

# Spaced Repetition: An Instructional Technique for Long-Term Learning

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# Who am I?

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What did you eat for breakfast today?

What did you eat for lunch last weekend?

What did you eat for dinner June 28, 2016?

What was your childhood address?

Memories are forgotten unless they are repeated



# By The End Of This Session You Should Be Able To:

- Explain how spaced repetition increases long-term retention
- Apply spaced repetition techniques, both inside and outside of the classroom

# Learning and the Brain

## A few Quick Facts

① Short-term memory has evolved from a single-system to a multi-system memory structure known as the

Working Memory Model  
(Baddeley, 1986).

The Working Memory Model still supports the

② chunking

of information as a good practice to promote retention of information (Miller, 2011).

Some argue that

③ attention is an integral part of information retention (Miller, 2011).

### References

Baddeley, A. D. 1986. Working memory. Oxford: Oxford University Press.

Miller, M. D. (2011). What College Teachers Should Know About Memory: A Perspective From Cognitive Psychology. College Teaching, 59 (3), 117-122

⑥ More recent research has suggested that information moves back and forth because of cues

from tagging of information (Miller, 2011).

⑤ Information should be visual

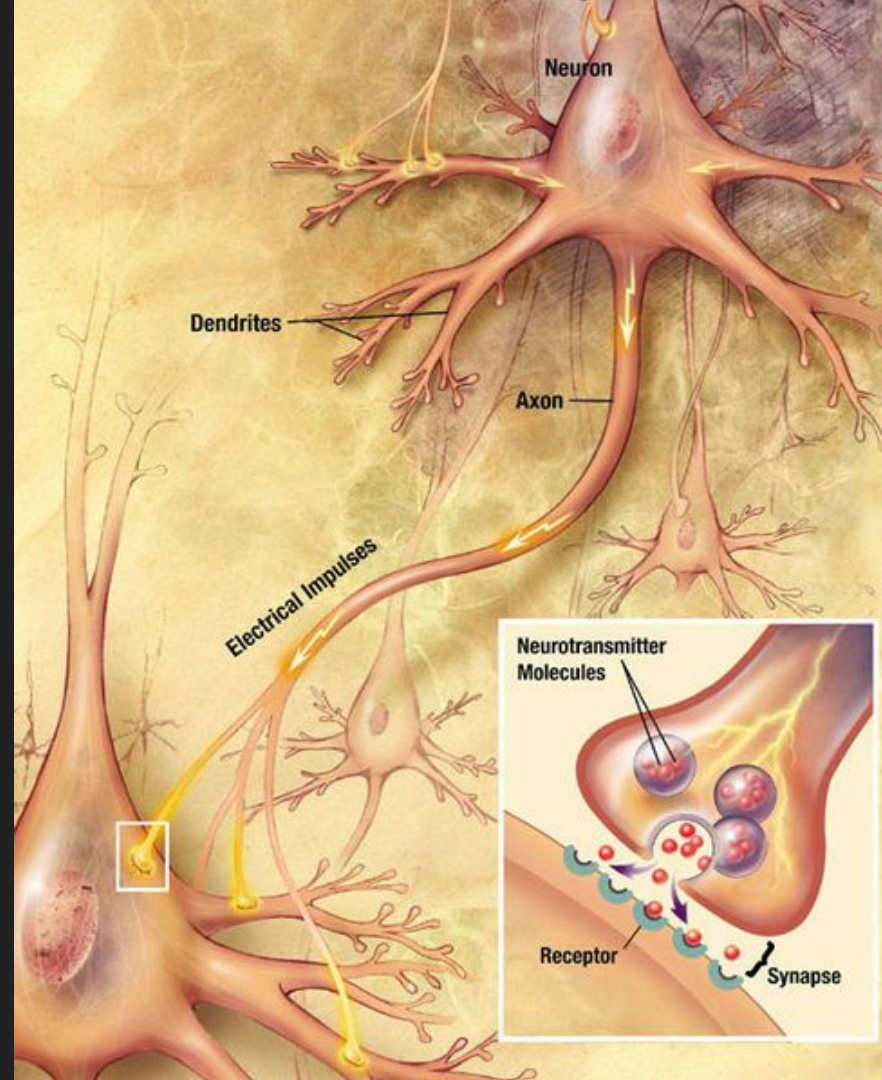
Visual imagery encoding is "generating mental images of objects, ideas, and actions" (Snowman, 2009, p.254).

④ Information must be meaningful

Meaningful learning "occurs when a learner encounters clear, logically organized material (Snowman, 2009, p. 252)."

by: Mia MacMeekin

**Cells that fire together  
wire together**

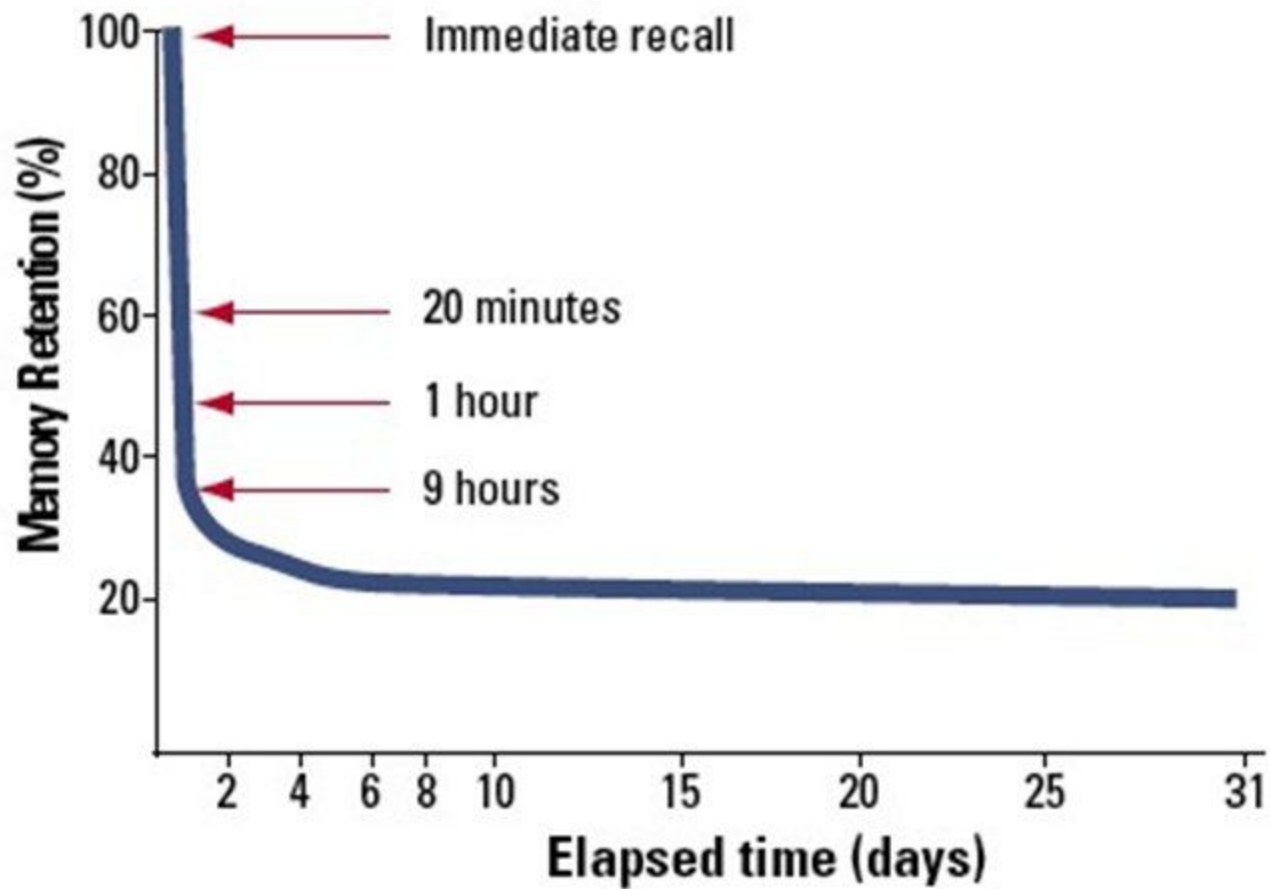


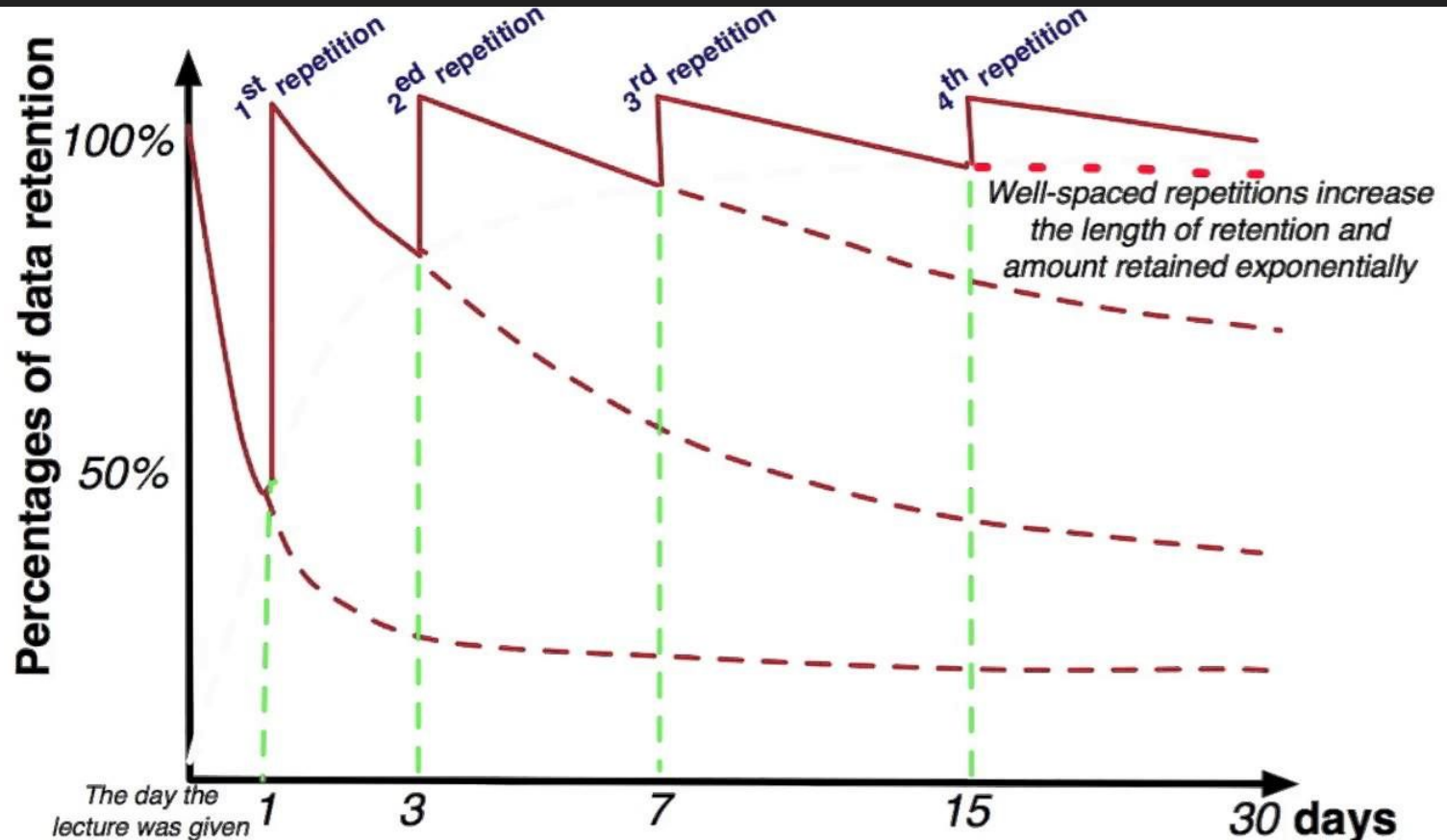
Use It

Lose It









# Best Practices for Spaced Repetition:

- Define optimum intervals
- Define discrete knowledge

# Define Optimum Intervals

Intervals should be as long as possible for a “small” proportion of knowledge be forgotten.

Can vary from very short (new knowledge and very exact learning) to longer (older knowledge, general knowledge, and enable faster learning)

# Define Optimum Intervals

## Examples:

- If you are learning general heuristics, you just need to be aware of them and revisit them occasionally.
- If you are learning foundational mathematics as the basis for advanced study, you need to be fluent quickly. Use very short intervals!

# Defining discrete knowledge

Break information into small, discrete chunks.

Make each chunk falsifiable, so you can't "cheat".

# Defining discrete knowledge

Examples:

- What are GPUs good for?

# Defining discrete knowledge

Examples:

- GPUs are optimized for \_\_\_\_\_ which enables \_\_\_\_\_ processing.
- GPUs are optimized for **throughout** which enables **fast parallel, processing**.



Discussion:

Where / How can we use Spaced Repetition to improve learning?

# How can we use Spaced Repetition to improve learning?

Our job as instructors is to create systems that repeat  
information at the appropriate intervals.

# How can we use this to improve learning?

1. During a single lecture
2. During an entire course / program
3. Beyond the classroom

# Lecture

1. Before class: Preparation materials
2. At the start of class:
  - Discussion
  - Learning Outcomes (LO)
3. Individual Sections
4. Summary

# Course

- Tell a story: Refer back to earlier topics
- Review activities
  - Coding Exercises
  - "No Stakes Testing"

# Beyond the Classroom

- Slack
- Flashcards

Anki Demo

# Anki on the Web



# Bonus Gifts!

[All my Anki flashcards to download and use](#)

# Summary

- Spaced Repetition is the systematic revisiting of knowledge
- Spaced Repetition increases long-term retention of that knowledge
- As instructors, we can help our students by building spaced repetition into our classroom and encourage it beyond our classroom

Questions?



# Further Study

- <https://www.supermemo.com/english/smintro.htm>
- <https://www.supermemo.com/english/princip.htm>