

# The Science of Learning: Three big ideas for faculty

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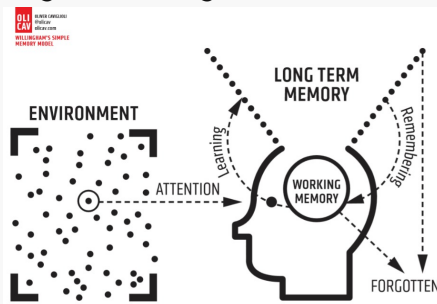
by [Arushi Manners](#), the Teaching & Learning Centre

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Willingham (2012) famously said, “Memory is the residue of thought.” How often do we plan our teaching activities with student thinking in mind? Knowing a little bit about human cognitive architecture can help make our practice more effective by enabling faculty to leverage effective cognitive learning strategies while practicing cognitive empathy in their teaching. These are the three big ideas that make up our Science of Learning To-Do List:

## 1. Review Human Cognitive Architecture

Below is Willingham’s simple memory model, designed by Oliver Caviglioli. From this model, we can see that in an environment full of stimuli, we learn what we pay attention to. How might we design activities where students are thinking about the right things? This model



also lends itself to thinking about Sweller’s (1998) [Cognitive Load Theory](#), which encourages us to optimize our use of instructional strategies while minimizing distractions, keeping in mind our limited working memory capacity. In 2017, Dylan Wiliam took to Twitter to claim that Cognitive Load Theory is the “single most important thing for teachers to know” because of the positive impact it has on their instruction, and consequently to student learning.

## 2. Use Effective Cognitive Learning Strategies

[The Learning Scientists](#) offer six key strategies: Spaced Practice, Retrieval Practice, Elaboration, Interleaving, Concrete Examples, and Dual Coding. In addition to knowing about human cognitive architecture, familiarize yourself with these strategies; they will allow you to

effectively plan your lessons, building in exercises where students are engaging with key ideas meaningfully. Kirschner, Sweller, and Clark (2006) describe learning as a “change in long-term memory.” How might we use these cognitive strategies to facilitate learning throughout the duration of our course?

It is also useful to share the research behind these strategies with students, so that they are encouraged to use more effective study techniques, rather than relying on ineffective practices such as re-reading text and highlighting notes.

### **3. Practice Cognitive Empathy**

Bill Crebin (2011) encourages us to practice what he calls ‘*cognitive empathy*.’ That is, considering in advance how our students might interpret our subject matter and instructional activities. It also means anticipating what students might find confusing, difficult, or challenging, and planning ahead for these events. Practicing cognitive empathy in our teaching means understanding how students learn, and designing our instructional activities accordingly, using cognitive learning strategies to optimize our learning environment.

In Fall 2019, Jean Choi and Amy Lin will be facilitating a series of workshops on embedding the Science of Learning principles into practice. They will delve deeper into cognitive architecture and implementing effective cognitive learning strategies. More details will be available soon on the [Teaching & Learning Centre calendar](#).

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