

RECOMMENDATIONS FOR EFFECTIVE LEARNING

Evidence-based principles

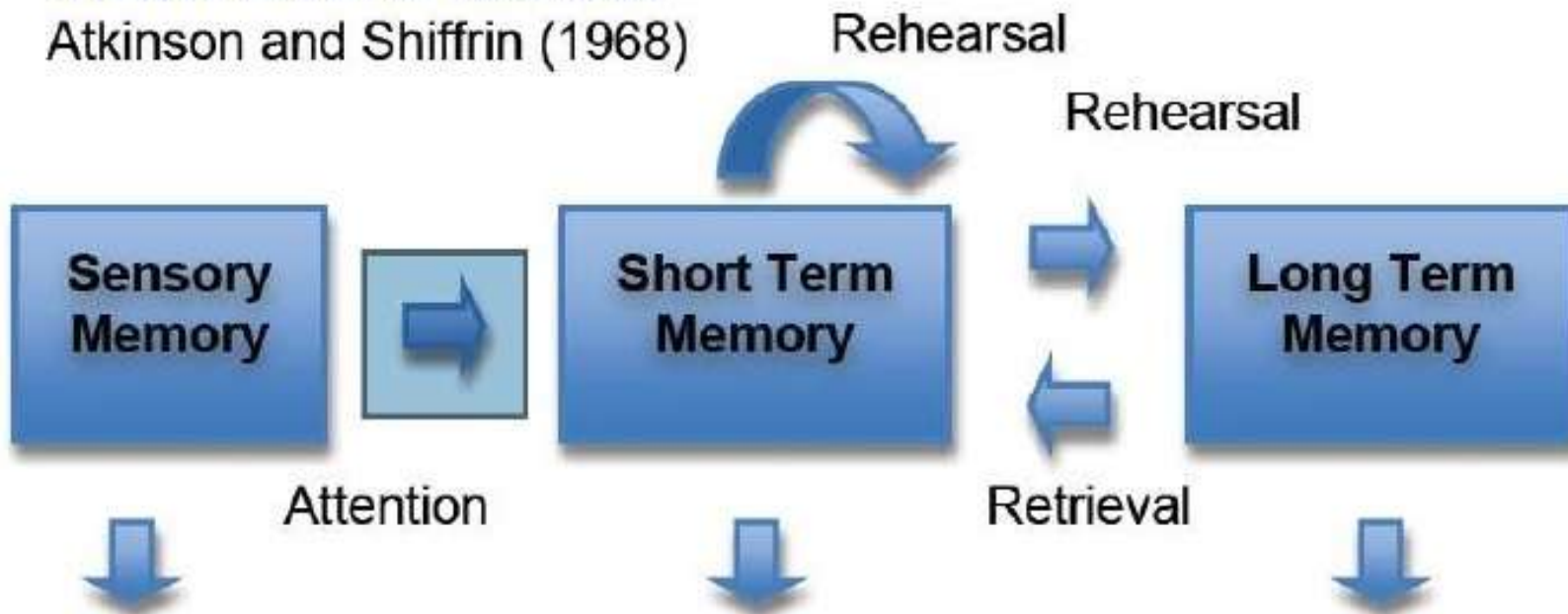
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HOW MEMORY WORKS



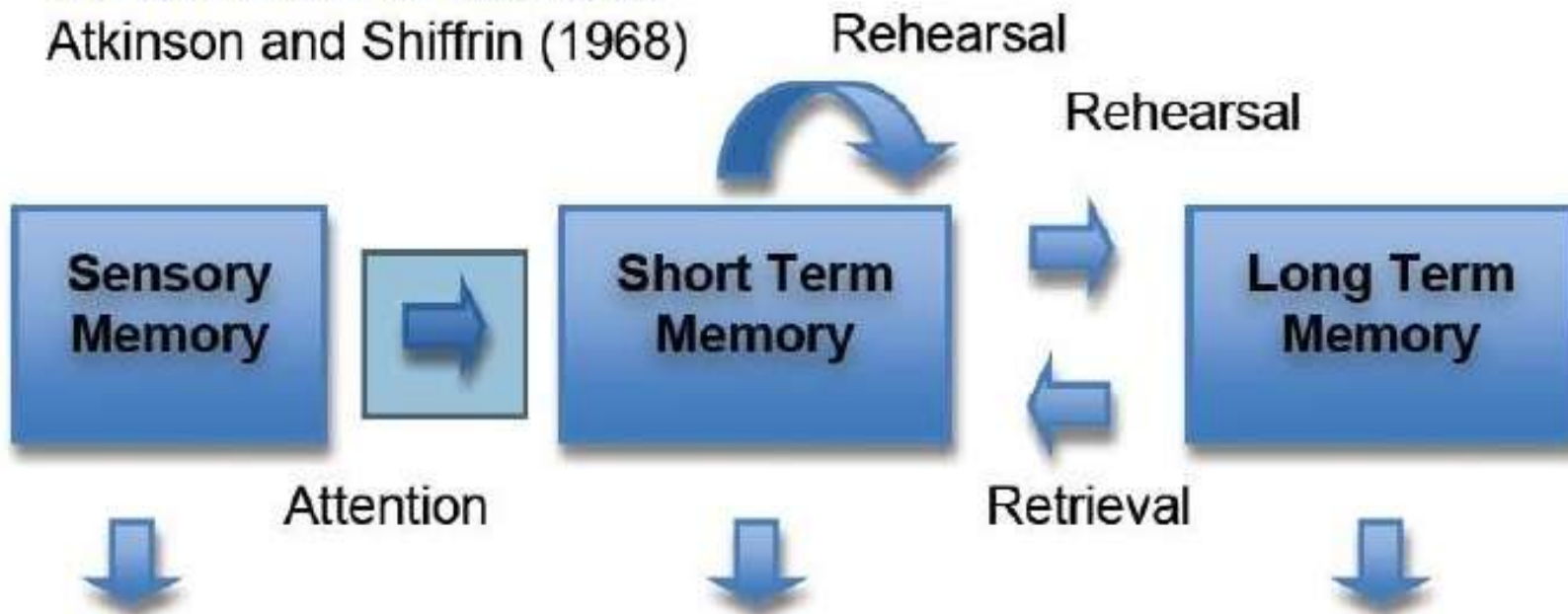
Multi-Store Model

Atkinson and Shiffrin (1968)



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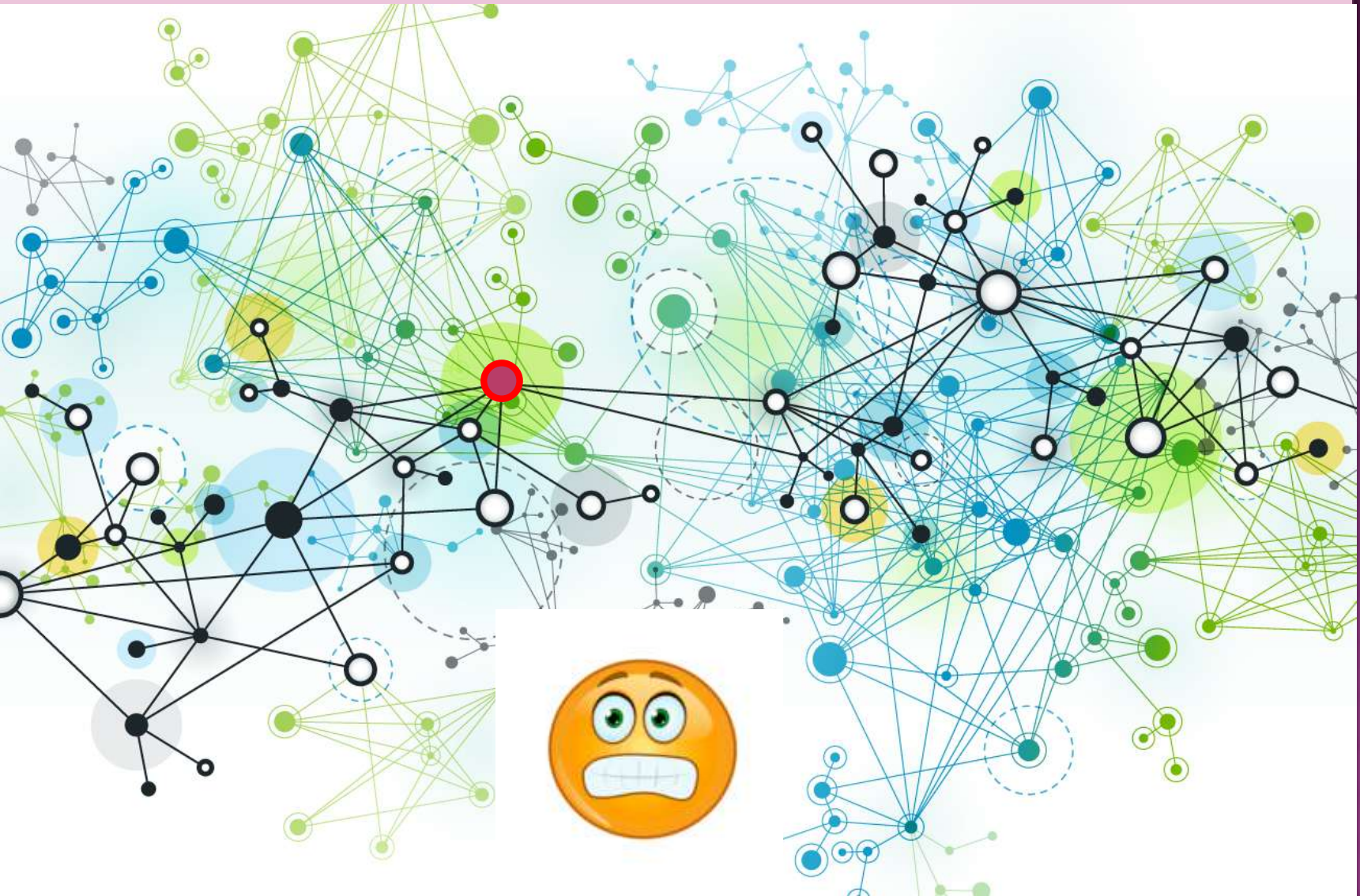
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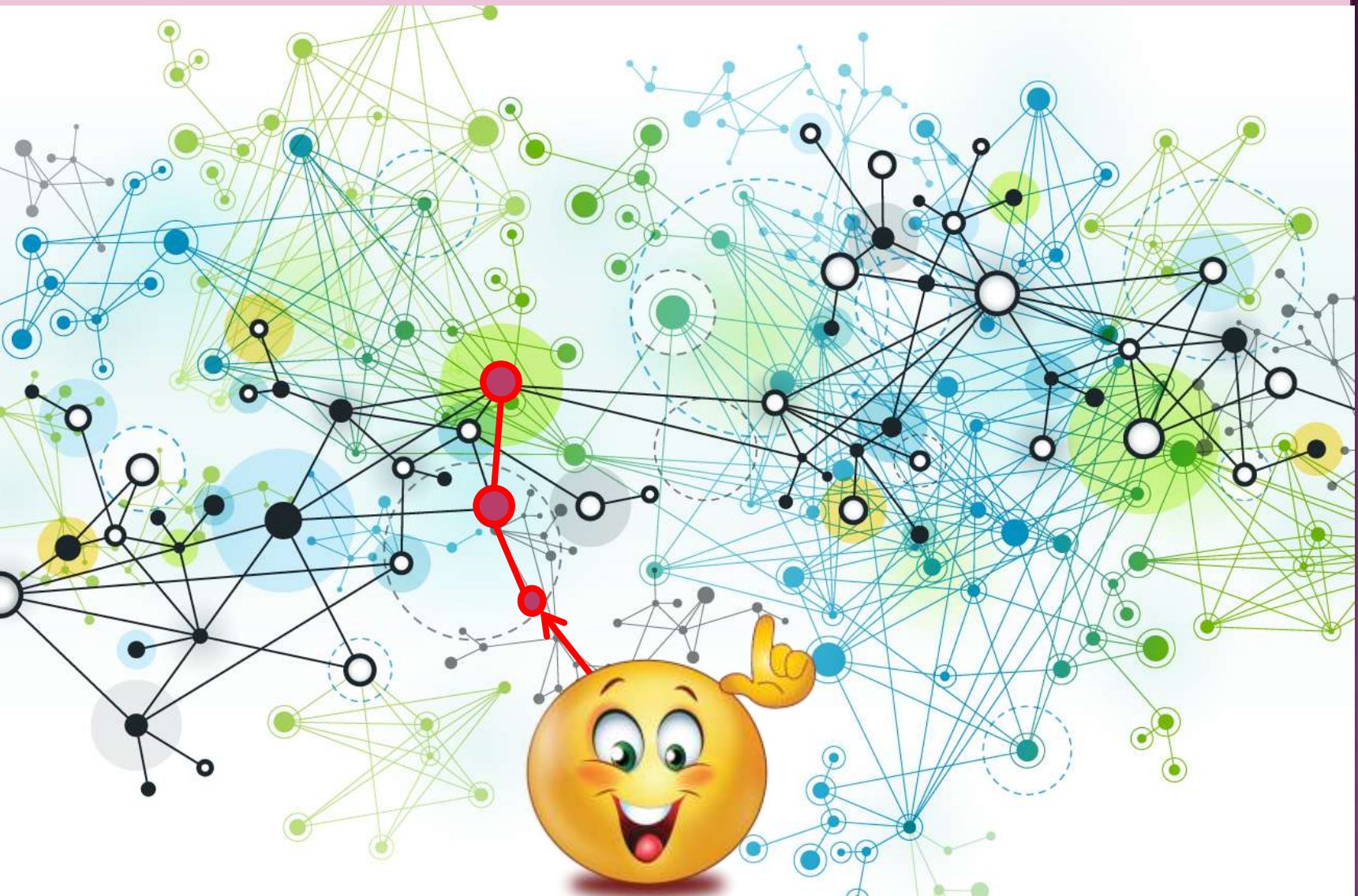
***WHAT EXACTLY DOES ENCODING
IN MEMORY INVOLVE?
WHAT DO WE REMEMBER?***



THE TESTING EFFECT - EXPLANATION



THE TESTING EFFECT - EXPLANATION



CONTEXT MATTERS

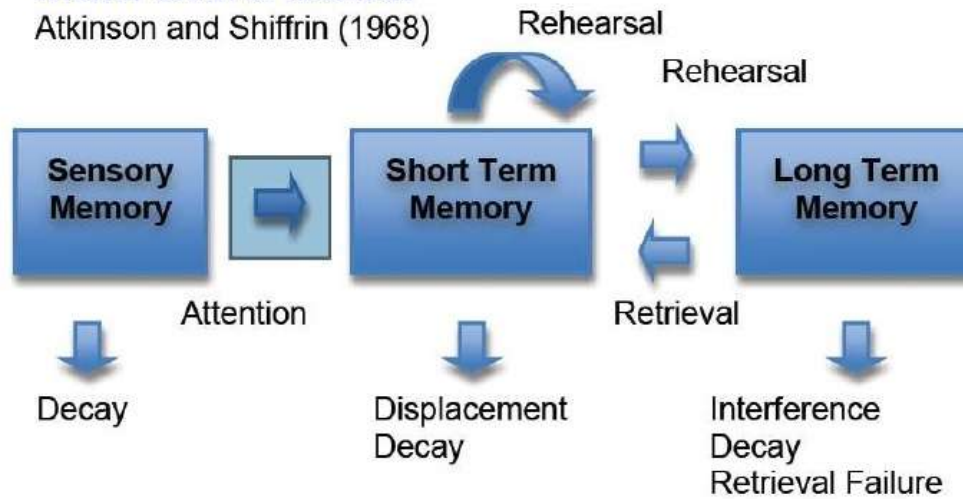


PROVIDING THE RIGHT CONTEXT - ROLE OF WORKING MEMORY



Multi-Store Model

Atkinson and Shiffrin (1968)

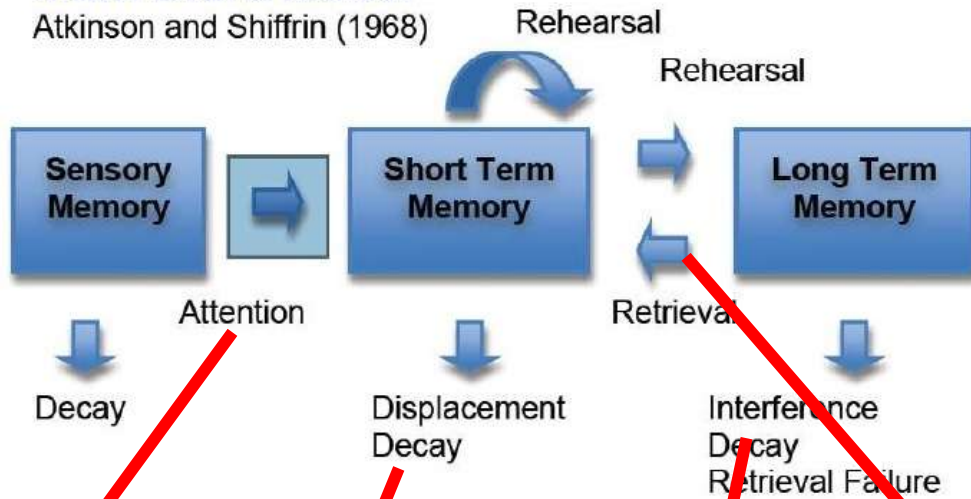


WHAT COULD “CAN’T REMEMBER” MEAN?



Multi-Store Model

Atkinson and Shiffrin (1968)



WHAT COULD “CAN’T REMEMBER” MEAN?

Attention

Not processed in declarative way

Encoding

Not encoded in long-term memory

Storage

Builds up with studying and use

Memory trace fell apart or too distorted

Retrieval

How easy it comes to mind

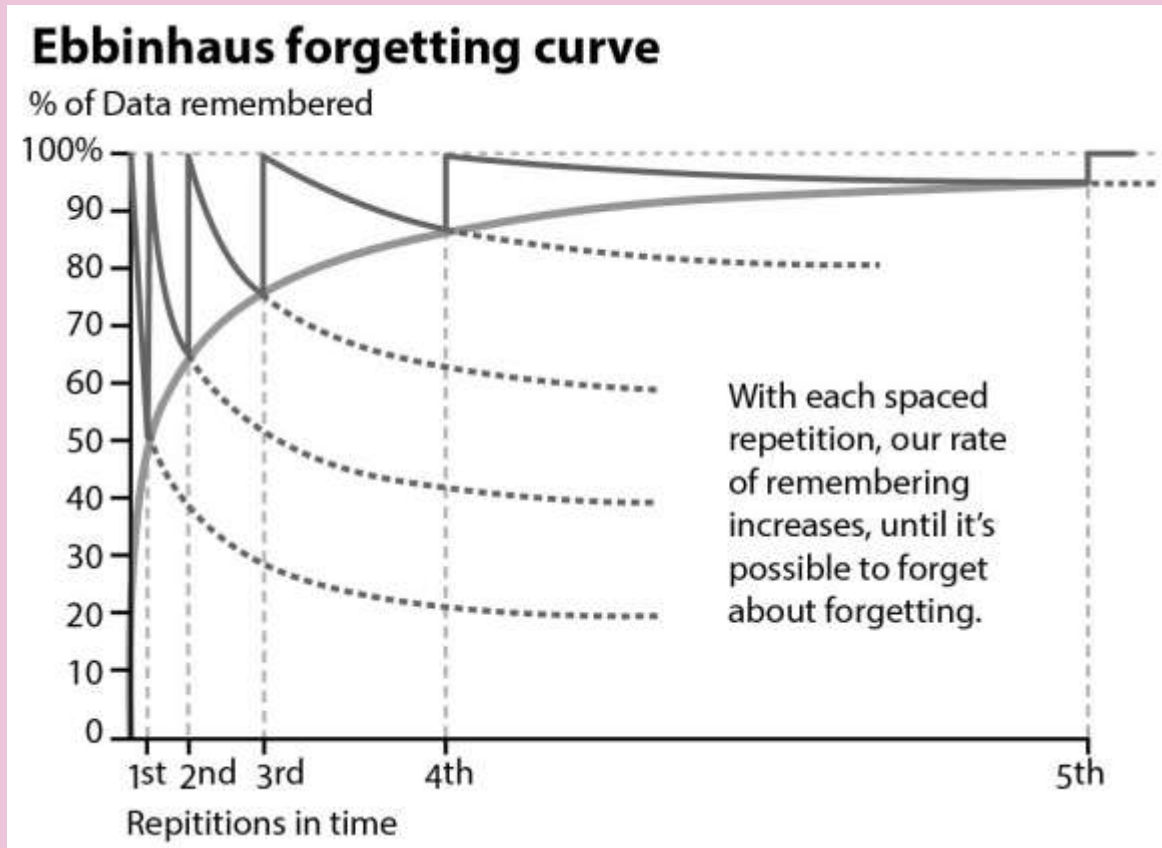
Limited access - insufficient retrieval structure

ESSENTIAL COMPONENTS OF LEARNING

- ◉ ***Repetition*** - *does it help? How much practice is needed?*

The forgetting & learning curve

(Hermann Ebbinghaus)



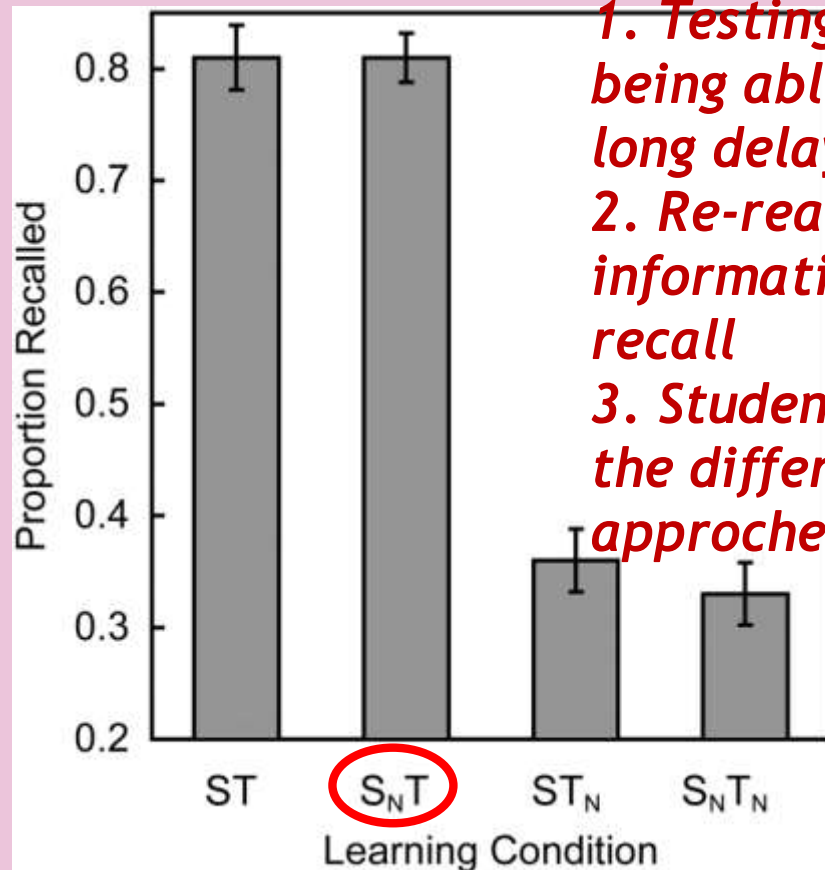
CONCLUSION: *Practice makes perfect.*



THE TESTING EFFECT

Ebbinghaus revisited - Karpicke & Roediger, 2008
Should I re-read or try to recall?

○ Results after one week:



1. Testing (retrieval) is crucial for being able to recall information after long delay
2. Re-reading of previously recalled information has no effect on long-term recall
3. Students are totally clueless about the differences in efficiency of these approaches

ESSENTIAL COMPONENTS OF LEARNING

- ◉ **Repeated practice** - re-studying only helps if information has been forgotten; however **repeated (self-)testing** is crucial for long-term outcomes! - How often?

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- ◉ **Spacing vs. cramming**

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- ◉ **Sleep?**

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- ◉ **Sleep** - essential for memory **consolidation** - keeping mind “neat and clean”

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- ◉ **Feedback? Motivation?**

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- ◉ **Finish one topic or jump between topics?**

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- ◉ **Interleaving practice** better than “blocked” practice **BUT** depends on material

ESSENTIAL COMPONENTS OF LEARNING

- ◉ *Getting one's mind ready for learning?*

ESSENTIAL COMPONENTS OF LEARNING

- ◉ *Getting one's mind ready for learning - schemata activation - **pre-testing** and **questions, preview***

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- ◉ *Getting one's mind ready for learning - schemata activation - **pre-testing** and **questions, preview***
- ◉ *How to pay attention?*

ESSENTIAL COMPONENTS OF LEARNING

- ◉ Getting one's mind ready for learning - **schemata activation** - **pre-testing** and **questions, preview**
- ◉ How to pay attention - **active processing** and **transformation** of information - elaborative and conceptual learning (when learning concepts)

PROCESSING STUDY MATERIAL

Bloom's Levels of Knowledge

CREATING

Design a new treatment that will combine as many advantages of the previous treatments as possible while minimizing shortcomings.

EVALUATING

What are the pros and cons of this approach, based on evidence? Which of the two approaches would you choose?

ANALYZING

Look at these two groups of systems/ approaches. Which principles are the same for both, and what makes them different?

APPLYING

Use this equipment to take the necessary measurements to solve problem A and interpret the values.

UNDERSTANDING

What are the key points? How would you explain this to your grandmother? Examples?

REMEMBERING

What are the components of...? Describe the process of... Name parts of X in this picture...

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ESSENTIAL COMPONENTS OF LEARNING

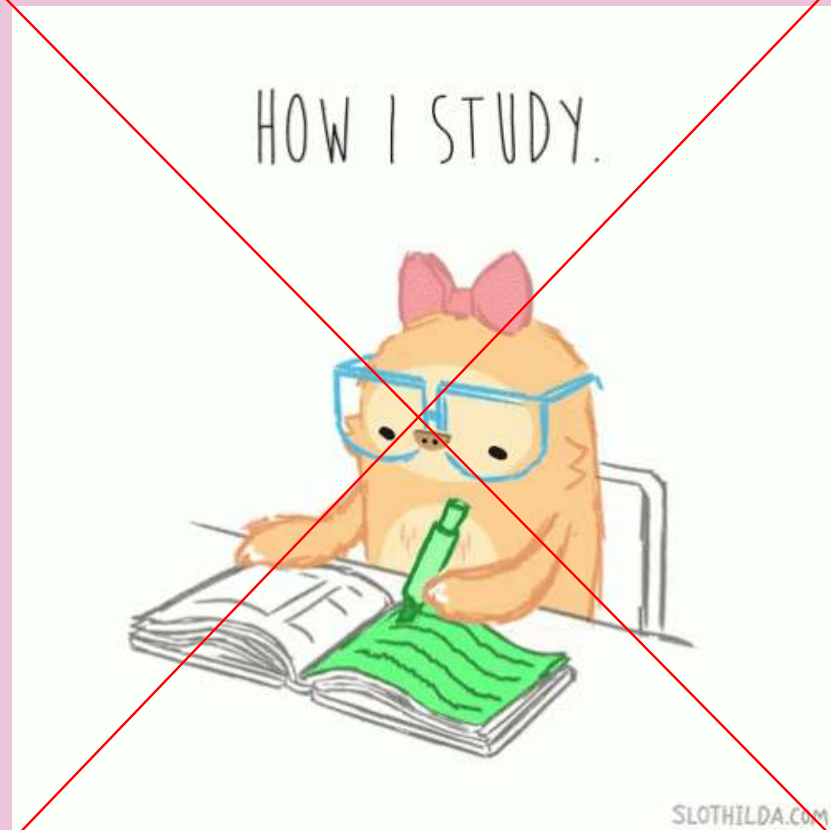
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- ◉ **Context** - learning in different contexts helps retrieval
- ◉ **Study material** - varied is better! Combination of visual and verbal representation helps.
- ◉ **Mnemonics** - only useful for very specific simple bits of information you have difficulty to remember (e.g. difficult foreign words)
- ◉ **Organization strategies** - items organized in categories - helps learning of isolated pieces of information, but...

BEST PRACTICES FOR LEARNING

- **SQ3R**

SQ3R

- **Survey**
- **Question**
- **Read**
- **Recite**
- **Review**



- + **Note-taking** - processed and retrieved, not simply reproduced!
- + **Repeated testing** after covering new material - even two spaced retrievals outside exam period are great!!!

BEST PRACTICES FOR LEARNING

- ◉ *SQ3R*
- ◉ *Expanding retrieval with interleaving, healthy sleep, diet and exercise*
- ◉ *Processing mistakes*
- ◉ *Comparing and contrasting*
- ◉ *Explaining to others*