Wooclap and the **science** of **learning**

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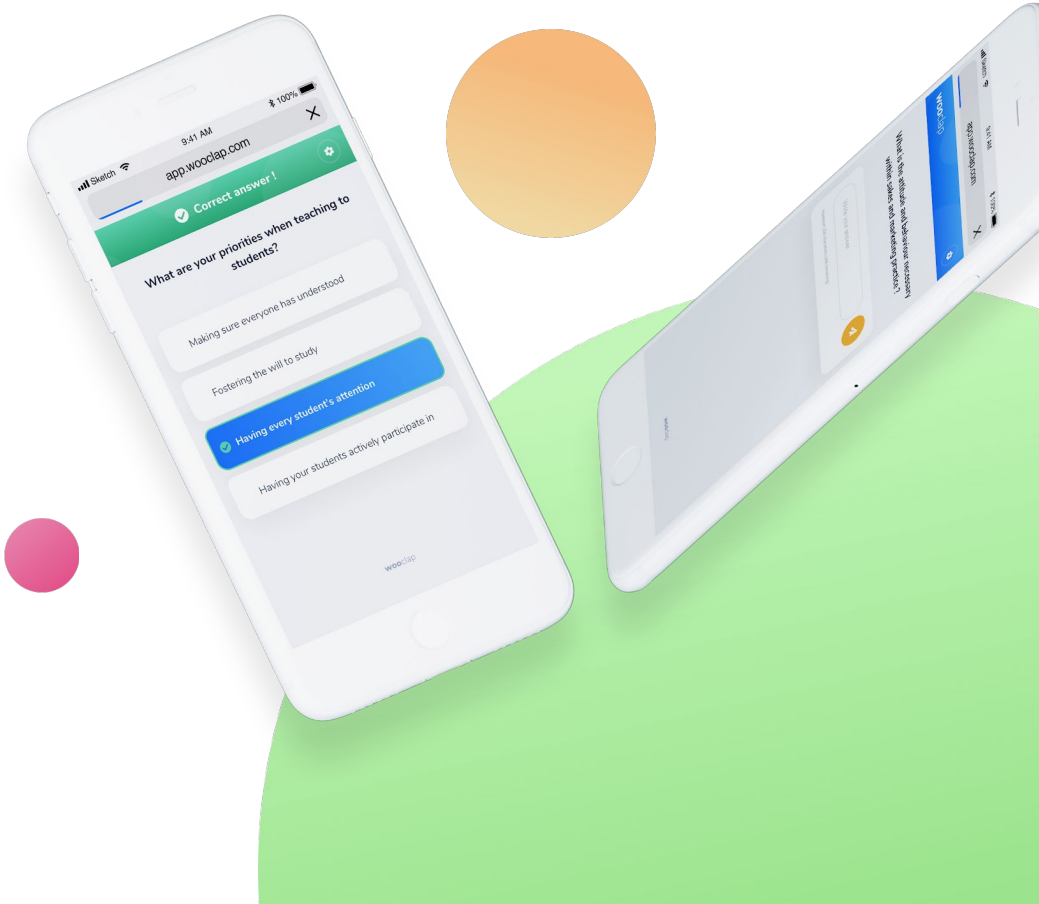
wooclap



Summary

1. Digital natives?
2. Attention
3. Memory
4. Retrieval practice
5. Spaced repetitions
6. Peer instruction
7. Conclusions

Digital natives?

According to American writer Marc Prensky

- **«Digital natives»**: young people immersed in technology all their lives
- **«Digital immigrants»**: all of those that try to keep up with the natives.

Forever young

Research evidence shows that

- There may be “as much variation **within** the digital native generation as **between** the generations” (Bennett et al 2008).
- “young people [do not] adopt radically different learning styles” (Margaryan, Littlejohn, and Vojt, 2011).

The existence of a new generation of students **cannot be cited as a reason for radical changes** to the existing educational structure. Political choices should not be blurred by these myths.

Pay close attention

«Everyone knows what attention is.»

William James
Philosopher and psychologist, 1890

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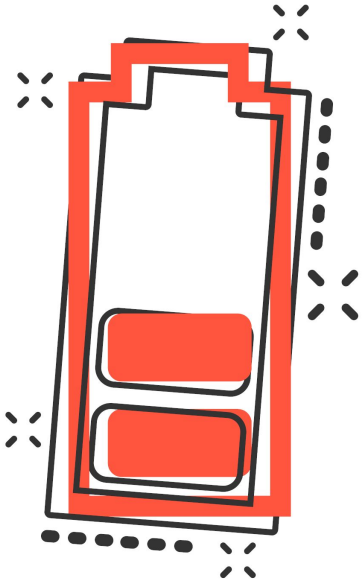
«There is no such thing as attention.»

Britt Anderson
Theoretical neuroscientist, 2011

Pay close attention



We adopt a functional approach

Experts agree that attention is an important concept to teach students.
It is best described as a **«limited-capacity resource»**.

Despite what “digital natives” advocate it is **nearly impossible** to pay attention to more than one thing at the exact same time.

Half of the time students are not paying attention to what the teacher is saying in class.

No distraction, no distraction

Mind-wandering is correlated with

- Missing important information
- Impairing later reading comprehension
- Bad memory performance
- During a test, poor time management and failure

What drives attention towards learning

- Make the material **more salient**
- Improve the **situational interest**: clear communication at the right difficulty level, concrete examples
- In short: **optimize encoding**

The 3 stages of memory (Melton, 1963)

Encoding

- Acoustic
- Visual
- Tactile
- Semantic
- ...

Storage

- Memory traces
- Working/short-term memory
- Long-term memory

Retrieval

- Sequences
- Cues, associations
- Various techniques

Memories are made of this

From short- to long-term memory

Short-term memory:

- decides what's worth keeping after a **15-30 seconds** window
- is limited in terms of how many separate items it can store: **7 +/- 2**.

Memories are made of this

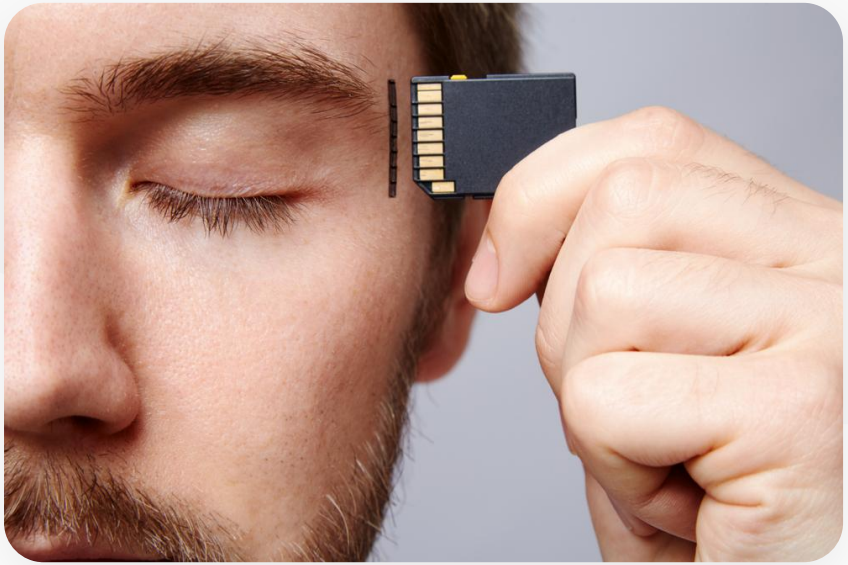
AIRM A NAYIGELPPUU ONTUSSLUM

Memories are made of this

AIRM A NAYIGELPPUU ONTUSSLUM

INAUGURAL AUN-TEPL SYMPOSIUM

Memories are made of this



Much easier!

- We chunked our data: less items, more information
- We created meaning out of it. **Semantic encoding** is very powerful

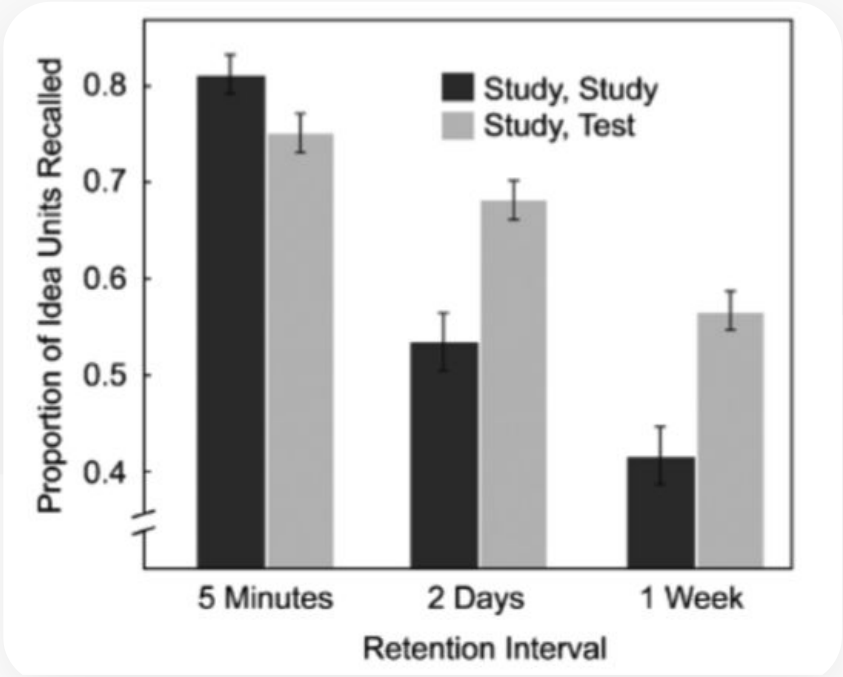
Retrieval practice

In an experiment, students were assigned to one among two strategies to encode recently exposed material.

- They could review the content by a simple proofreading
- Write down everything they remember on a blank sheet of paper.

They were then tested.

This phenomenon is called the **“test effect”**.



(Roediger & Karpicke, 2006)

Retrieval practice

How to implement it in the classroom

- **10% of your class time** is enough to see the benefits of quizzing
- Use **frequent low- or no-stakes quizzes** (reduction of anxiety)
- Use multiple-choice, or **open-ended questions** (preferred).
- Wrong choices should be relevant and should make sense.
- Include the option **«I don't know»**.
- Try to include only wrong answers to sparkle discussion!

Quizzing the students has several advantages

- They are a teacher's instrument of choice for measuring students' skills and comprehension
- Students themselves develop their self-assessment skills (**«metacognition»**)
- **A test not only measures learning, but also changes it**

Spaced practice

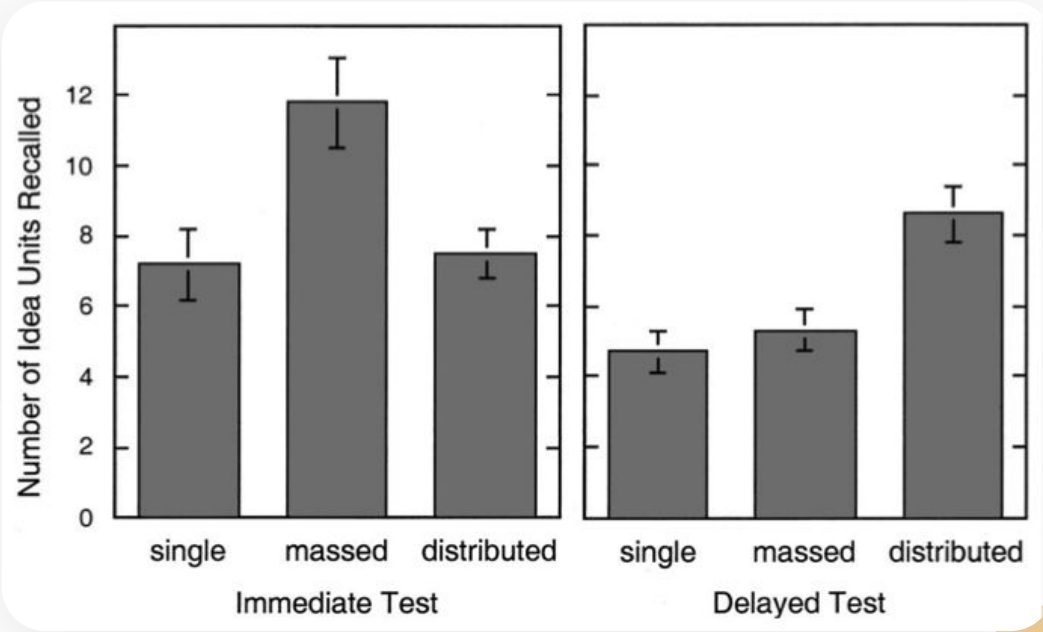
«With a considerable number of repetitions, it is much more advantageous to distribute them properly over a period of time than to group them together in a single step.»

Hermann Ebbinghaus

Psychologist, 1885

Once is not enough

Effect of crammed versus spaced reading on an immediate versus a delayed test



(Rawson & Kintsch, 2005)

How to implement it in the classroom

Give students opportunities to engage with material covered in previous classes – this can be most effectively done with spaced quizzes: it takes only a few minutes!

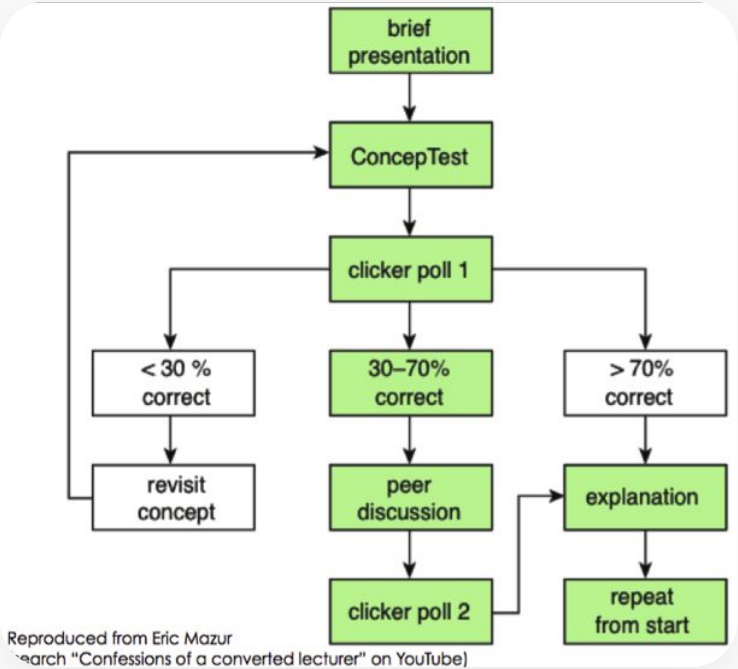
Peer instruction

«Shocking how many people substitute memorization for understanding.»

Eric Mazur. Physicist and educator, 2017

- The students are given **the course material in advance** so that they can read it at home. This way, they can prepare for the lectures.
- During class, the professor briefly summarizes the topic and provides the students with a **conceptual multiple choice question**.

Peer instruction



Reproduced from Eric Mazur
earch "Confessions of a converted lecturer" on YouTube)

Why to implement it in the classroom

- When answering the quiz, the students are forced to be **committed** to an answer, to various degrees of conviction.
- Students have to **externalize** their answer, turn to their neighbor and convince them of their reasoning.
- By doing this, a student's answer changes from a simple fact to an articulated reasoning.
- Students get **emotionally invested** in the learning process

Conclusions

1. **Practicing retrieval** is a powerful way to improve meaningful learning of information.
2. **Spaced practice** is one of the strongest contributions that cognitive psychology has made to education.
3. **Peer instruction** is a first effective step toward flipped learning.
4. Education technology is empowering everyone to achieve their maximum potential, at scale. **This is our mission at Wooclap**.

Thank you!

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