Supporting generative learning in your students: Lessons from Educational Psychology

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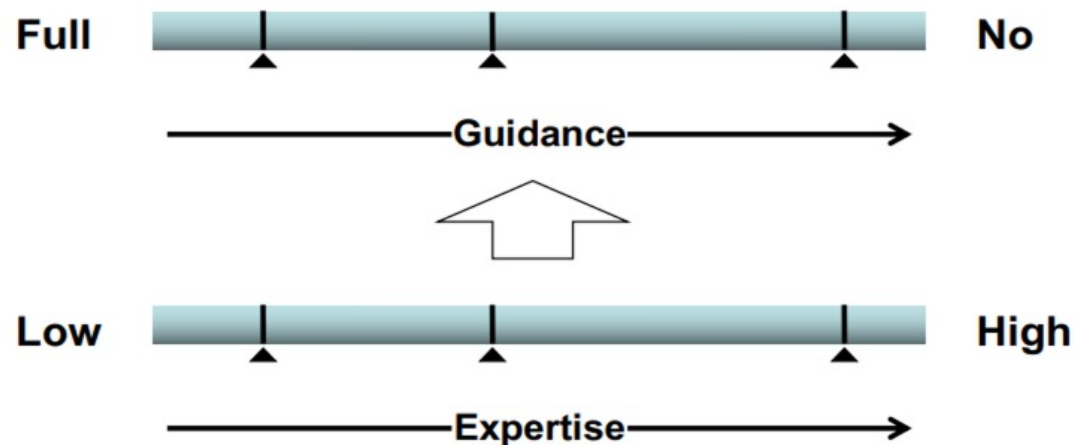
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Reality vs. ambition

Science of learning

Cognitive Load Theory (CLT; Sweller, 1988; Sweller et al., 2019)

Transition from guided to unguided learning

Full ————————————————— No

————————— Guidance —————————→

Low ————————————————— High

————————— Expertise —————————→

Basic assumption: Learning happens best under instructional conditions that are aligned with our **cognitive architecture**

Concerned with: The instructional control of the high cognitive load on our cognitive architecture that is typically associated with the learning of complex cognitive tasks
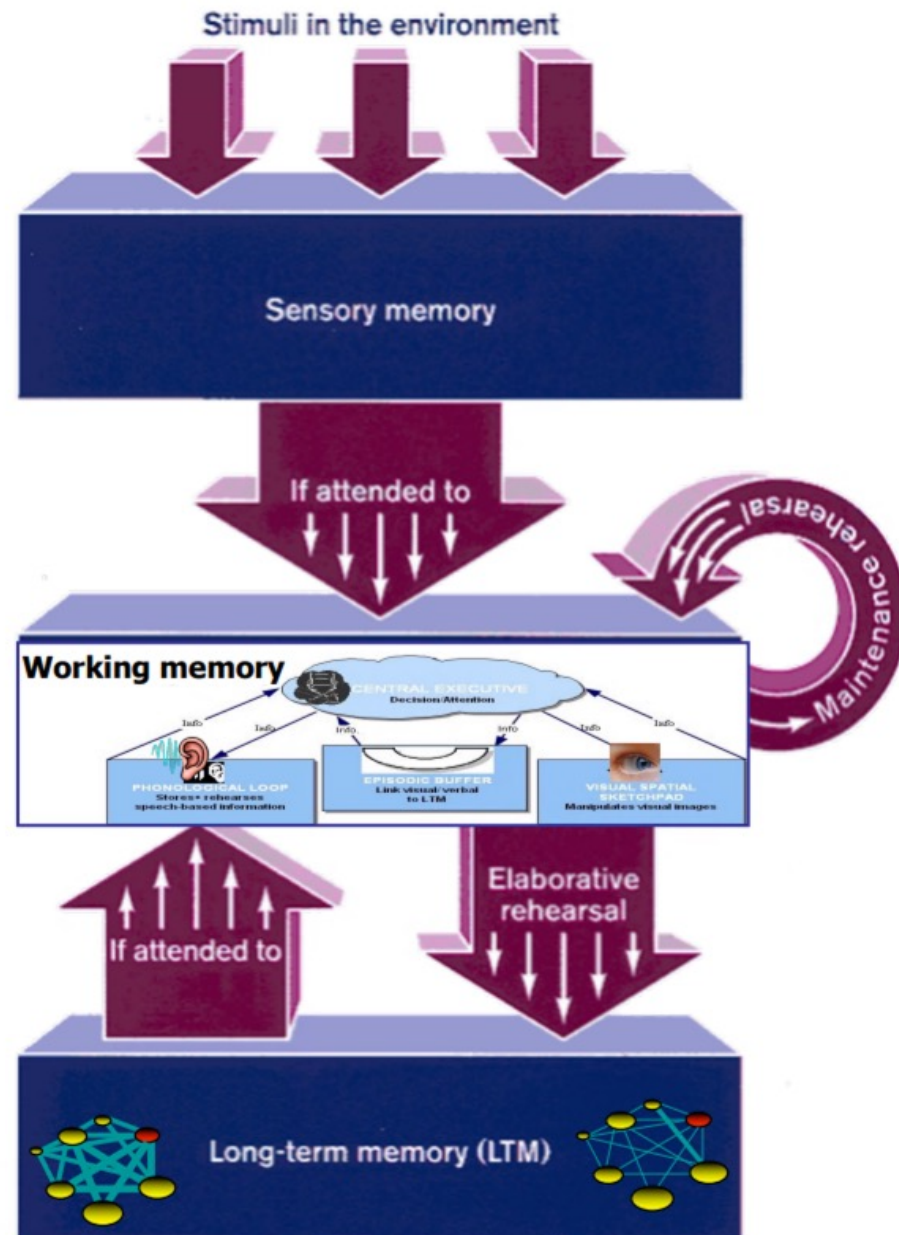
Science of learning

Perceives incoming information

Selects, organizes, and integrates information

- **Limited capacity**

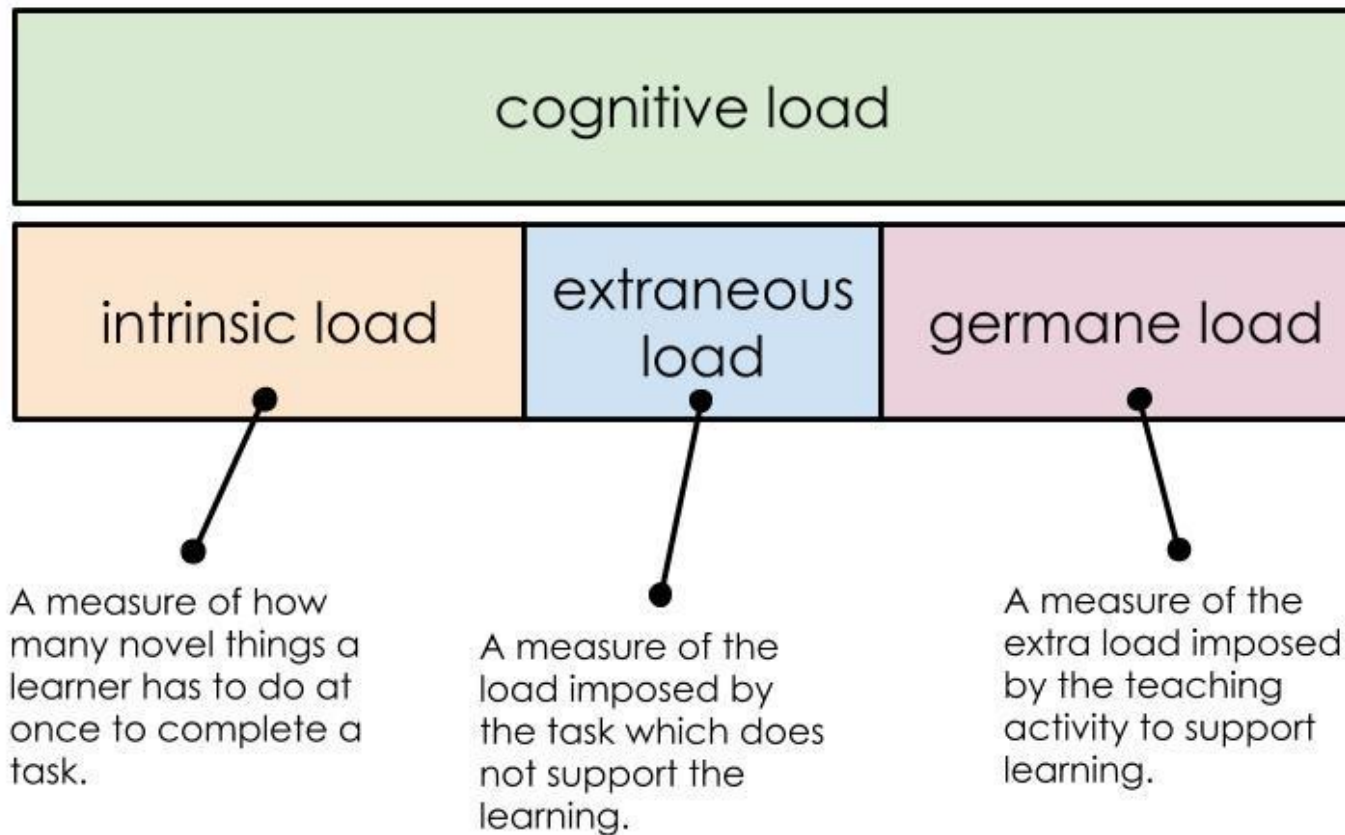- **Limited duration**

- **Separate processors**

Permanently stores information

- **Unlimited capacity**

Science of learning

Cognitive Load Theory (CLT; Sweller, 1988; Sweller et al., 2019)

Implications for teaching

Teacher as memory-manager:

Optimize WM capacity for learning; reduce the rest

Learners do not automatically use available working memory capacity for learning
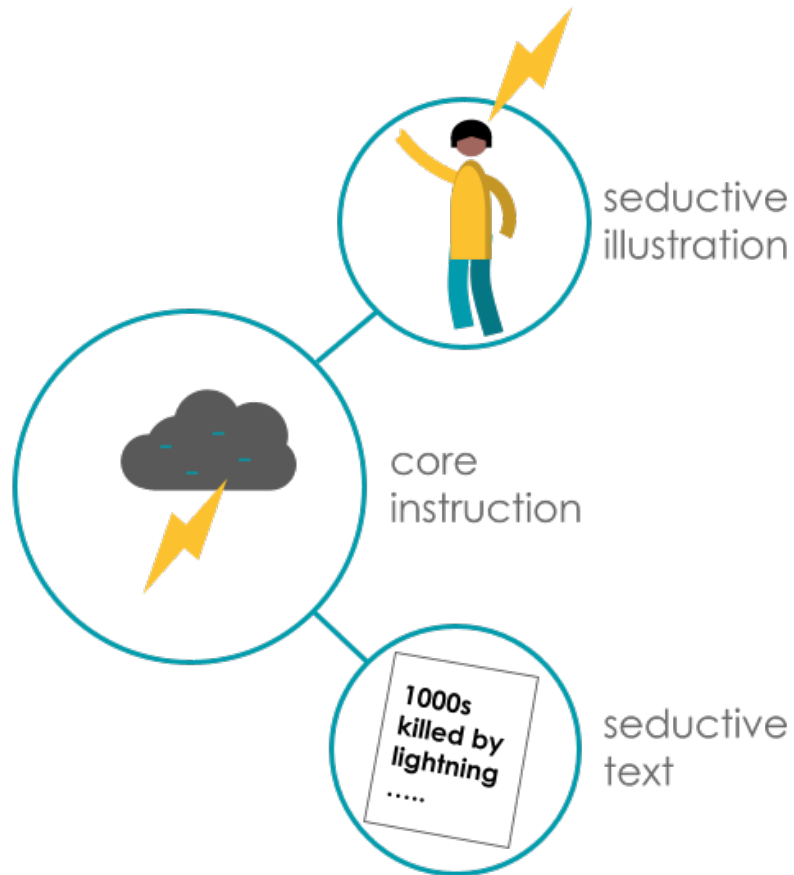
→ Extra encouragement needed

Consider learners' prior knowledge

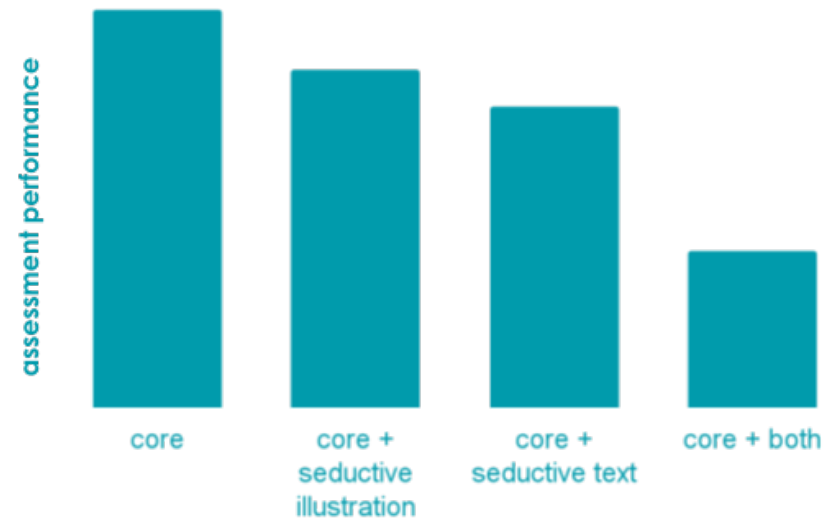Use the CLT-lens in selecting teaching methods and instructions

Principles to support learning
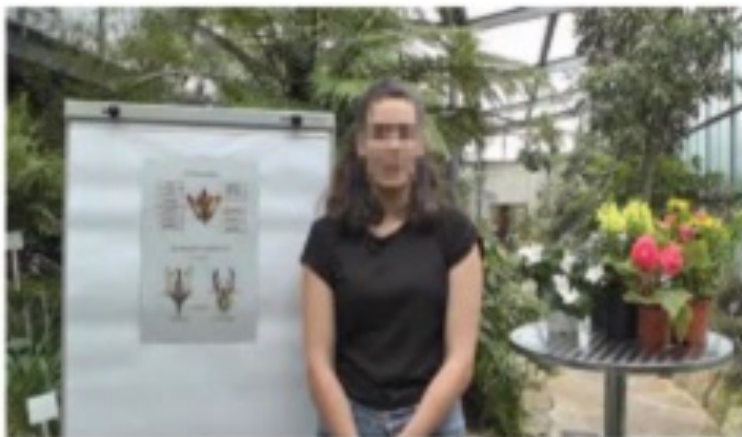
Avoid bells and whistles

seductive illustration

core instruction

1000s killed by lightning .....

seductive text

Adding detail intended to motivate and engage has a detrimental effect on learning.

assessment performance

core | core + seductive illustration | core + seductive text | core + both

Source: Harp and Mayer 1997

Seductive details in video lectures

Encourage explanations

Self-explaining: explaining to yourself how what you're studying works

OK, so now I'm going to multiply these two numbers…and now write this one over here because I'm transposing the fraction..

not self-explaining

self-explaining

Effectiveness and caution

An effective generative learning strategy to support deep learning

-creates a new 'product': activates prior knowledge, helps to organize and integrate information

-supports monitoring (self-regulation)
For example: Do I really understand what it says here?

But:
-Guidance needed for high-quality explanations (e.g.,prompts/questions)

-Self-explaining hinders learning if task complexity is high

Teach your students to teach others

Learning by teaching: explaining to others how what you study works

By explaining to a <u>fellow student</u> or to a <u>fictitious student</u> (e.g., by creating a video or a blog)

Let your students move meaningfully

 ≠

Applications of 'smaller' movement:

Gesturing	Tracing	Enactment

Divergent Plate Boundary

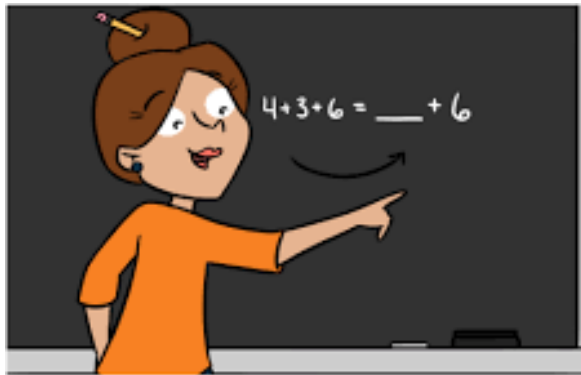Tectonic plates move apart & new crust is created

Use gestures in your teaching

Direct attention

Enrich understanding

Testing knowledge as a study strategy

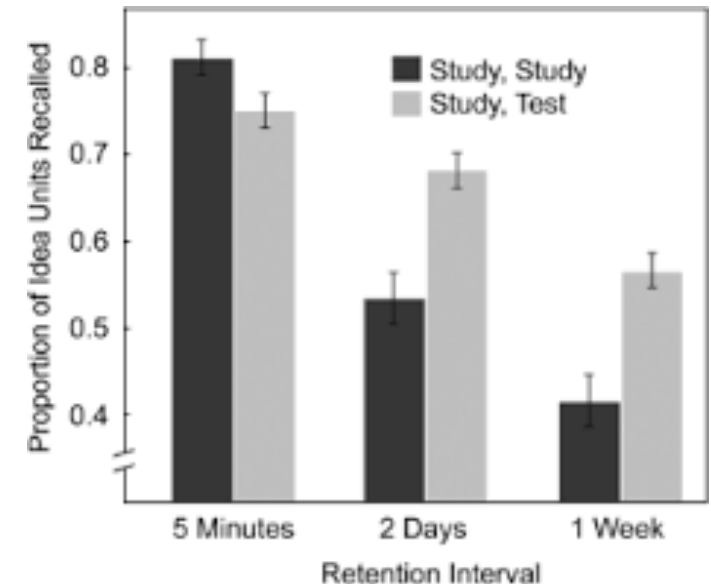Retrieval practice: practice through remembering

Forces learner to retrieve information which strengthens memory → testing effect

Outperforms rereading and any other learning strategy!
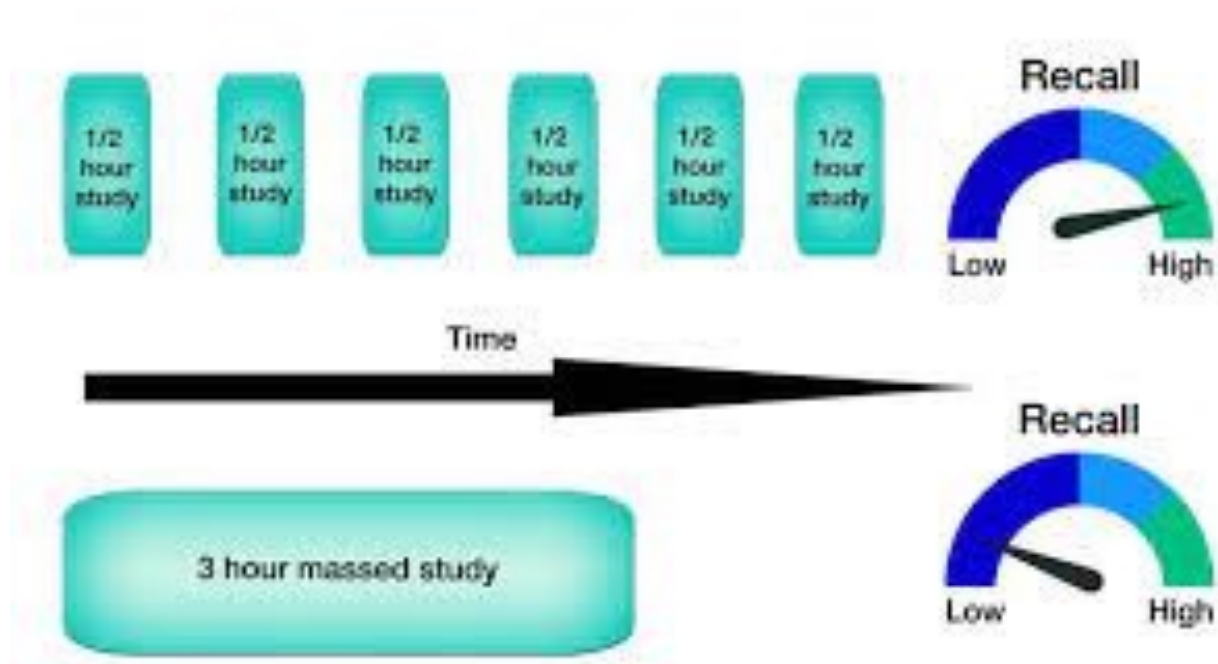

Applications:

Offer a quiz, practice test, asking repetition questions, etc.

Stimulate and guide students in creating flash cards, summaries (in text or visualization)

Space your practice

Spacing effect: learning is more effective when to be learned information is studied in several short sessions separated over time than all at once.

Final thoughts

Various effective strategies for supporting active cognitive processing

Students often do not engage in such strategies automatically

Application requires careful educational design

- Appropriate level of guidance (scaffolds)
- Aligned with learner prior knowledge and/or task difficulty

Generative strategies are worth the (cognitive) effort!

Q&A

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