

The Science of Learning: Strategies to Help Any Learner!

Welcome!

- A bit about me
- A bit about you
- Expectations/hopes?

Welcome!

The sessions

1. What is learning? Models of memory, metacognition
2. The adolescent brain, and challenges of AI
3. Strategies, myths and the brain as it ages
4. Applying what we've learned!

Thoughts, questions?

To think about **learning** we need to know about **memory**...

The 'modal (or multi-store) model of memory'

- **Sensory** memory
- **Working** memory
- **Long-term** memory

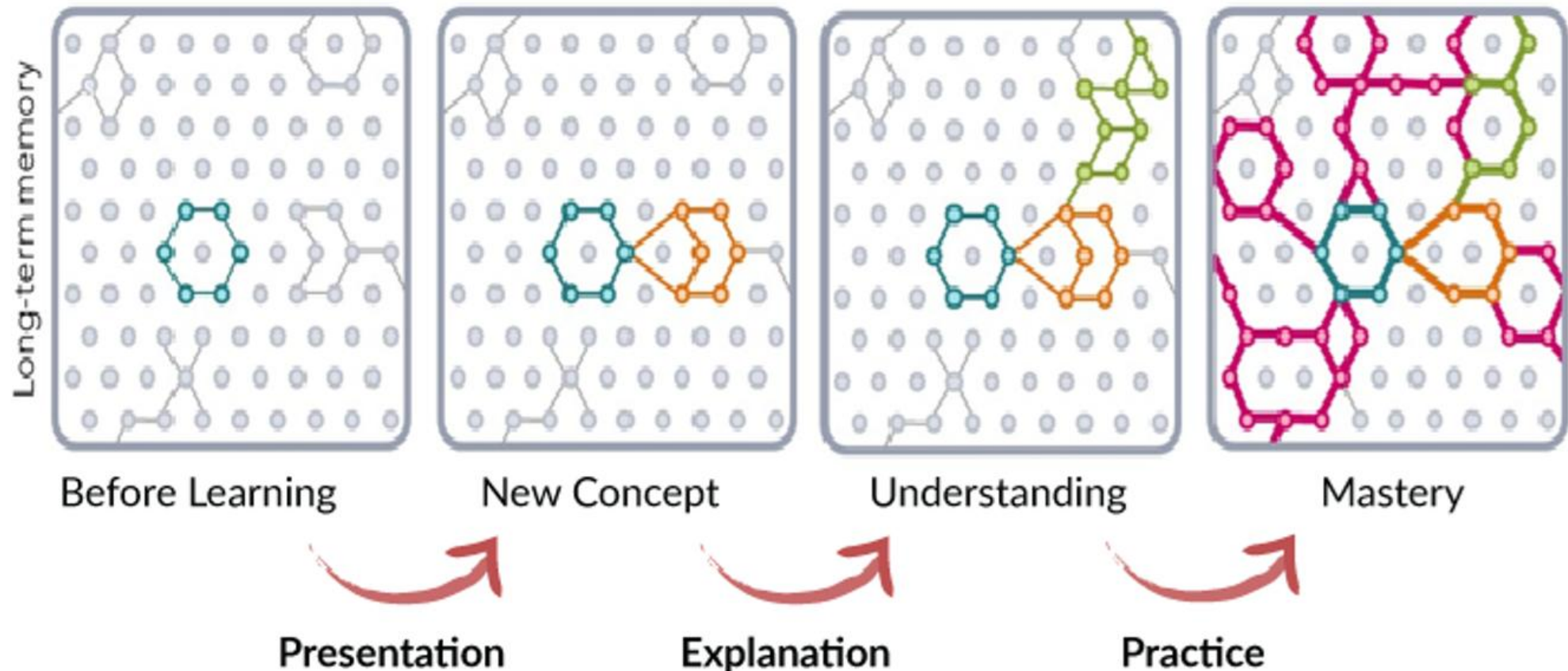
NB: Working memory is not 'short-term memory'!

What is 'learning'?

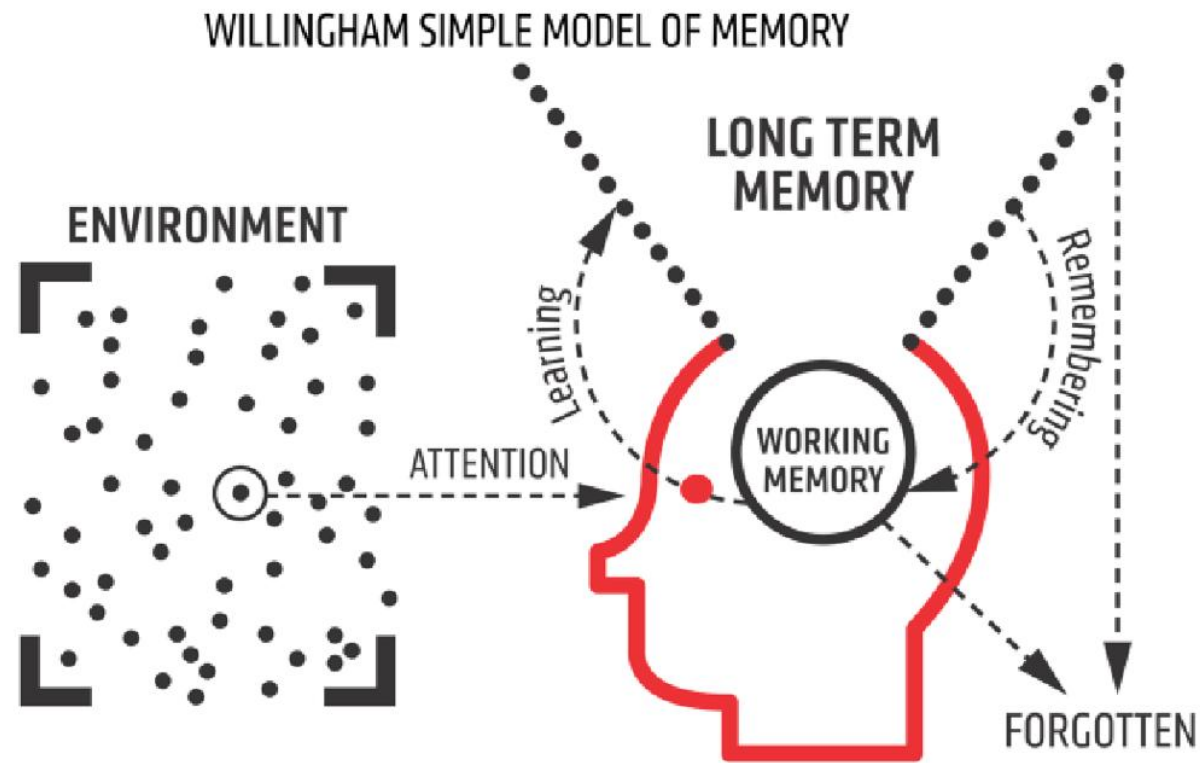
Learning is a change to your long-term memory.

... it's better to think about **schema**...

Model of memory representation in long-term memory store



A useful interpretation of the modal model

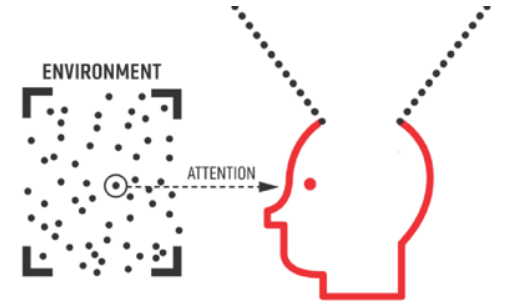


1. What we need to know about attention

It's evolution.

You are programmed to

- have a **wide, less focussed** view (so you don't get eaten)
- have a **narrow, focussed** view (so you know what to eat)
- notice **new** things (that might help you survive/mate/get fed)

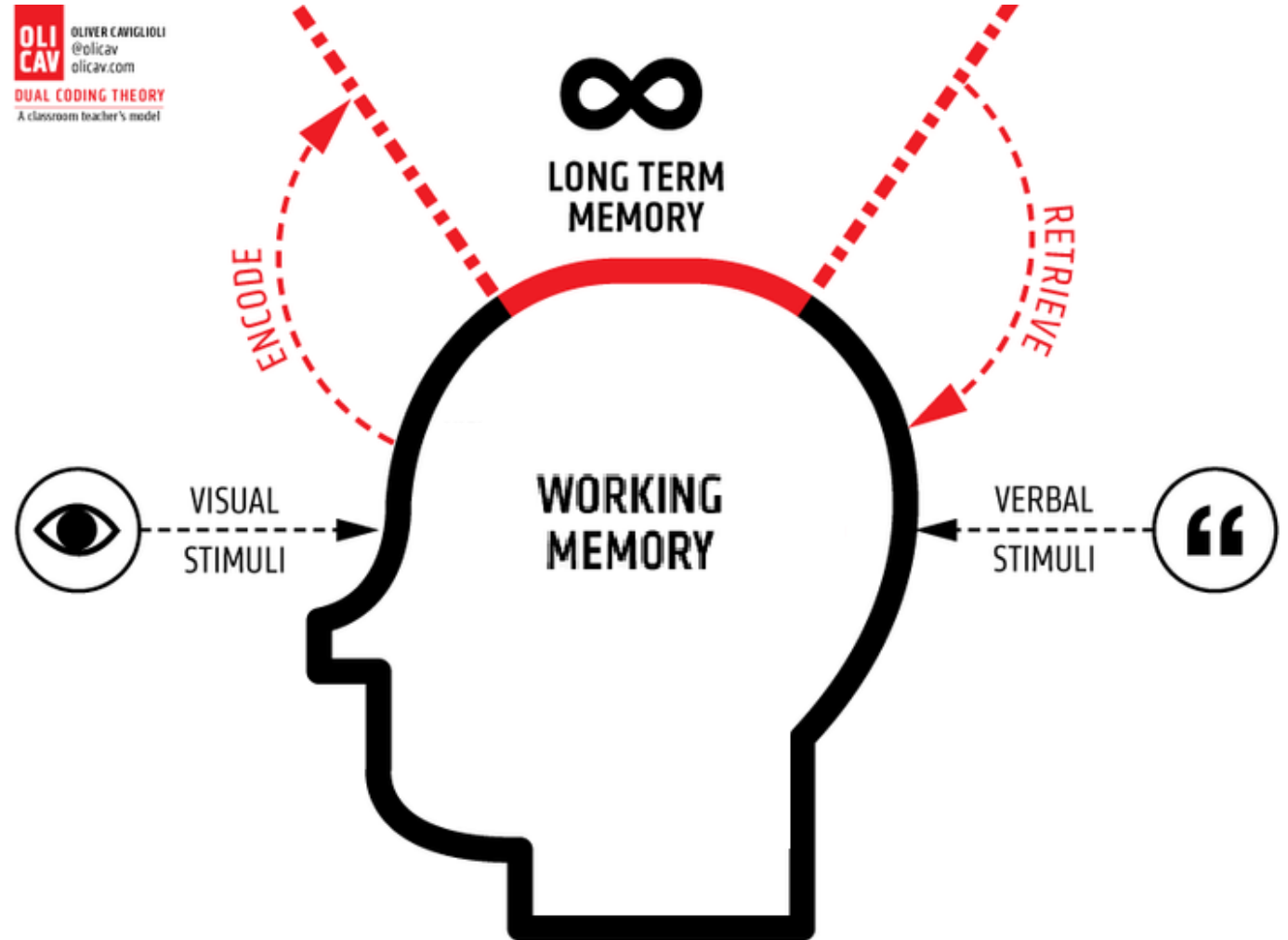


Watch the video



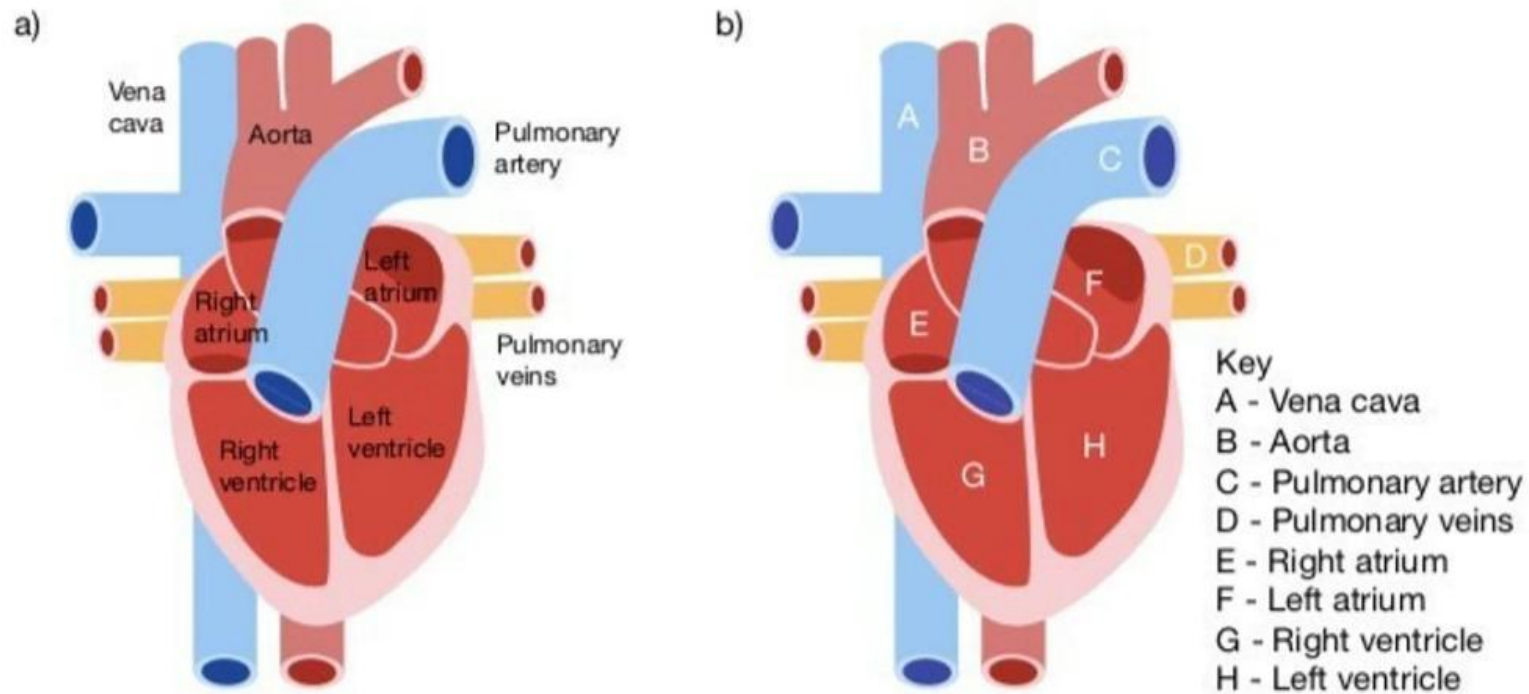
1. Attention has **two** main sensory channels

- Visual
 - Verbal
(written or speech)
- They work **in parallel**.



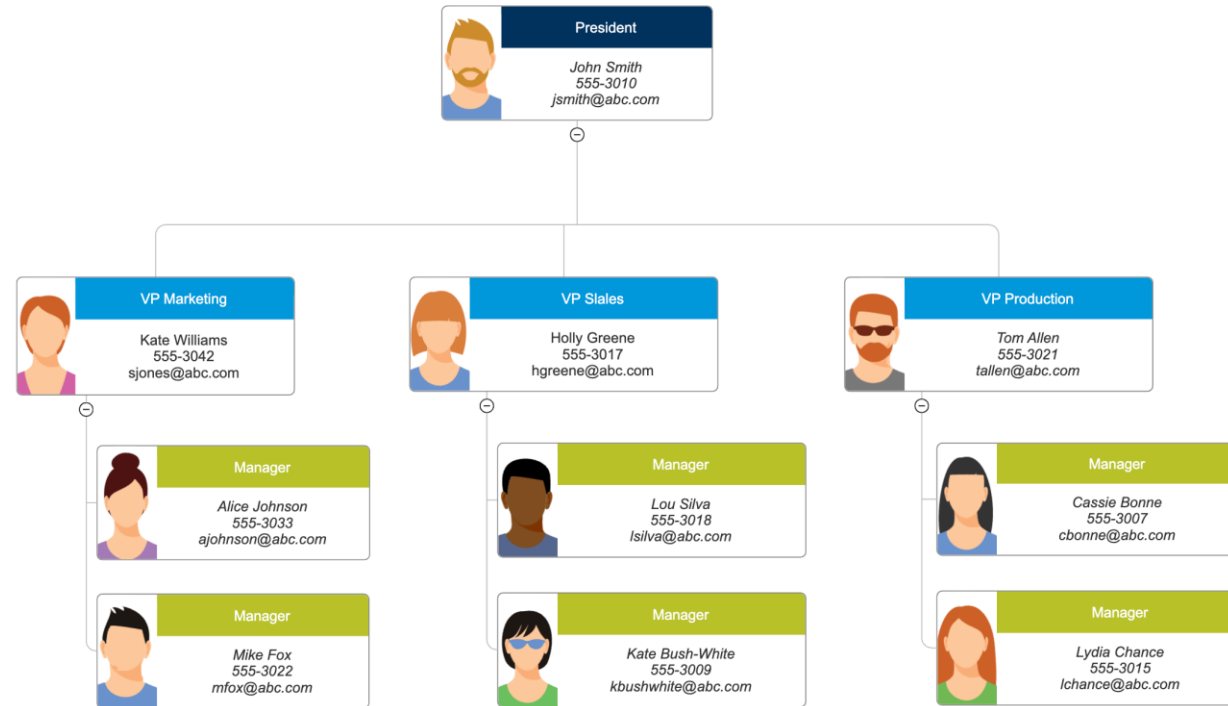
Dual coding in practice

We can use the **parallel** channels to our advantage...

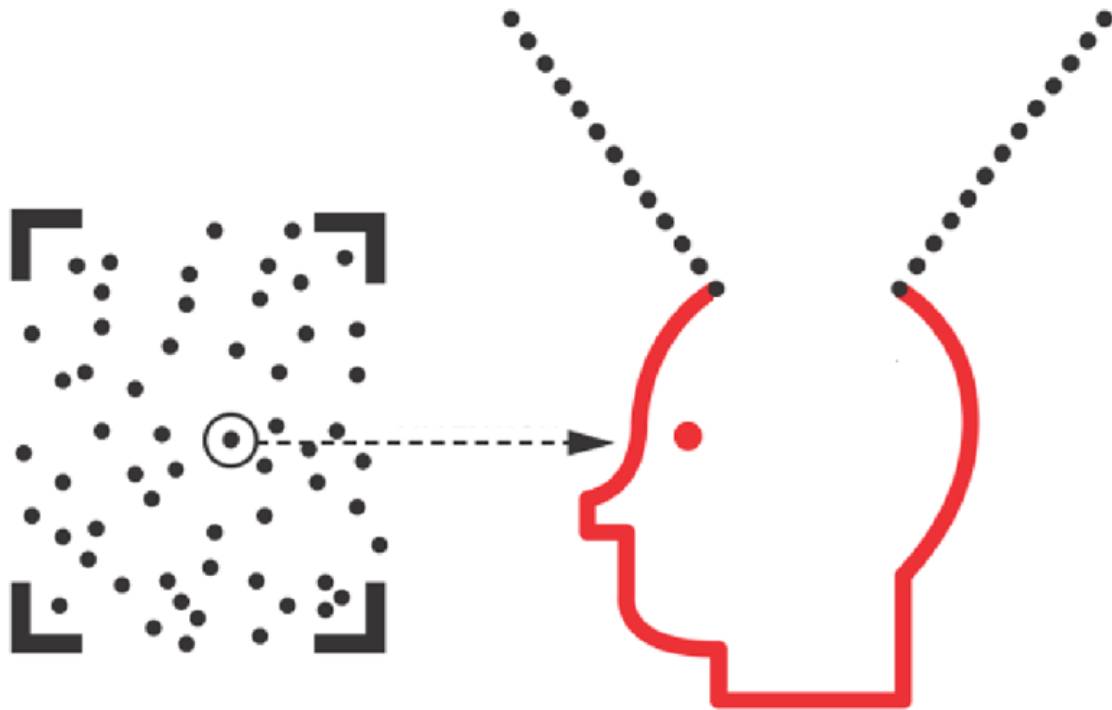


Dual coding in practice

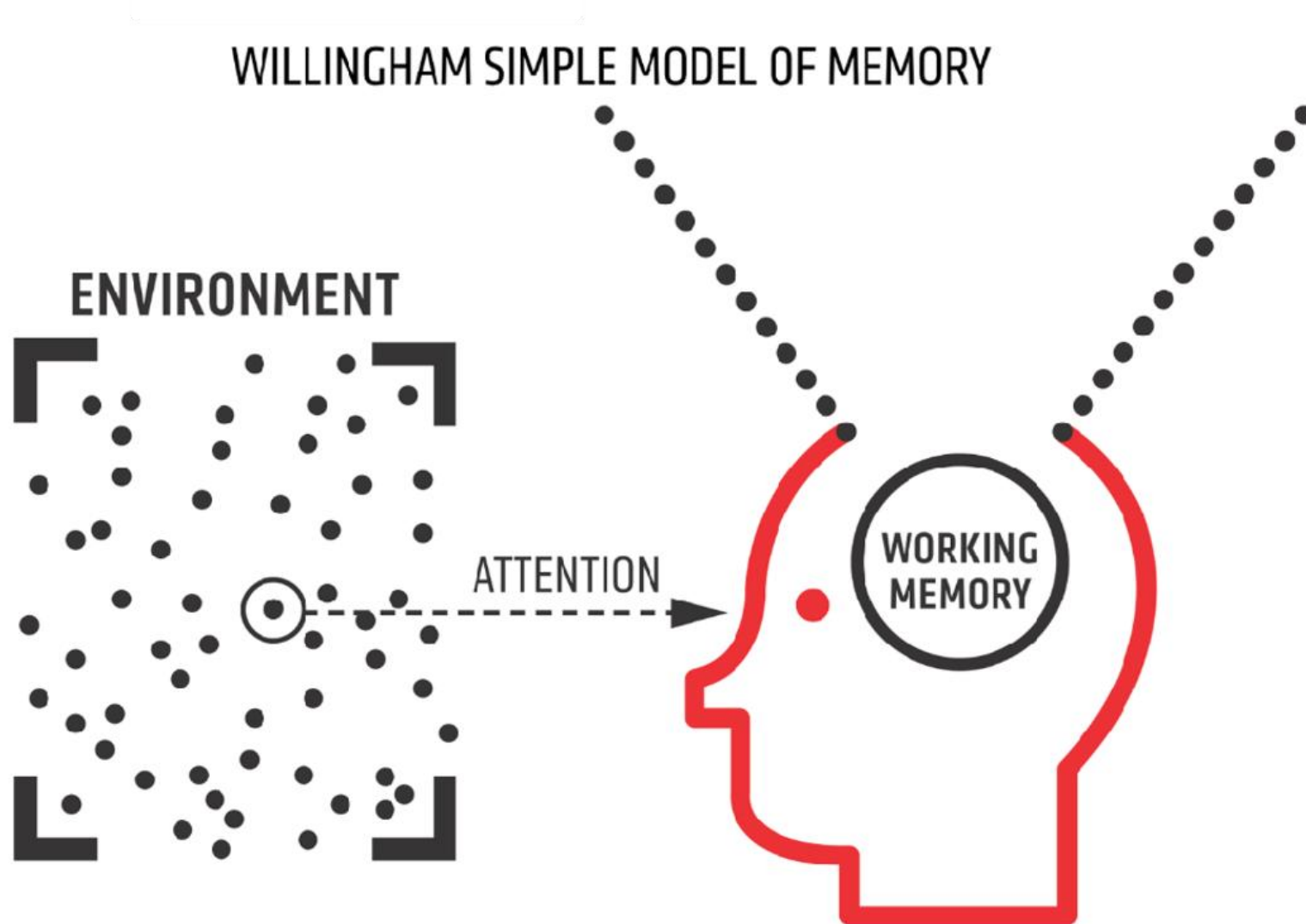
We can use the **parallel** channels to our advantage... and you probably have!



Let's have a go!



2. Everyone's **working memory** is limited



How do we experience memory overload in everyday life?

- Too many things on our mental shopping list
- Phone numbers
- Directions
- Other things?

How much can we remember?

What's your 'digit span'?

5 6 1

8 7 3

9 7 5 4

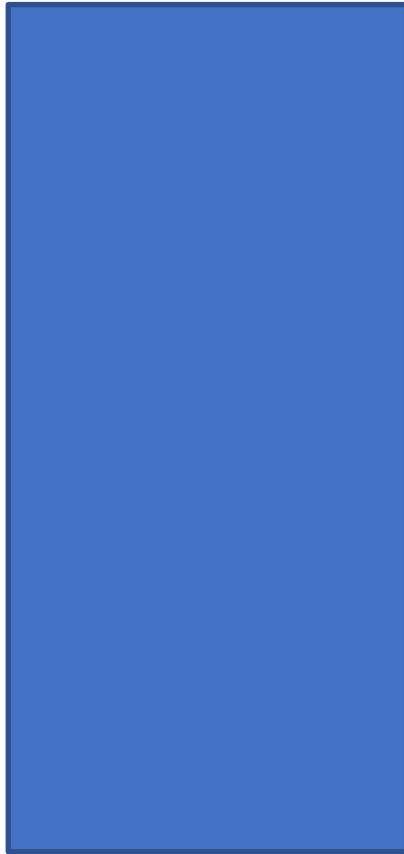
3 8 2 5

9 4 3 1 8

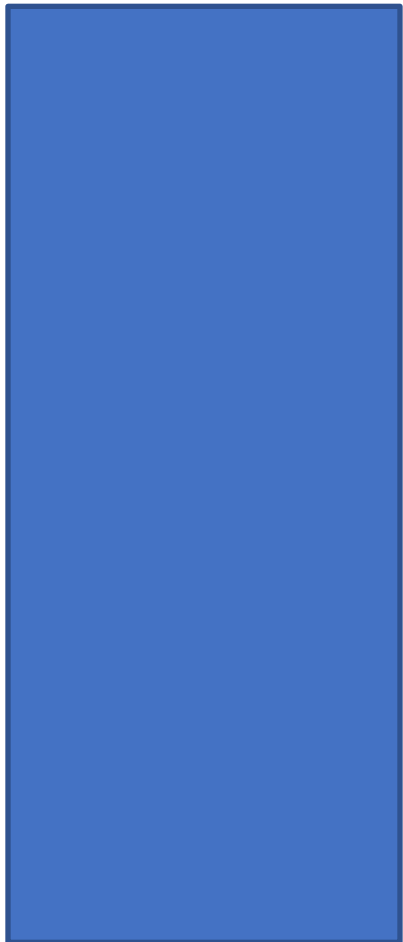
6 8 2 5 9

9 1 3 8 2 5

6 4 8 3 7 1



What's your 'digit span'?



Do all of this in your head

5 6 1



Do all of this in your head



Do all of this in your head

5 6 1

8 7 3



Do all of this in your head



Now say BOTH lines.

Do all of this in your head

5 6 1

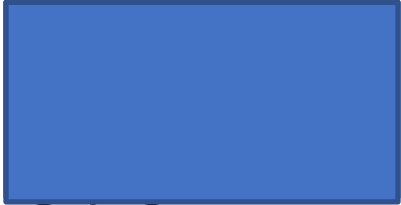
8 7 3



Do all of this in your head



Do all of this in your head



9 7 5 4



Do all of this in your head



Do all of this in your head



9 7 5 4

3 8 2 5



Do all of this in your head



Now say BOTH lines.

Do all of this in your head



9 7 5 4

3 8 2 5



Do all of this in your head



Do all of this in your head



9 4 3 1 8



Do all of this in your head



Do all of this in your head



9 4 3 1 8

6 8 2 5 9



Do all of this in your head



Now say BOTH lines.

Do all of this in your head

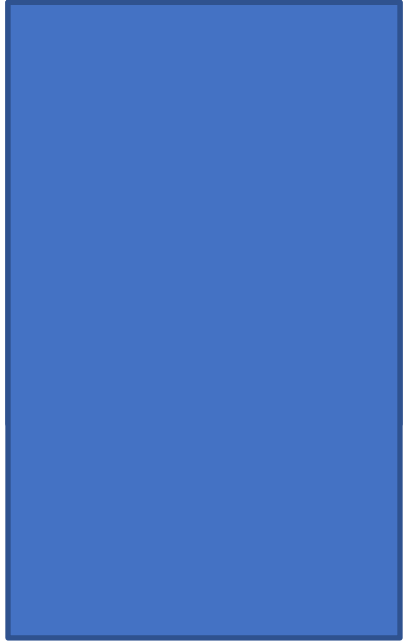


9 4 3 1 8

6 8 2 5 9



Do all of this in your head



9 1 3 8 2 5



Do all of this in your head



Do all of this in your head



9 1 3 8 2 5

6 4 8 3 7 1

Do all of this in your head



Now say BOTH lines.

Do all of this in your head



9 1 3 8 2 5

6 4 8 3 7 1

But! This is short-term memory, not working memory!

Let's look at **working memory**...

Put the letters of the alphabet **in alphabetical order**...

A

B

H

D

R

W

...

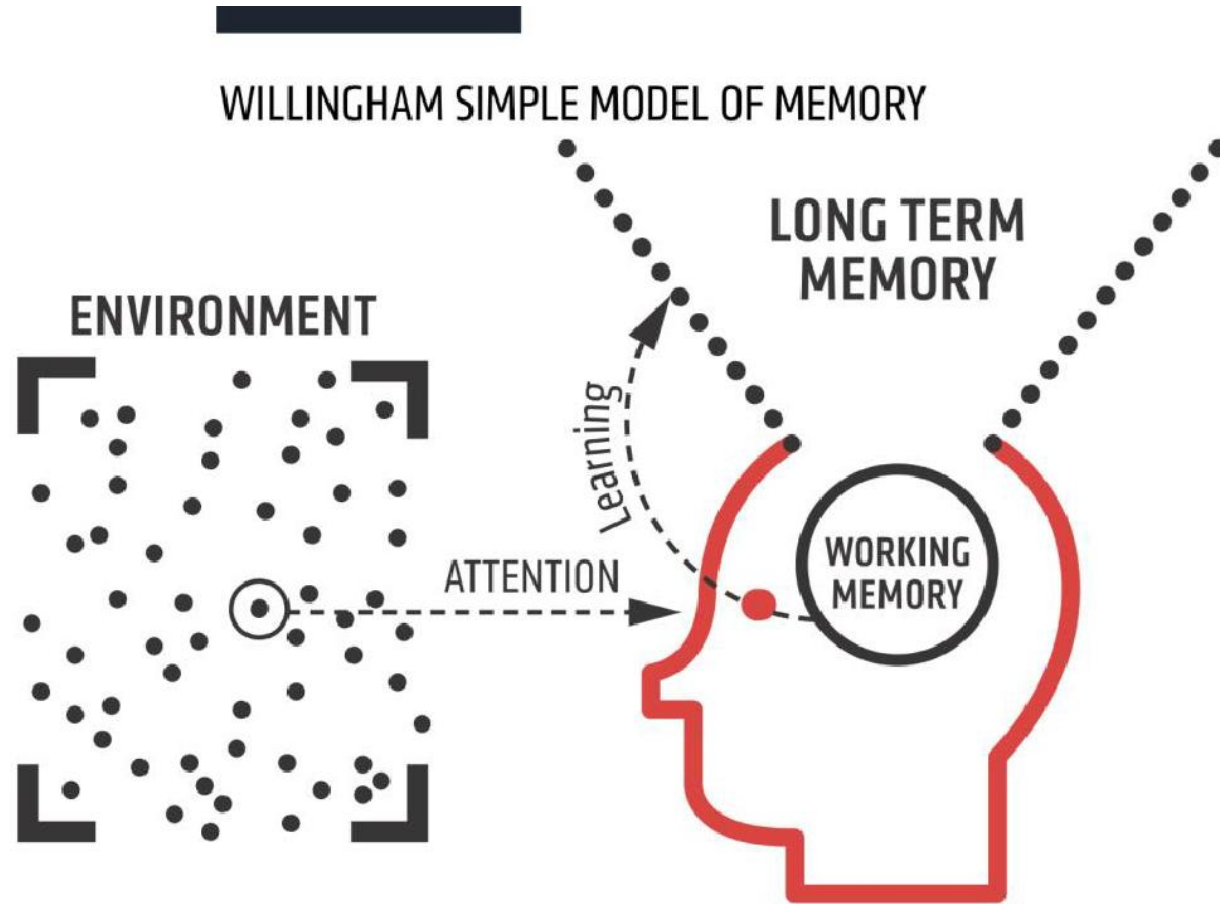
...

AHRBDWEFLMNSXIJGKQOPCTVYUZ

What can be done? Some questions...

- Can you **increase** your working memory capacity?
- What about 'brain games'?
- What about 'offloading'?
- There's **one thing** that helps everyone... (next section)

3. Thinking moves things to your long-term memory



**This is a REALLY GOOD IDEA
because
your LONG- TERM MEMORY
IS HUGE.**

Learning is technically about processing...

- Working memory capacity depend on **what you're holding** in it AND **what you're doing** with those things (processing)
- Processing involves **connecting the new stuff** with **what you already know** (in your long-term memory)
- What helps?

We can make the 'making connections' easier

... but how?

Here's some questions...

- Where were you last Thanksgiving?

Here's some questions...

- What are the pictures on the back of a dollar bill?

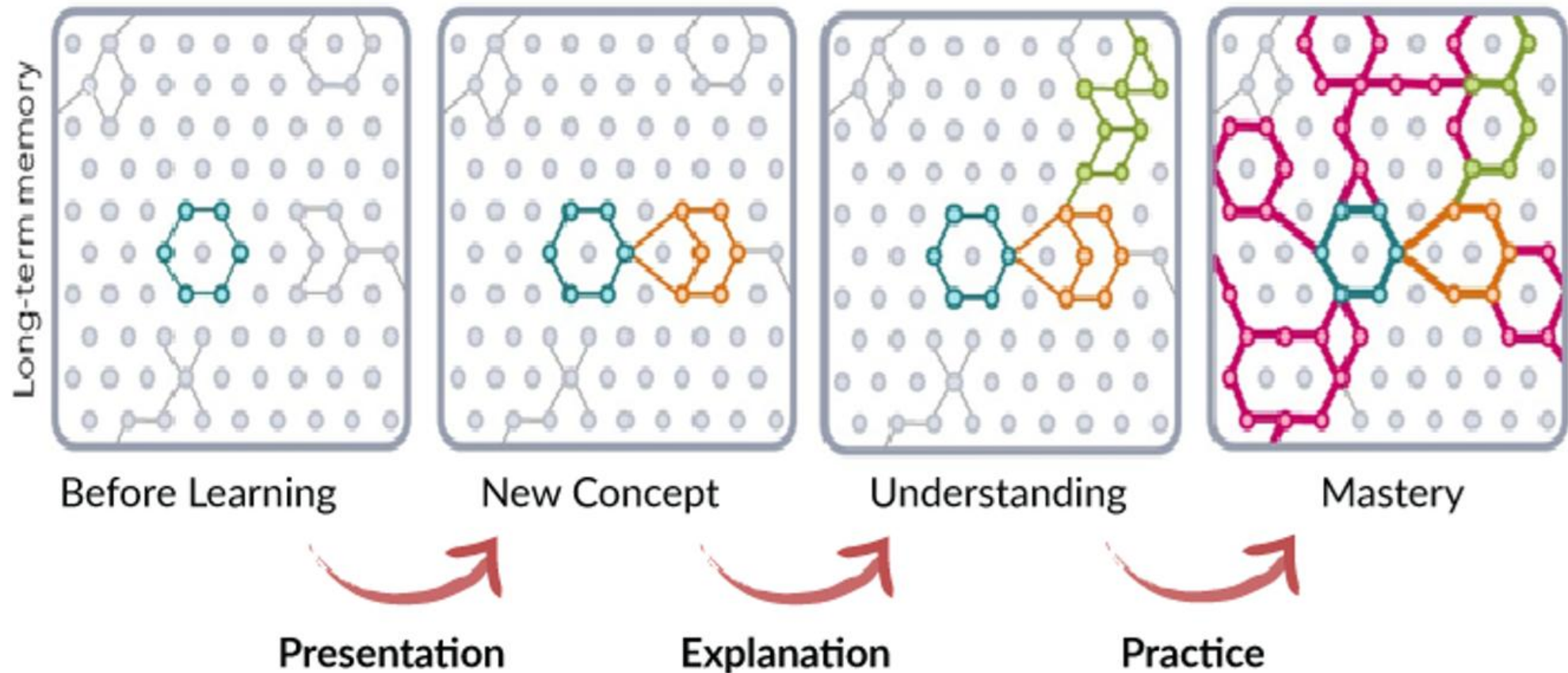
Here's some questions...

- Where were you last Thanksgiving?
- What are the pictures on the back of a dollar bill?



Remember **schema**...

Model of memory representation in long-term memory store



It's the meaning that matters

- It's easier to connect to things that are meaningful...
- Which matters because the more you know the easier it is to learn.

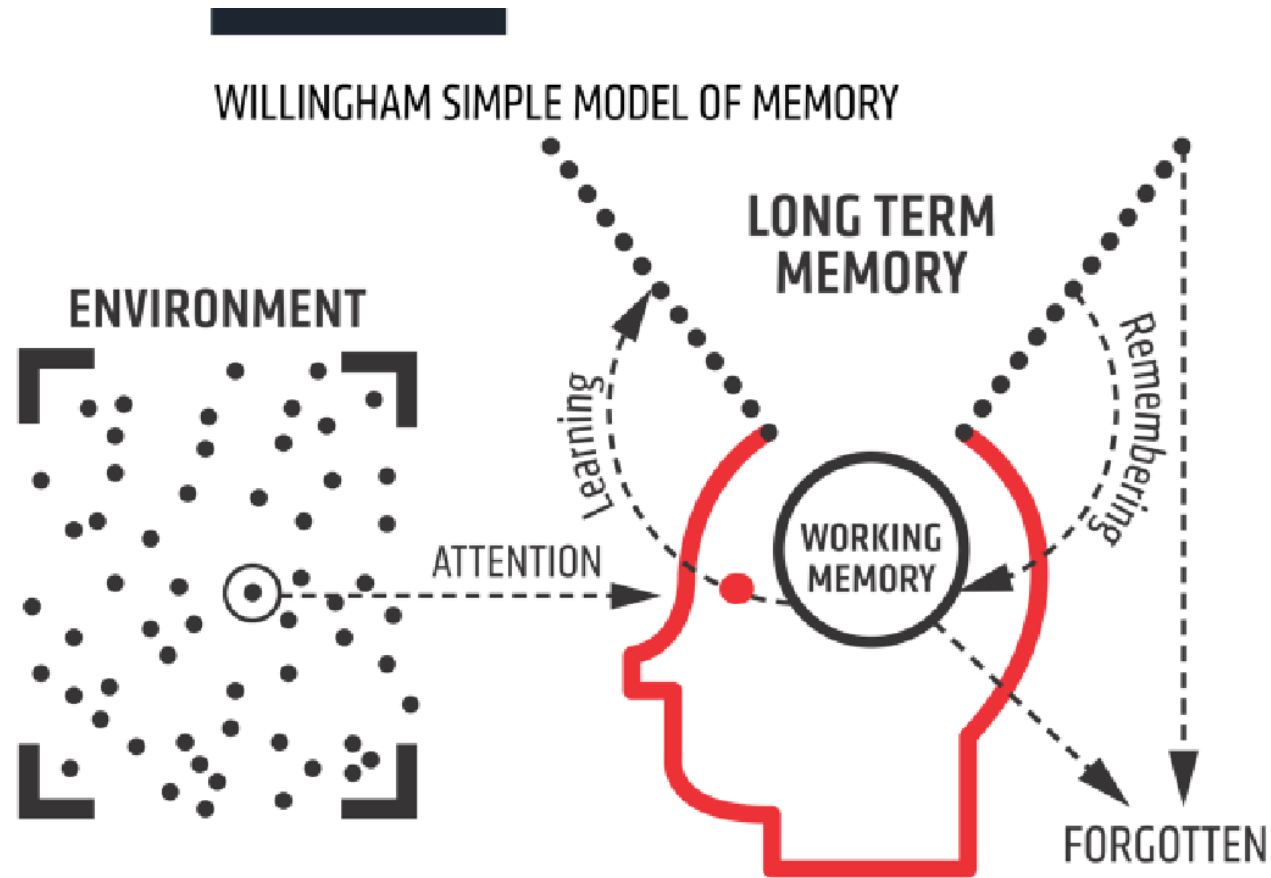
A recap!

- Our **attention** is precious; it determines what ends up in our working memory
- Our **working memory** is limited; it helps not to overload it
- It's easier to put things with meaning in our (infinite) **long-term memory**

From the video earlier

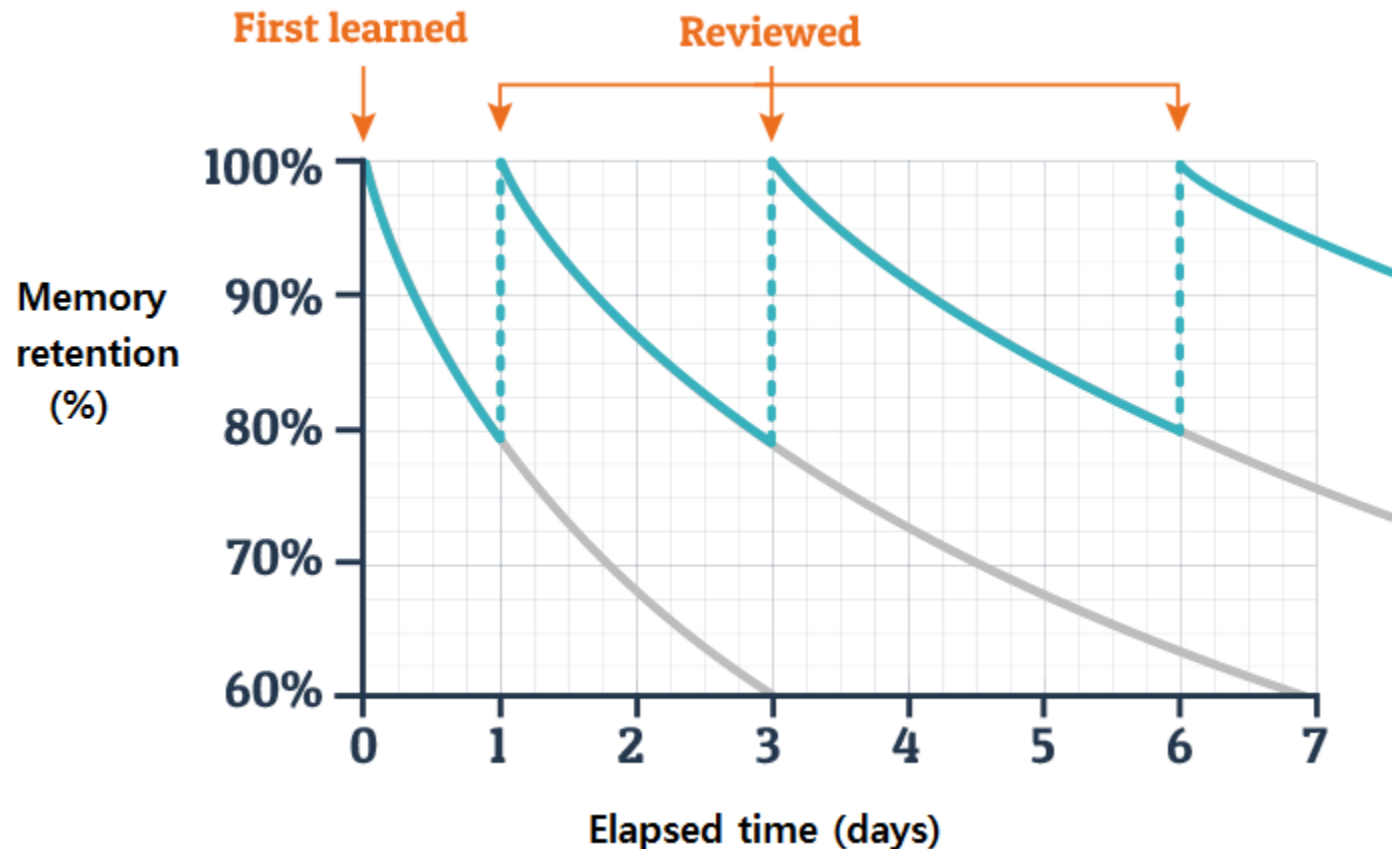
1. Which **animal** appears?
2. **How many** players are there on each team?
3. What **color** are the balls they are playing with?
4. What is the **color of the shirt** of the player that **leaves**?
5. What **color is the curtain** at the **start**?
6. What **color is the curtain** at the **end**?

4. Forgetting is part of learning



Retrieving things **upsets** the 'forgetting curve'

- Ebbinghaus (1885)
- Experimented on himself
- Reviewing increases retention... makes memories **stronger**

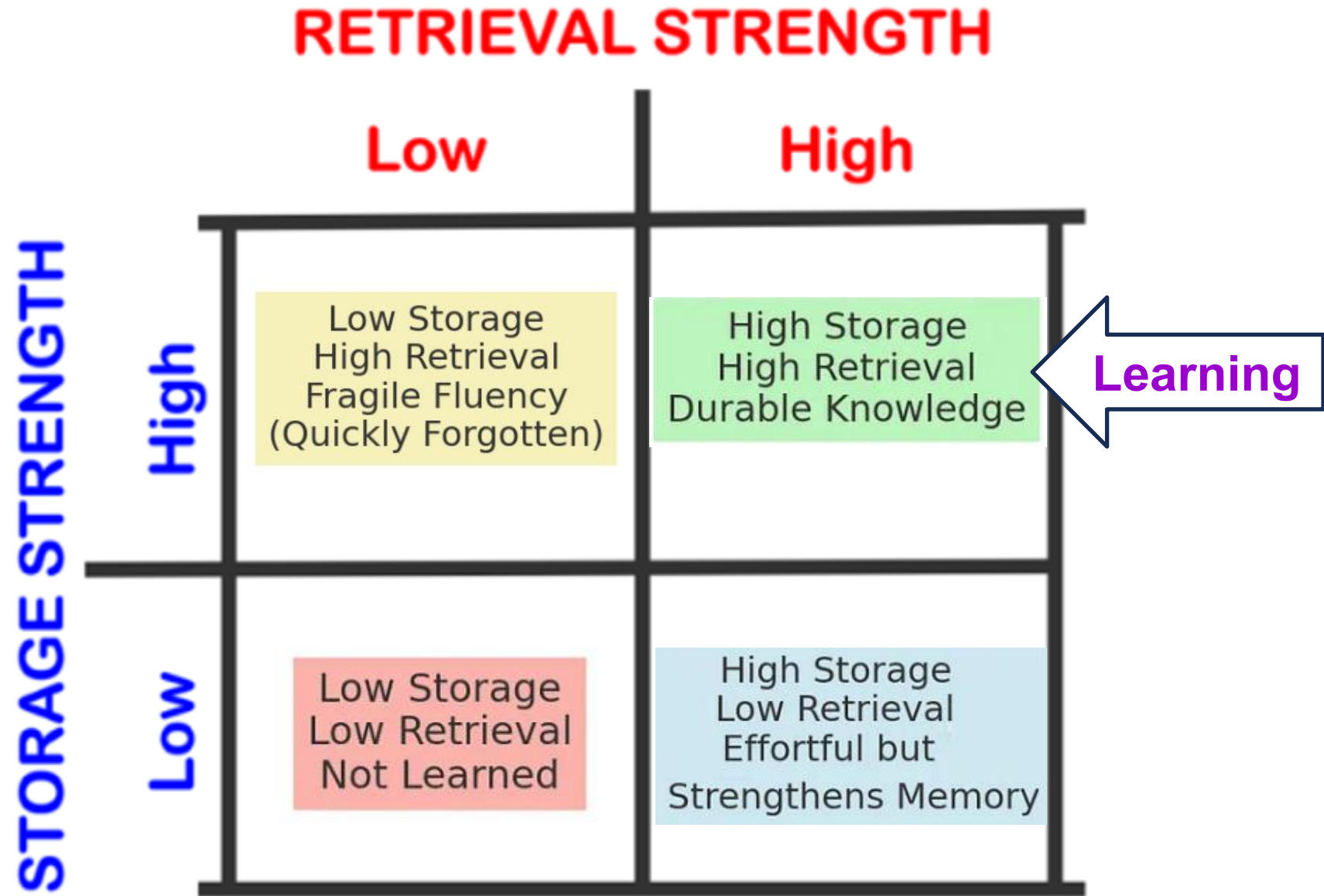


BUT there are **two** types of memory strength

- **Everything** is in there!

There's a difference between

- **Storage** strength – how strongly it is 'encoded' in your brain
- **Retrieval** strength – how easily you can bring it to mind



- A. Your phone number as a child
- B. The check last time you ate out
- C. Your phone number now
- D. Where you're going after this class

RETRIEVAL STRENGTH			
		Low	High
STORAGE STRENGTH	High	1.	2.
	Low	3.	4.

RETRIEVAL STRENGTH			
		Low	High
STORAGE STRENGTH	High	Your phone number as a child (1/A)	Your phone number now (2/C)
	Low	The check last time you ate out (3/B)	Where you're going after this class (4/D)

Thoughts, questions?

Metacognition – what is it? What isn't it?

Not so much 'thinking about thinking' as 'learning about learning'

1. Metacognitive knowledge:

- knowing how we learn (Declarative metacognitive knowledge)
- knowing how to learn (Procedural/conditional metacognitive knowledge)

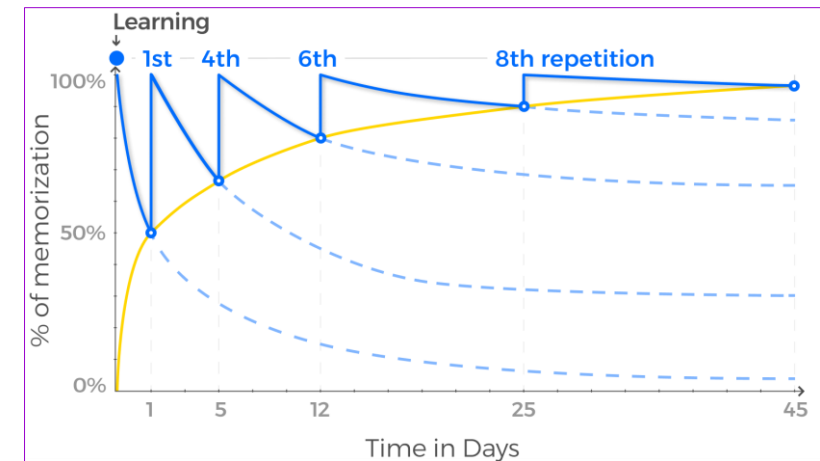
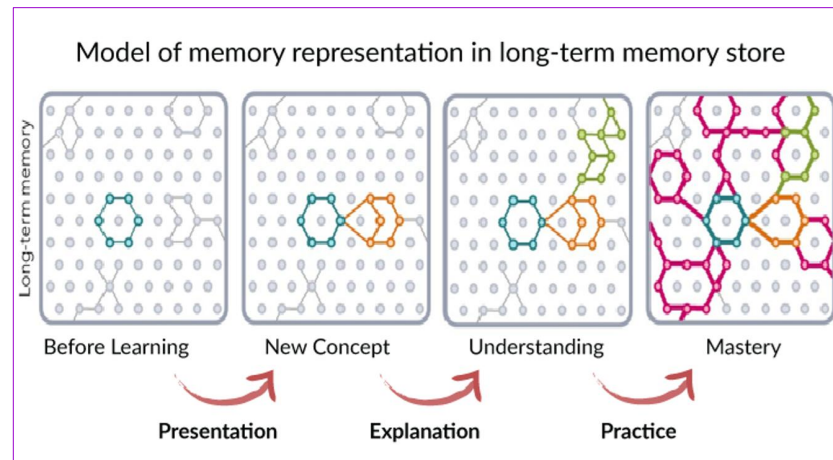
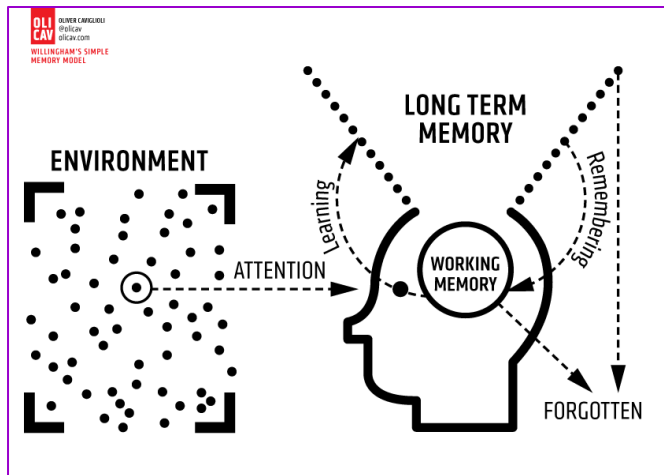
2. Metacognitive regulation:

- Planning
- Monitoring
- Evaluating

1. What is metacognitive knowledge?

- How people learn (working memory, long-term memory, forgetting...)
- Yourself as a learner (your work habits, motivation...)
- Strategies (practice, planning...)

1. What is metacognitive knowledge?



Knowledge of memory, schemas, forgetting

1. What is metacognitive knowledge?

For knowledge of yourself as a learner...

- You can the **Metacognitive Awareness Inventory (MAI)**
- ... or simply reflect on **how you think** and **what you do** when you're trying to learn something

Metacognitive Awareness Inventory (MAI)

Think of yourself as a **learner**. Read each statement carefully. Consider if the statement is true or false as it generally applies to you when you are in the role of a learner (student, attending classes, university etc.) Check (✓) True or False as appropriate. When finished all statements, apply your responses to the Scoring Guide

	True	False
1. I ask myself periodically if I am meeting my goals.		
2. I consider several alternatives to a problem before I answer.		
3. I try to use strategies that have worked in the past.		
4. I pace myself while learning in order to have enough time.		
5. I understand my intellectual strengths and weaknesses.		
6. I think about what I really need to learn before I begin a task		
7. I know how well I did once I finish a test.		
8. I set specific goals before I begin a task.		
9. I slow down when I encounter important information.		
10. I know what kind of information is most important to learn.		

1. What is metacognitive knowledge?

You need knowledge of strategies to help you learn

Things that work... like:

- The testing effect/retrieval practice

Things that don't work... like:

- Reading without processing!

1. What is metacognitive knowledge?

- knowledge how to best perform strategies
- knowledge about when and why to use a strategy

Metacognition – what is it? What isn't it?

1. Metacognitive knowledge:

- knowing how we learn
- knowing how to learn

2. What is metacognitive regulation?

- Planning on how to obtain your learning objectives/meet your goals
- Monitoring the progress you are making while studying/doing what you need to do
- Evaluating how well you prepared/your overall success.

Do you **need** strategies?

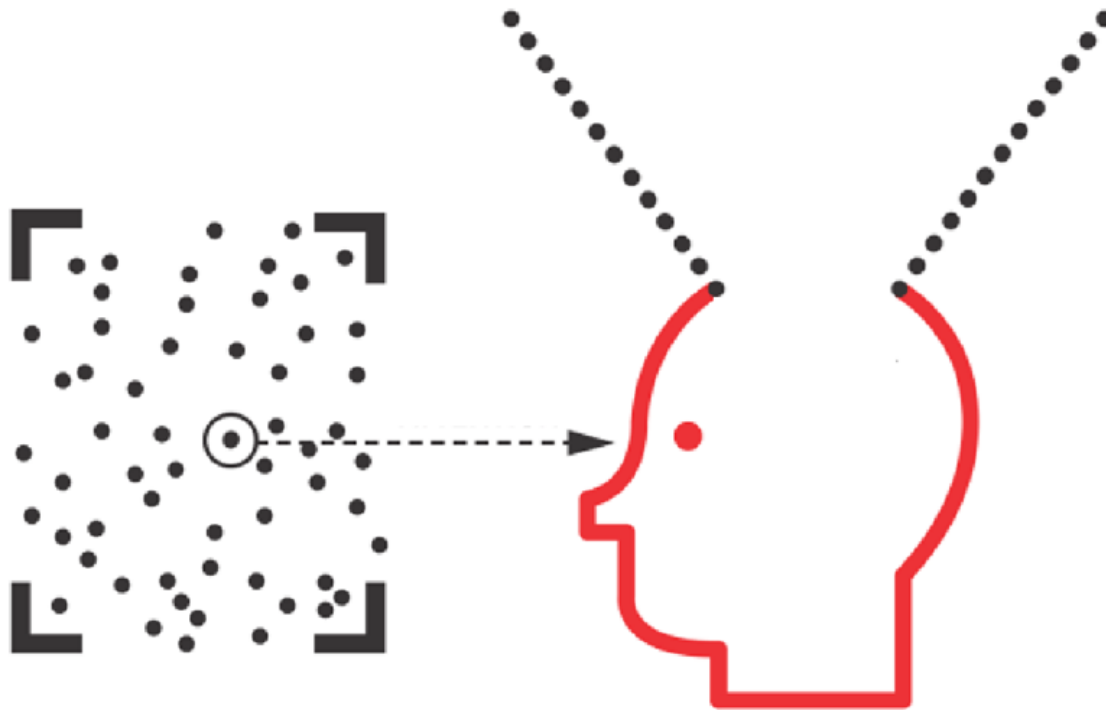
- Planning on how to obtain your learning objectives/meet your goals
 - Monitoring the progress you are making while studying/doing what you need to do
 - Evaluating how well you prepared/your overall success.
-
- Could you do all of the above **without** using any metacognitive knowledge?

Metacognitive regulation is better described as:

Using metacognitive knowledge to

- Plan on how to use metacognitive strategies to obtain your learning objectives/meet your goals
- Monitor the progress you are making while using metacognitive strategies to study/do what you need to do
- Evaluate how well you used metacognitive strategies to prepare/achieve your overall success.

Let's have a go!



Let's try that again...

1. Which **animal** appears?
2. **How many** players are there on each team?
3. What **color** are the balls they are playing with?
4. What is the **color of the shirt** of the player that **leaves**?
5. What **color is the curtain** at the **start**?
6. What **color is the curtain** at the **end**?

Thoughts, questions?

Applying this to... dancing!



For next time...