How to Reduce the Cognitive Load on Students During Lessons

A look at ways teachers can refine their practices to help ensure that students absorb and process information so they can retrieve it later.

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September 16, 2022

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Our active working memory is amazing. It's where thinking takes place. New information gets mixed in with things already stored in your long-term memory and is processed. Some of what you process gets written back into your long-term memory—this is learning.

Yet, our active working memory also presents a huge bottleneck to learning. Research suggests it only holds three to five items for 10 to 20 seconds. Yikes. The demands we place on our very limited active working memory are known as cognitive load.

If the total cognitive load on students is too high, learning is hard or impossible. One scenario is that their working memory just can't hold all the new stuff at once (we've all felt like this at times). Or, they might have enough capacity to hold and process everything but no "extra" space to write schema in their long-term memory. This presents itself as students being able to do a task in class but not being able to do it later. If it hasn't been stored in long-term memory, it hasn't been learned.

As a classroom teacher, these two scenarios probably sound familiar. So what can we do about it? There are two easy areas in which to start.

AREA 1: REDUCE EXTRANEOUS COGNITIVE LOAD

Anything that isn't intrinsic to the learning task itself or isn't part of the process of helping it stick in students' long-term memory is extraneous cognitive load. Always be on the lookout for extraneous cognitive load, and eliminate it wherever you find it. Here are some examples.

Give better assignments: Give clear instructions for assignments, especially homework. Even though you're busy, always ask yourself, "Could I be clearer?" Edit for clarity if you have any doubt. Remember that your students are novice learners in the subject whereas you're an expert. To help things be clear and simple, keep these details in mind:

- Number each step.
- Ensure that all students have easy access to all resources they need. Alter your assignments if this isn't the case.
- Make sure that necessary knowledge and skills are already in place. If not, adjust your assignments.
- Have students submit work in a limited number of ways.
- Research suggests that the quality of homework assignments is much more important than the quantity. Make assignments highly integrated with what is going on in class rather than as an add-on.

Improve the work environment: Reduce unnecessary noise in class. If you want to play music in class, deliberately choose when, knowing that for some students it will add significant extraneous cognitive load.

- The research on listening to music is interesting and nuanced. Music clearly adds extraneous cognitive load, but for some students performing some tasks, this might

be offset by positive impacts on things like stress or attention. Have ongoing discussions with students to help them honestly find what works for them when.

- Avoid visual clutter in your classroom. Everything there should have a purpose—design, don't decorate. Have less on show at once, and rotate it as the year goes on. Can you find three things in your room to remove that would make it better?

Present information more effectively: Try following Rich Mayer's principles of multimedia learning when presenting slides:

- Only provide the information that the learner needs. This usually means simple text and simple visuals directly related to the topic being taught.
- Use humor with caution, and only when it amplifies the idea you're trying to teach. Beware of cartoons and funny images that become seductive details. Students remember these but not the key points.
- Give students verbal cues to what they should be looking at—don't make assumptions.
- Reduce the amount of text where possible. Narration plus text to read creates cognitive overload, so don't read out your slides. Prompt students to read the text, and give them time to do so with you being silent.

Nurture each student's sense of belonging: Every student brings a lot more than just their book bag to your class. To what extent do you aid identity validation? To what extent do you help each student feel safe, build their trust, and feel that their unique story matters in your class? To what extent do you work to eliminate identity threat in all its forms? To what extent do you help build each student's sense of social belonging and academic belonging?

- For many students, for many reasons, much of their active working memory may be taken up with things not related to the topic of your class. The work we do for

diversity, equity, inclusion, and belonging is vital for a great many reasons. It's important for teachers to pay attention to its impact on working memory and cognitive load, and thus on learning.

- Build routines and rituals that make your room a safe, predictable place by investing time early on to build a positive classroom culture and relationships.

AREA 2: USE SCAFFOLDS TO REDUCE DEMANDS ON WORKING MEMORY

Add scaffolds: These help students to offload some of their thinking onto paper so that they have less "new stuff" to hold in their working memory at once. The first rule of scaffolds is that they should be temporary—phased out over time, though some students may need them brought back occasionally. Here are some examples:

- Use visual planning sheets to help organize your thinking for a piece of writing or to lay out some steps of a problem in math. Tell students, "By writing some of this down, you are freeing up some space in active working memory so that you can think more deeply."
- Allow students to have a note card with quotations on it for the first essay of the year so that they can focus on the mechanics of the essay. Explain why you're doing this.
- Have students make a temporary help sheet for a tough verb tense in Spanish.
- Allow students to use an equation sheet at the start of a physics unit.
- Use a single-column rubric in the "coming up with a plan" stage and for check-ins during a project, as well as at the end.
- Deliberately plan short activities at the start of a topic to help students "awaken" and connect their prior knowledge and experiences to the new topic, rather than making assumptions or leaving this to chance.