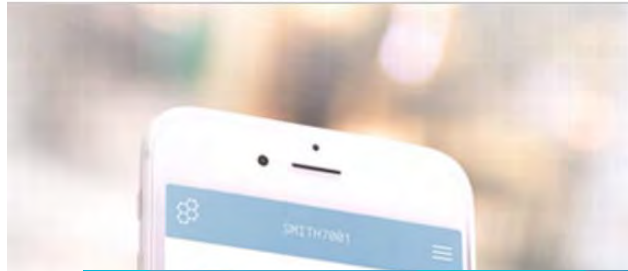
Quizlet Search Create

15 terms Marcus\_Cherrill

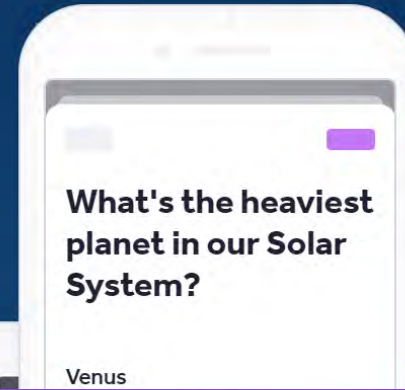
## Science Key words



Try the new Learn mode!



Learn better, faster, free.



Teach Teens about their Brains



Player vs Player  
1:1 Devices

Classic



Team vs Team  
Shared Devices

Team mode





# Make Learning Stick – For Teachers

## #6 Vary Tests Dates

- Challenge retention by allowing time to forget and retrieve
- Prepare for synoptic tests



## Retrieval in your Long-term curriculum map

WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39																																						
	September							October							November							December							January							February							March							April							May							June							July						
<b>7</b>	Transition - Independent Reading and Creative Writing							Class Reader - Carnegie Winner or shortlist							Writing - Journalism							Speaking and Debating - Mainstream, Online and Social Media							Great Writers - Benjamin Zephaniah (poetry, drama and prose)							Shakespeare - Ghost							Writing - Creative writing for effect (poetry and narrative)																																		
<b>8</b>	Class Reader - Carnegie winner or shortlist							Speaking and Debating - Great Speeches in Context							Great Writers - 19th-Century Female Writers in Context							Class Reader - 20thC with prominent context, e.g. Animal Farm							Shakespeare - Soliloquies							Writing - creative writing for effect (Gothic and Crime Writing)																																									
<b>9</b>	Writing - criticism and review			Genre Study - Tragedy in Context				Shakespeare - Tragedy							Class Reader - To Kill a Mockingbird							Writing - Non-Fiction - writing for persuasive effect							Speaking and Debating - Mindfulness and exams							Great Writers - Living Poets																																									

## Make Learning Stick – For Teachers

# #7 Memorable Marking

- Active or passive process?
- Ensure the way you mark the students work gives them something to remember.



## 1. Live Marking

The most effective time to improve student work is during the writing process. These should be busy times for teachers—circulate the room looking for misconceptions (or mistakes, although these are harder to spot).



## 2. Mastery Marking

Only accept a pieces of work when it has met a specified quality. Agree as a class only to give an A (top) grade—everything else is a work in progress. Students have as many opportunities as required.

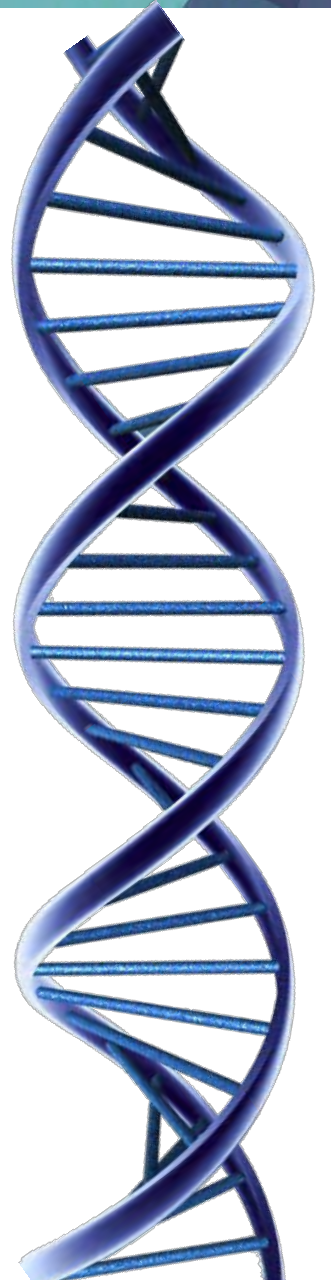
OR

Only accept a pieces of work when it has met a specified quality. This can be a rubric (i.e. three pages, all topic sentences link to the question).



## 3. Do Now Activities

Marked work is never simply handed back to students without a requirement that they work on a specified target. This can be a 'Do Now Activities' written below



## Reducing the Extraneous Load of Marking

- **Mark selectively** - use effective instructional methods to check learning, such as regular retrieval practice, critique and redrafting and low-stakes recall testing.
- **Be explicit** and specific about improving students' work and knowledge. Be explicit about what students should know and then help them to learn it.
- **Be precise** - use criteria, knowledge organisers or checklists to make expectations explicit



# Research Informed Revision Strategies





# Bamboo Revision

**What are students' three favourite revision techniques?**

1. Re-reading your notes
2. Highlighting details in your notes
3. Summarising the highlighted parts of your notes



## Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology

John Dunlosky<sup>1</sup>, Katherine A. Rawson<sup>1</sup>, Elizabeth J. Marsh<sup>2</sup>, Mitchell J. Nathan<sup>3</sup>, and Daniel T. Willingham<sup>4</sup>

<sup>1</sup>Department of Psychology, Kent State University; <sup>2</sup>Department of Psychology and Neuroscience, Duke University; <sup>3</sup>Department of Educational Psychology, Department of Curriculum & Instruction, and Department of Psychology, University of Wisconsin–Madison; and <sup>4</sup>Department of Psychology, University of Virginia

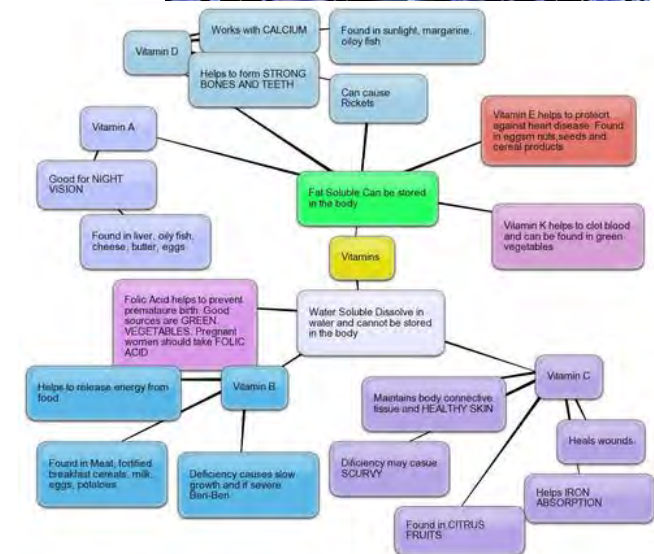
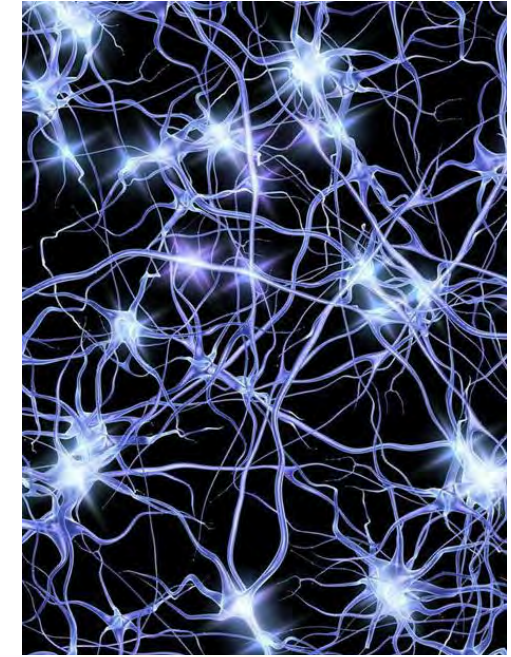
Psychological Science in the Public Interest  
14(1) 4–58  
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sagepub.com/journalsPermissions.nav  
DOI: 10.1177/1529100612453266  
http://pspi.sagepub.com



## 5. Self Explanation

Metacognitive attempt to recreate the brain's synaptic interconnectivity, rather than considering new learning in isolation, students start by linking it to what they know already. When students learn anything new, the need to connect it with previously retained learning, through careful (perhaps indexed) note-taking and/or by mapping learning together.

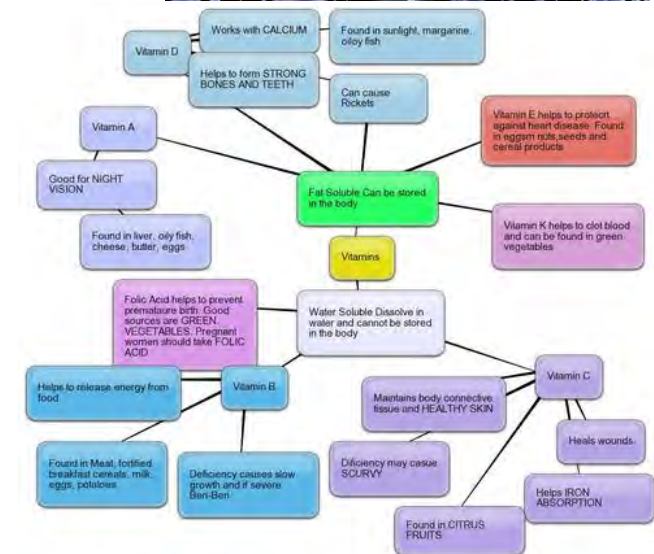
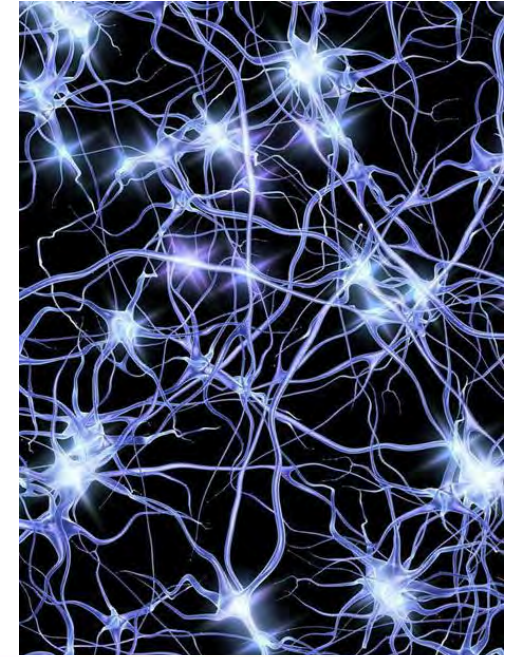
Interconnected mind-maps are a visual representation of self explanation.



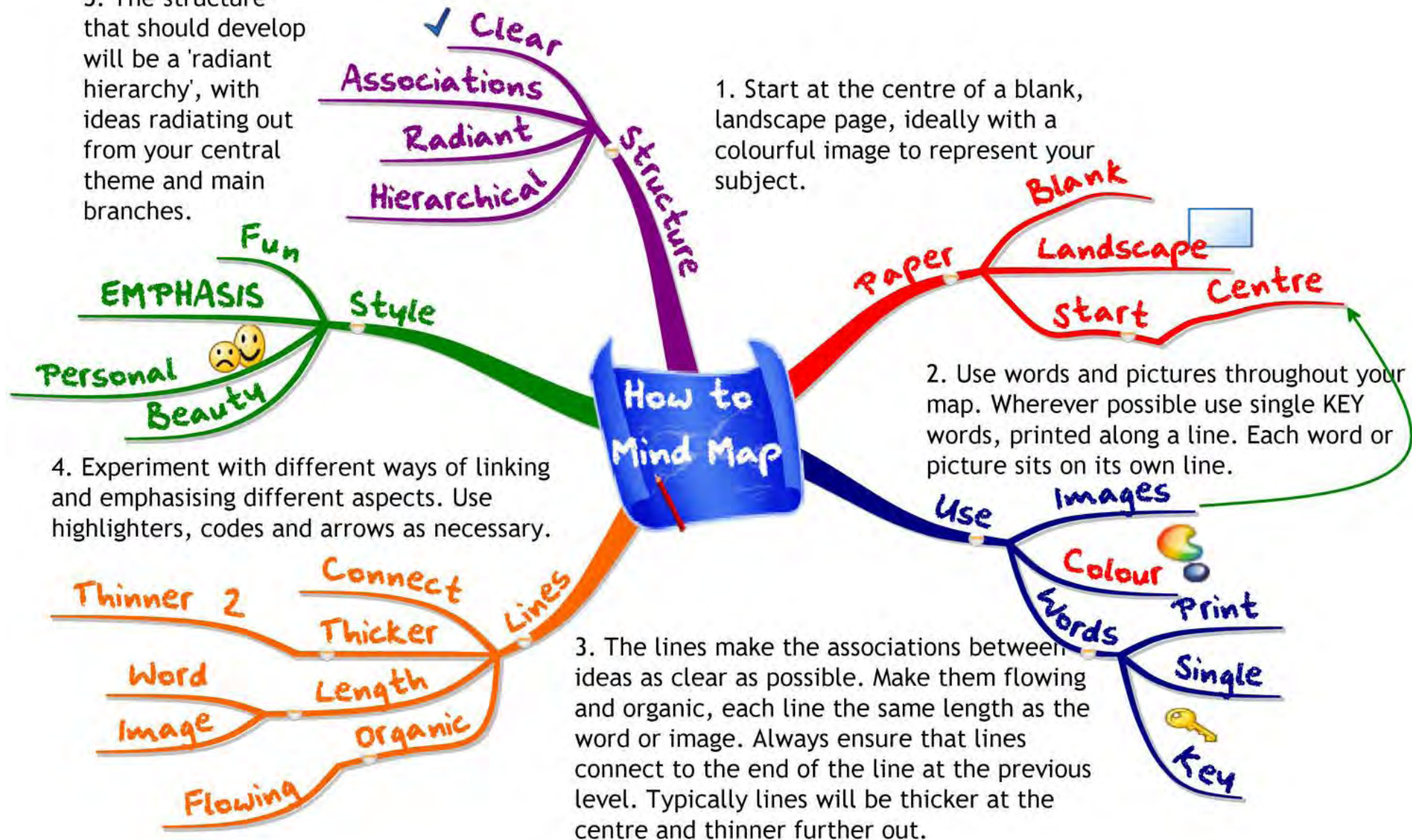
## 5. Mind Mapping or Indexing

Metacognitive attempt to recreate the brain's synaptic interconnectivity, rather than considering new learning in isolation, students start by linking it to what they know already. When students learn anything new, the need to connect it with previously retained learning, through careful (perhaps indexed) note-taking and/or by mapping learning together.

Interconnected mind-maps are a visual representation of self explanation.



5. The structure that should develop will be a 'radiant hierarchy', with ideas radiating out from your central theme and main branches.



# Evidence-based practice to improve Memory, Retention and Recall

## GoConqr Library

Variation and Evolution Mindmap  
by James Edwards22201 ★★★★★ (1)

Biology- Genes and Variation  
by Laura Perry ★★★★★ (28)

Biology - Chapter 16 - Darwin's Theory of Evolution  
by Ashley Ketterling ★★★★★ (1)

Evolution Flashcards  
by Stefania Schoen ★★★★★ (0)

### Genetics for Nurses

This is a course for my genetics class at Spring Arbor University. The book I'm using is: Brooker RJ. Genetics: Analysis & Principals. 3rd ed. New York City, NY: McGraw-Hill. 2009. ISBN: 978-0-07-299278-6

You have selected: (clear all)

Subjects

Biology ✖

Inheritance, variation and evolution ✖

Subjects

Biology

Inheritance, variation and

Exam Levels

A level (233)

AS level (122)

A2 (45)

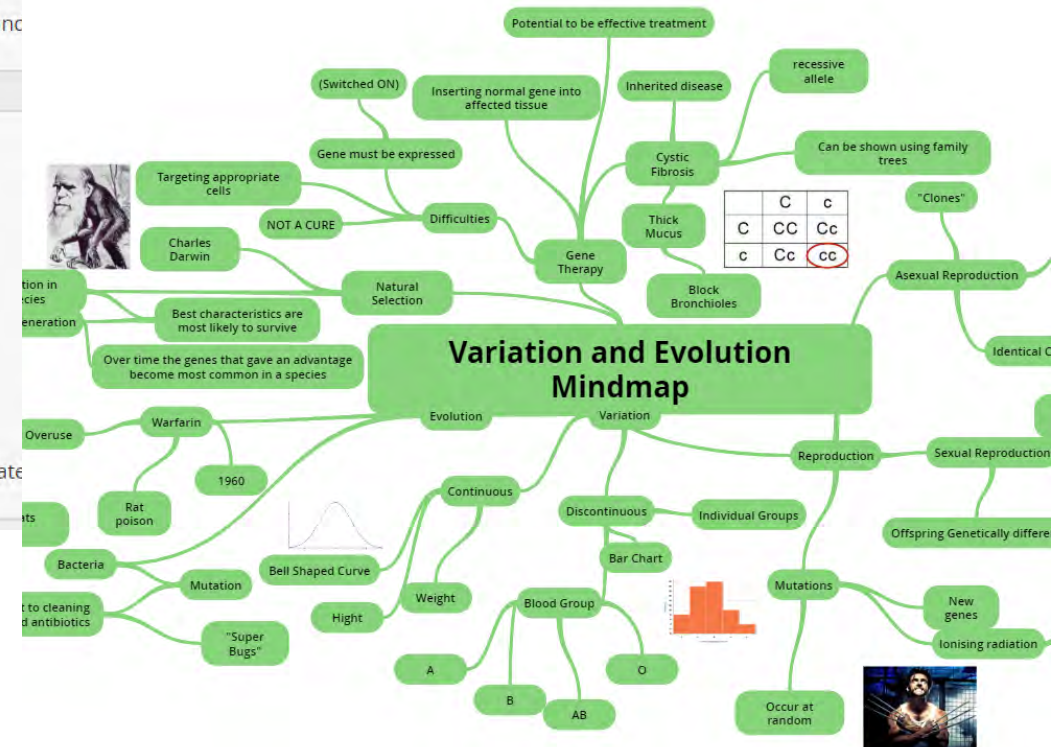
Bachelors (12)

BTEC (1)

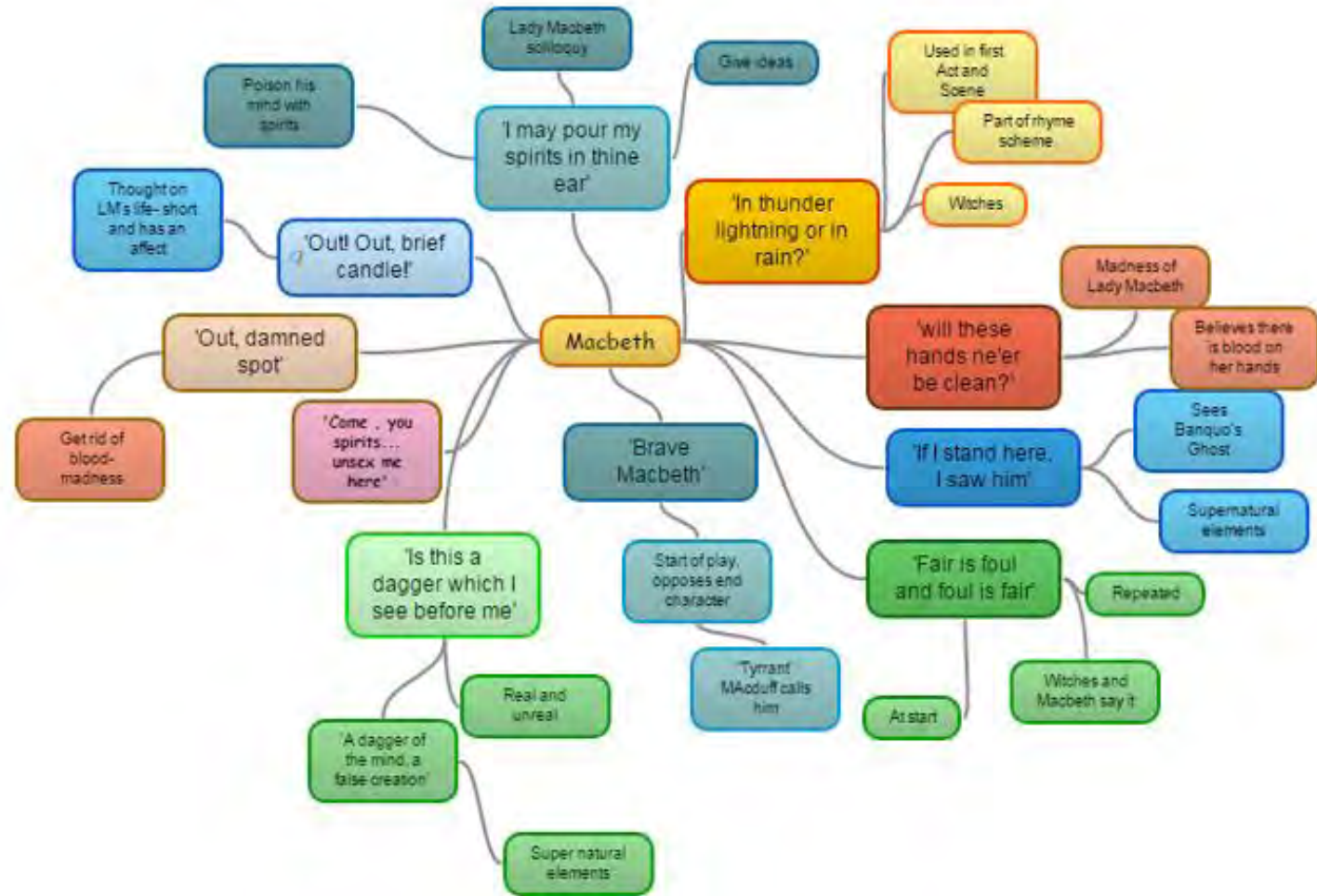
GCSE (147)

Highers (47)

International Baccalaureate



# Evidence-based practice to improve Memory, Retention and Recall



CREATE

Slide Set

Flashcards

Mind Map

Note

Quiz

Flowchart

Course



**Take a look at our recommended mind mapping apps for teachers and students.**

- **Mindomo** (mind mapping) ( **Android** - Free , iPad - Free )
- **SimpleMind** for iPad (mind mapping) ( iPad - £3.99 )
- **SchematicMind** Free mind map. ( **Android** - Free )
- **Mindjet Maps for Android.** ( **Android** - Free )
- **Mindly** (mind mapping)

**Top 5 Mind Mapping Apps for Students - Educational App Store**

<https://www.educationalappstore.com/best-apps/top-5-mind-mapping-apps-for-students>



## 4. Elaborate Interrogation

Prompting learners to generate an explanation for an explicitly stated fact' such as:

- “Why does it make sense that...?”
- “Why is this true?”
- “Why?”

Students get into the habit of challenging the perceived wisdom of their learning, meaning the new knowledge is not simply accepted, but considered and explored.

## 4. Always asking 'why'?

Prompting learners to generate an explanation for an explicitly stated fact' such as:

- “Why does it make sense that...?”
- “Why is this true?”
- “Why?”

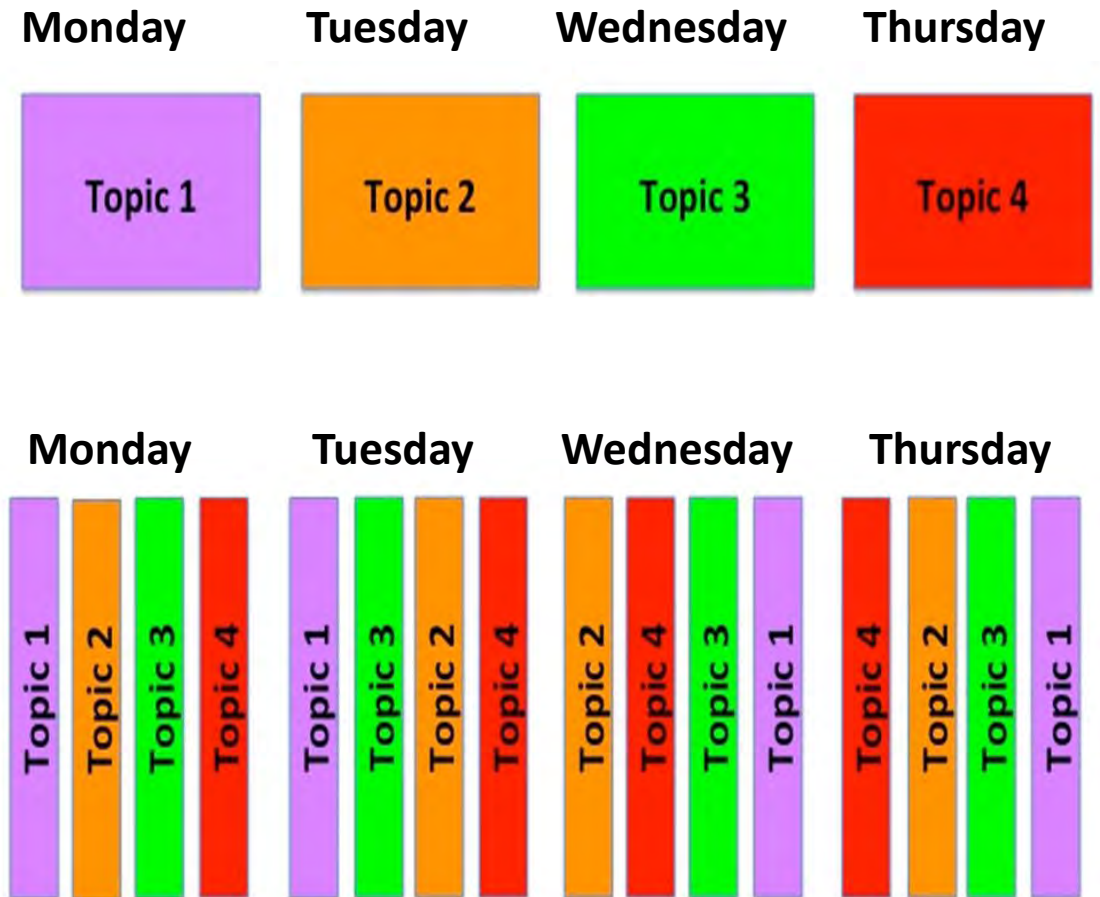
Students get into the habit of challenging the perceived wisdom of their learning, meaning the new knowledge is not simply accepted, but considered and explored.

## 3. Interleaved Practice

The brain retains knowledge much more successfully when revision tests different content in a single revision session.

The top image shows typical 'massed' approach to revision: revising one subject or topic all evening, varying across the week. This, like the bamboo revision strategies, feels reassuring to the students: they get the impression that they have 'done' their revision.

Replacing this with a schedule of interleaved revision will create an increase in synaptic activity and significantly increase retention. An interleaved revision schedule would look more like this:

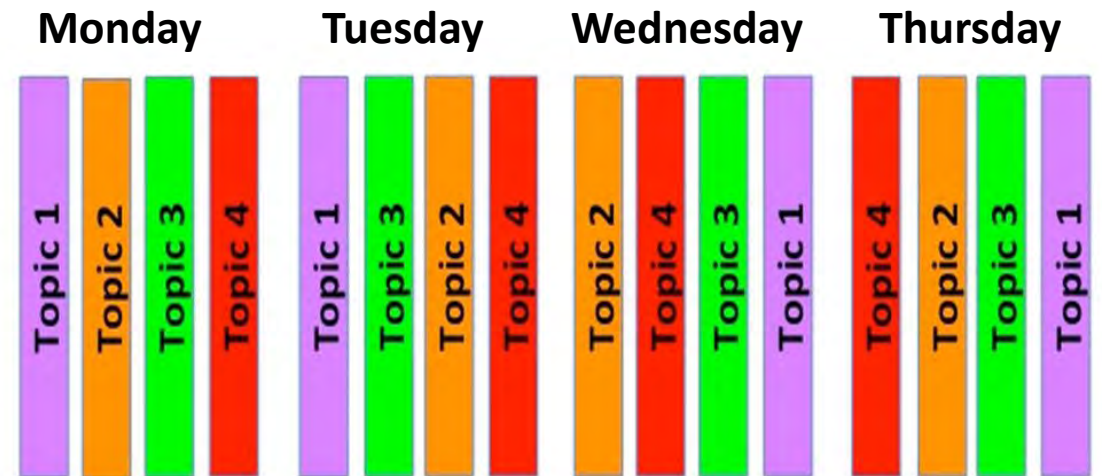
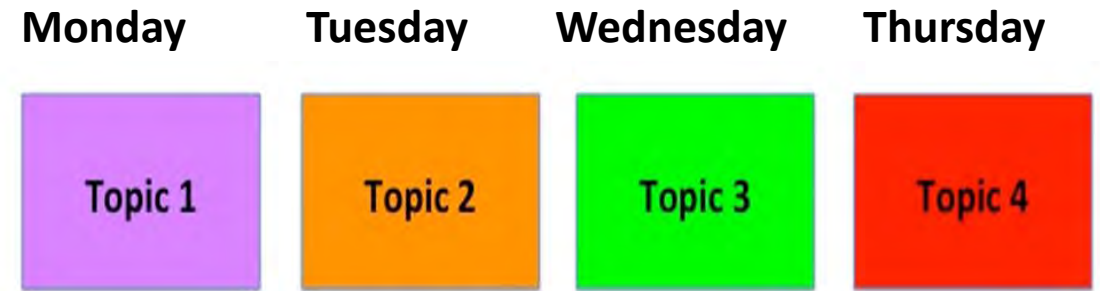


## 3. Revise a range of topics in short bursts

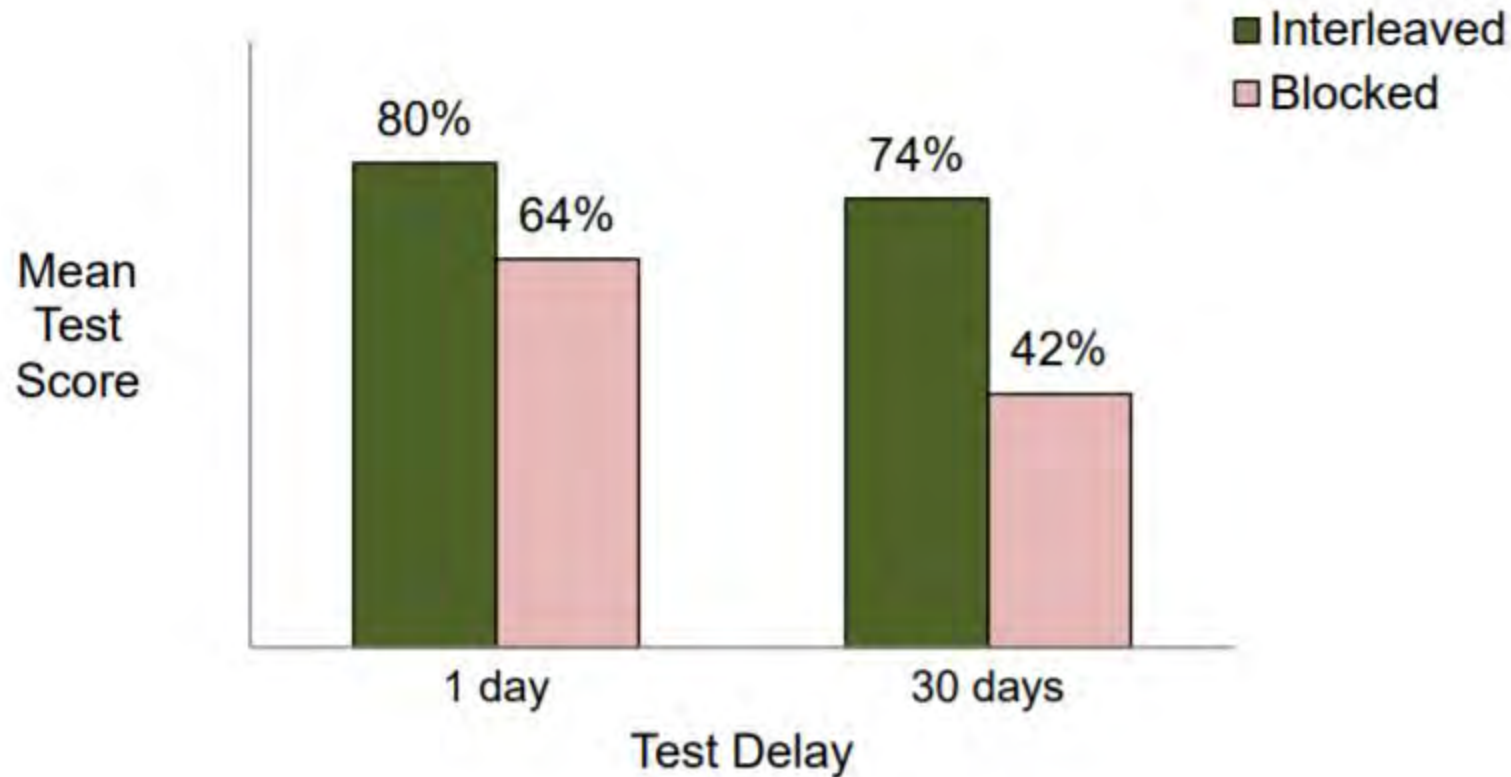
The brain retains knowledge much more successfully when revision tests different content in a single revision session.

The top image shows typical 'massed' approach to revision: revising one subject or topic all evening, varying across the week. This, like the bamboo revision strategies, feels reassuring to the students: they get the impression that they have 'done' their revision.

Replacing this with a schedule of interleaved revision will create an increase in synaptic activity and significantly increase retention. An interleaved revision schedule would look more like this:

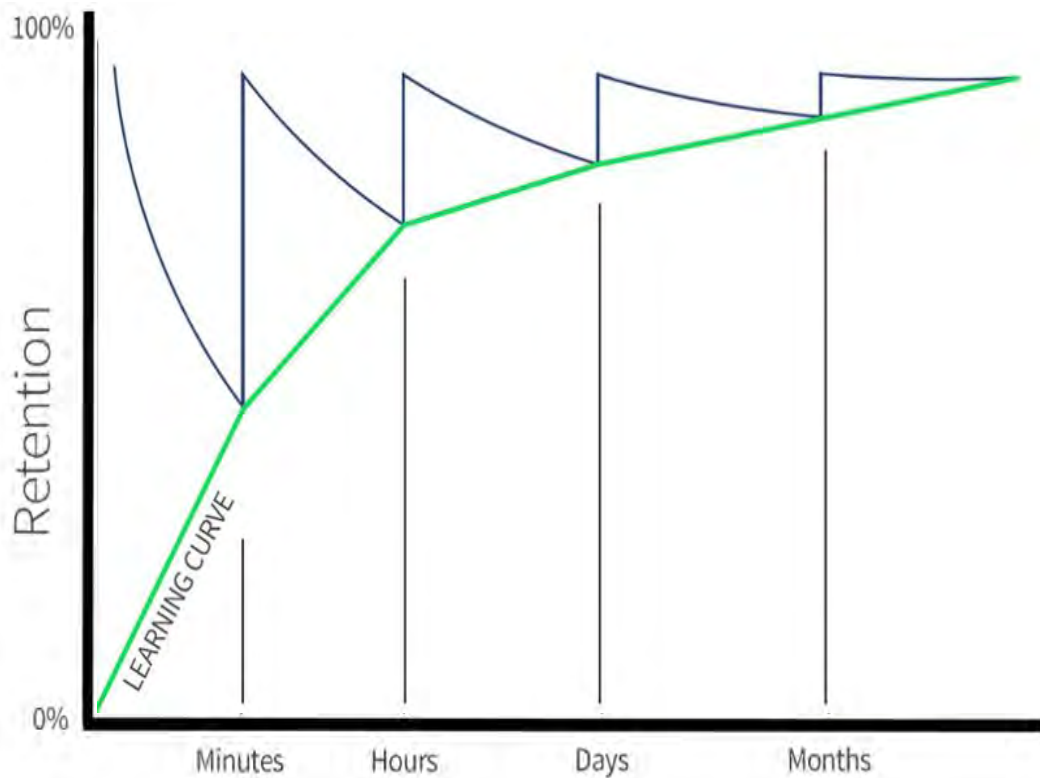


# 3. Revise a range of topics in short bursts



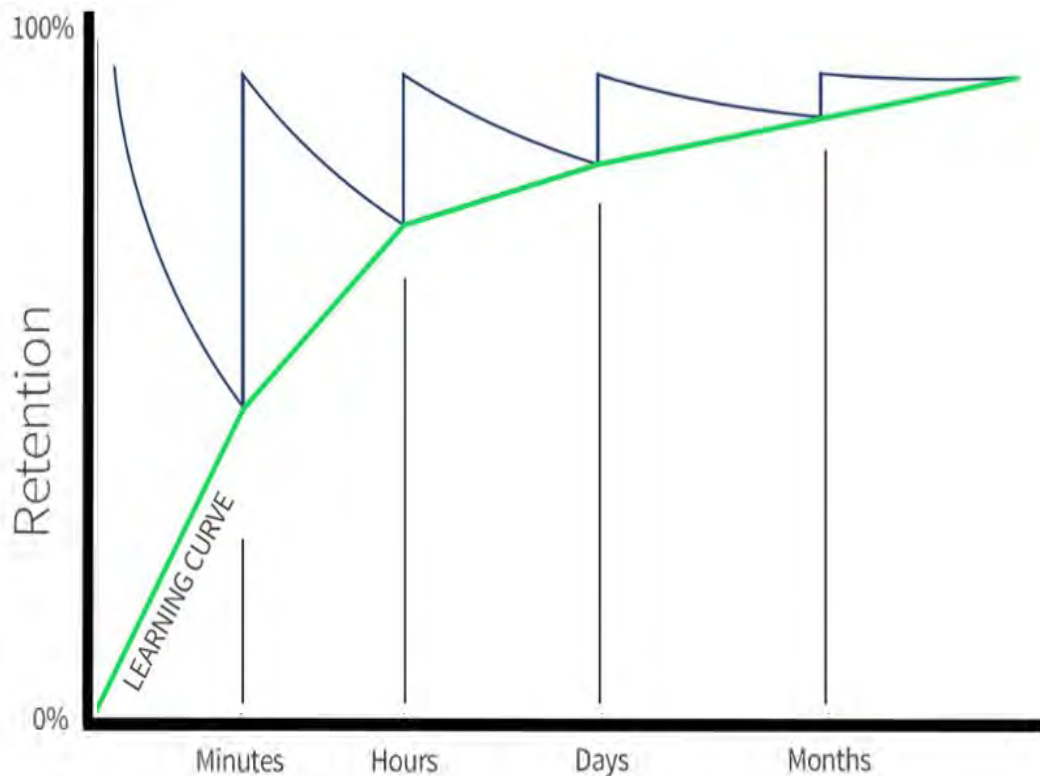
Rohrer, Dedrick, & Stershic, 2015. Interleaved practice improves mathematics learning. *Journal of Educational Psychology*

## 2. Distributed Practice



By varying and prolonging the time between practice, students allow 'forgetting time'. When the brain is tasked to recall this information after several weeks, it is required to retrace the synaptic activity that first retained the information. And the more frequently you come back to a topic, especially after several weeks or even months, the clearer your memory is.

## 2. Revise what you have forgotten



By varying and prolonging the time between practice, students allow 'forgetting time'. When the brain is tasked to recall this information after several weeks, it is required to retrace the synaptic activity that first retained the information. And the more frequently you come back to a topic, especially after several weeks or even months, the clearer your memory is.

# 1. Practice Testing

It seems almost too easy, but the research is clear: for effective revision which best enables RECALL, the humble Flashcard is king.

Teachers can provide the questions and the focus, but it is most effective if the students create the cards for themselves or one another - questions on one side, answers on the reverse.

Practice Testing works best when students work with at least one other person, which stimulates much more synaptic activity than simply re-reading notes. If nothing else, get you students proficient in Practice Testing.







Myelination

Semantic

Rosemary

Schema

Elaboration