Attention and Working Memory
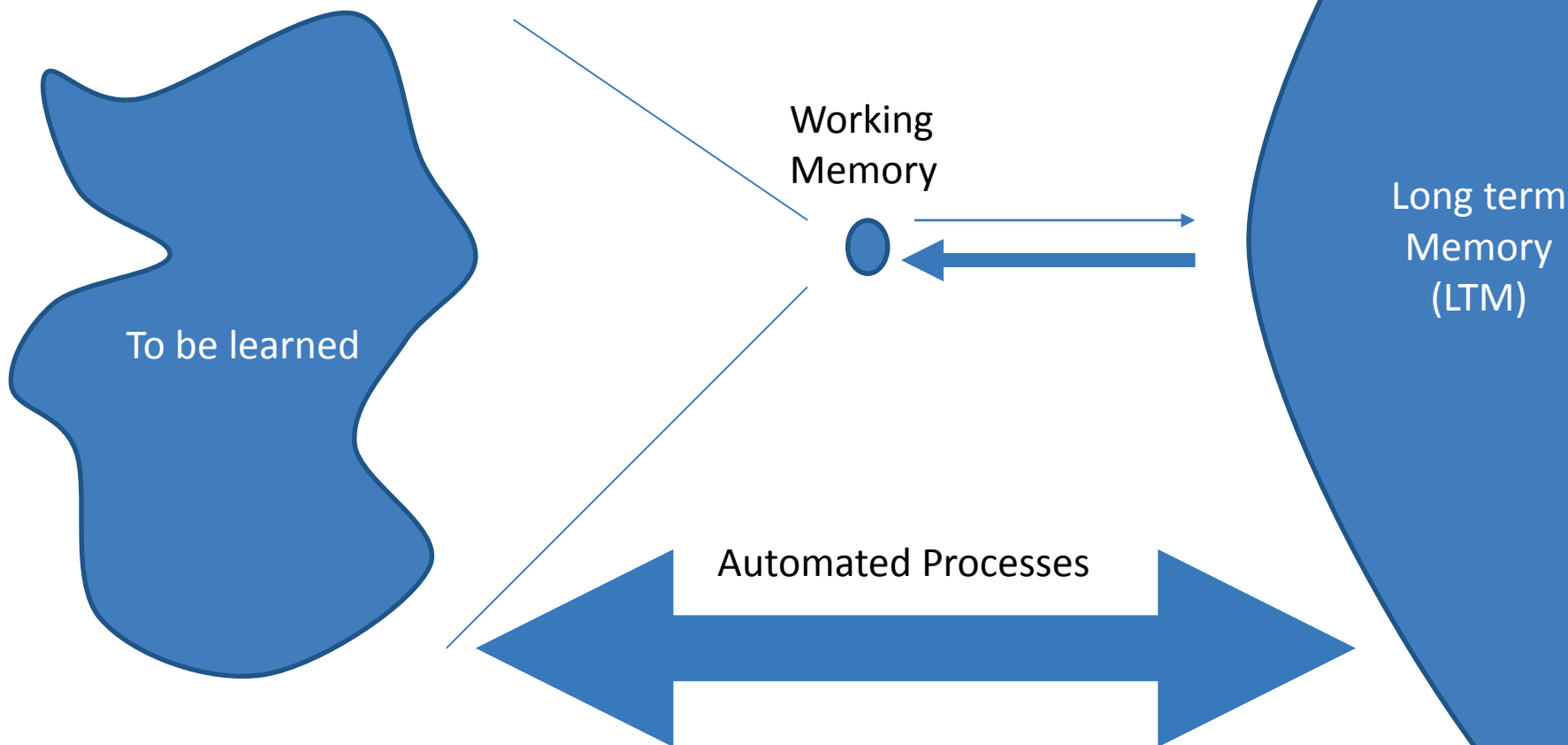
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To be learned

Working Memory

Long term Memory (LTM)

Automated Processes

Learning Aims

- You will today be able to use the following concepts
  - Working Memory
  - Controlled attention / Stimulus driven attention
  - Visio-Spatial Sketchpad, Phonological Loop, Episodic Buffer
  - Chunking

– Typically people get between 5 and 9 right
- Miller's magic number 7±2

• How did you remember them?

- Repeating them in your head?
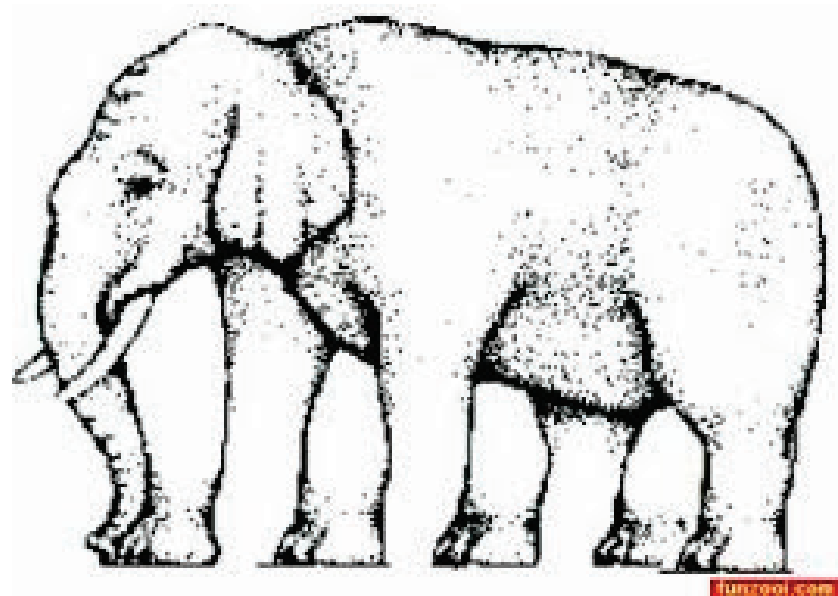
- Trying to visualise them?

Working Memory

Working Memory is a brain function (not a location in your brain)
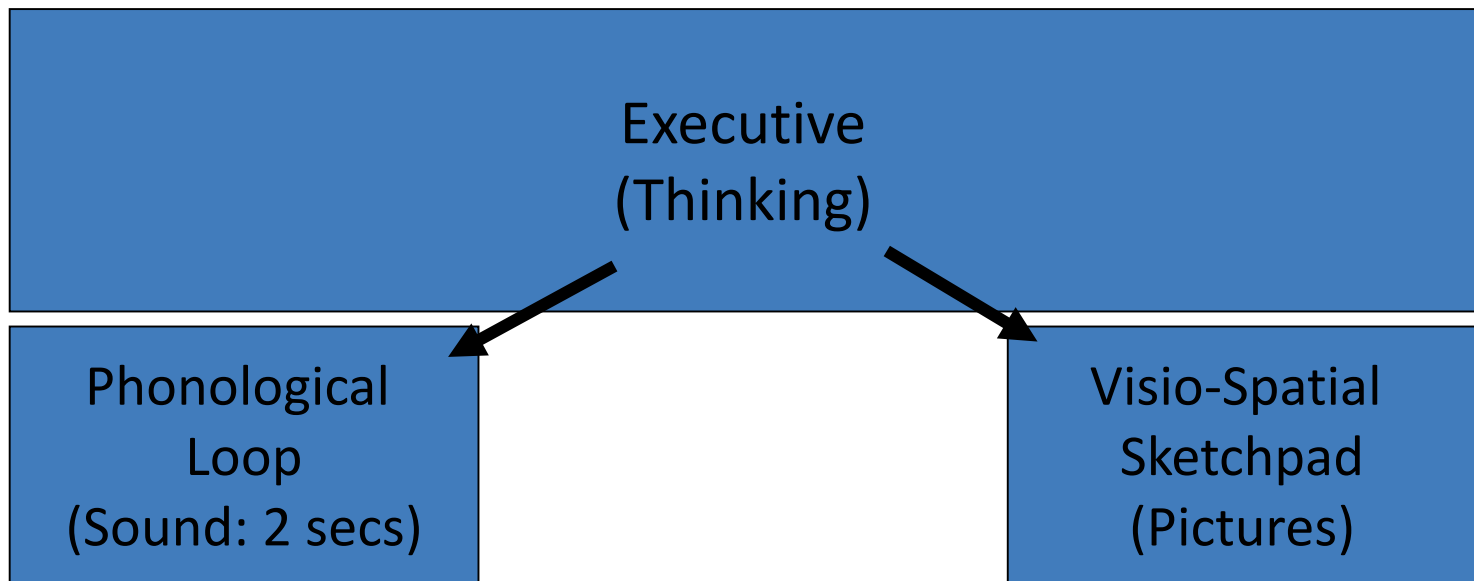
Baddeley and Hitch, 1974; Baddeley 2000

- Working memory involves focusing attention
  - It has **very** limited capacity (maybe 4 'slots')
  - If something takes your attention it will push things out of working memory
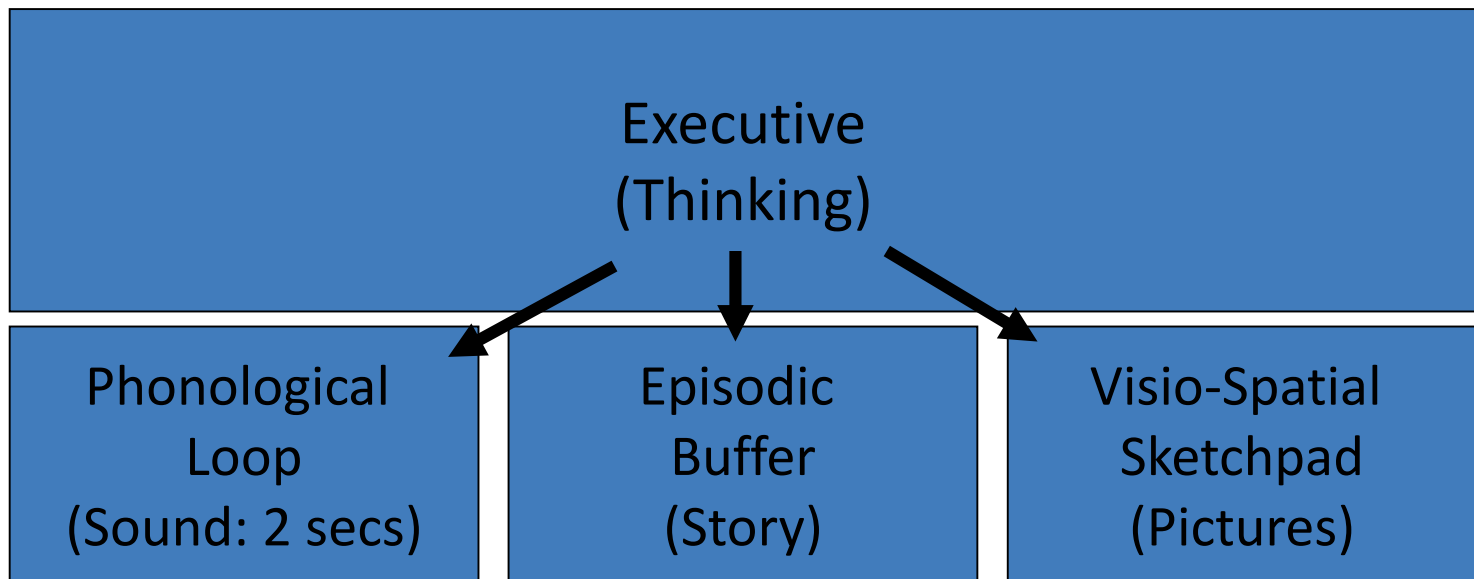
What do you see?

Attention

- Working memory allocates attention

- Prior knowledge (schemas) are used to "filters out" information that is "not important"
  - May filter out information that contradicts schema

- Two important types
  - Controlled attention
  - Stimulus driven attention

- Controlled attention central to studying

- If we break things into "chunks" things are easier to remember…(Called 'Chunking')

- Using graphic images, narrative also helps (memory palace technique)

Working Memory

Limit of 4 slots idea: Saults and Cowan (2007); Cowan 2010

Executive
(Thinking)

Phonological
Loop
(Sound: 2 secs)

Episodic
Buffer
(Story)

Visio-Spatial
Sketchpad
(Pictures)

"Cognitive load"

In the following combustion reaction, how many grams of CO_2 will be produced by the reaction of 1 gram of ethanol and 2 grams of oxygen?

$$C_2H_5OH + O_2 \rightarrow CO_2 + H_2O$$
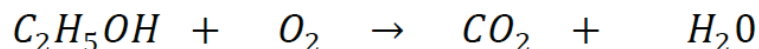
Molecular weights	
C_2H_5OH	46.08 g/mol
O_2	32.00 g/mol
CO_2	44.01 g/mol
H_2O	34.02 g/mol

– Does it matter that it is combustion?

– Method:

- Balance the chemical equation (How?)
- Convert mass into moles (How?)
- Identify limiting reagent (what does that mean?)
- Remember to answer the question

Teaching and "Cognitive load"

- Questions framed in complicated ways:
  - "Is it the case that 6 multiplied by 8 is always equivalent to four multiplied by 12"?

- "Unintended complexity"
  - Need to learn to use SolidWorks, but to do so you need to install a VPN, download the software from the servers, administer the appropriate licence, deal with system crashes…

Overcoming cognitive load

- Worked examples
- Use dual channel/ dual mode (multimedia)
- Contiguity (keep words close to relevant images)
- Reduce extraneous information
- Provide cues
- Progression

Conclusion

- For semantic memories, attention is the gateway

- Our capacity for attention is very limited

- Controlling attention, working with information are key functions of working memory

- Chunking, using images and story can play a role in retention in long term memory