

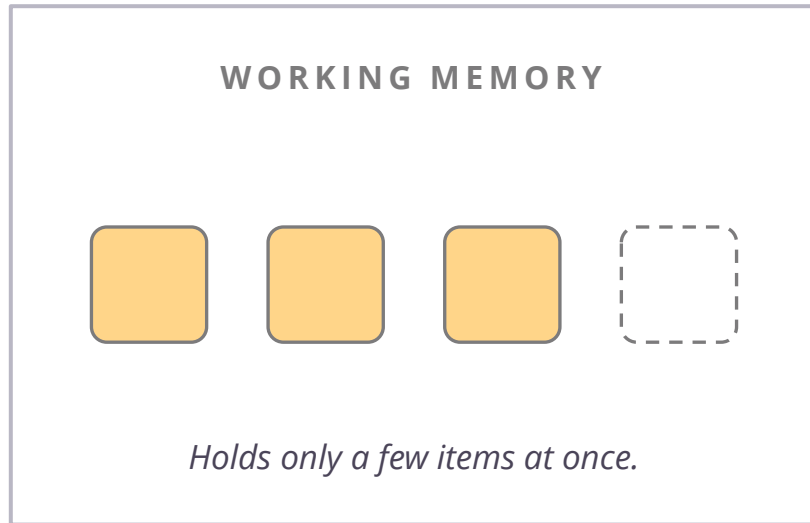
MODULE 2 · THE LEARNING-SCIENCE

Lecture 2.2

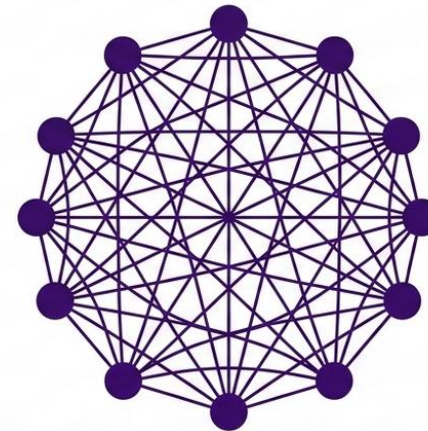
Productive Struggle vs. Needless Friction

Which difficulty builds learning, and which only blocks access? Protect one. Remove the other.

Working memory is small. Mental models are big.



MENTAL MODEL (LONG-TERM MEMORY)



Durable understanding is built by effortful processing — not by reading explanations alone.

Bjork's four desirable difficulties

1

Retrieval

Pulling out is more durable than putting in.

2

Spacing

Distributed practice beats massed practice.

3

Interleaving

Mixed problem types beat blocked problem types.

4

Elaboration

Explain in your own words; connect to what you know.

Not all difficulty is desirable.

Productive struggle vs. needless friction

Feeds your Friction Audit

Productive struggle *builds learning*

- Working out an argument before reading a critic.
- Calculating before checking with a tool.
- Drafting before reading a model.

Needless friction *blocks access*

- Formatting before feedback.
- Decoding jargon unrelated to the goal.
- Wrestling with a broken file format.

Where AI helps: Access Repair

- ✓ Reformat a draft for accessibility.
- ✓ Explain a passage at the student's reading level.
- ✓ Generate practice items at the right difficulty.
- ✓ Translate feedback into a student's home language as a support, not as a replacement for instructor judgment or multilingual access practices.
- ✓ Summarize a long policy document.
- ✓ Restructure a confusing assignment prompt.

ACCESS REPAIR Removing friction that was never the point.

Where AI threatens



Generate the argument before the student has tried.



Produce the explanation before the student has explained.



Write the summary before the student has retrieved.



Hand back the answer after one wrong attempt.



Provide the analogy before the student built one.



Surface the counterargument before the student noticed it.

CAUTION Risk: AI removes retrieval, elaboration, or sense-making before the student has made a first attempt.

The diagnostic question

Feeds your Friction Audit

Is this friction **the thing** students should learn to do —
or
in the way of what they should learn to do?

IF IT IS THE THING

Protect it.

Build a Cognitive Sanctuary.

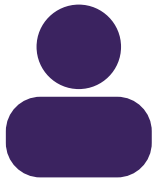
IF IT IS IN THE WAY

Remove it.

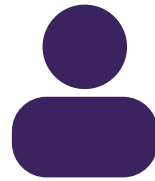
Build an Access Repair.

Equity test

Needless friction falls hardest on the same students that access barriers fall on.



A multilingual student decoding archaic instructions.



A first-generation student wrestling with an unfamiliar genre convention.



A working adult re-formatting a document the LMS could have rendered.

EQUITY CHECK Removing needless friction is an equity move, not a softening move.

Also check: disability access, uneven time, and uneven technology access.

Your Friction Audit

Use the four-question pass to separate useful friction from avoidable access damage.

INSTRUCTION

Complete four decisions: learning goal → friction → protect/repair → AI boundary.

1

Name the learning goal.

2

Identify the friction.

3

**Decide whether to
protect or repair it.**

4

Choose the AI boundary.

Output Check

End with a concrete distinction the learner can use on the next assignment.

DELIVERABLE

Your deliverable: one protected struggle, one access repair, and one sentence explaining the difference.

1

One protected struggle

Name the learner work that should remain effortful.

2

One access repair

Name the barrier AI can remove without doing the learning.

3

One difference sentence

Explain why one builds understanding and the other clears access.