

## Seven Insights into Learning

Brown, P.C., Roediger III, H.L., and McDaniel, M.A. (2014). *Make It Stick: The Science of Successful Learning*. Cambridge, MA: The Belknap Press of Harvard University Press.

The following evidence-supported insights are about the mechanics of learning. These insights can inform course design or advice to students about how to study.

1. All new learning requires a connection to prior knowledge.
2. Retrieval practice—recalling facts, concepts, or events—strengthens memory and interrupts forgetting. A simple quiz after reading a text or hearing a lecture produces better learning and remembering than rereading the text or reviewing lecture notes does.
3. Rereading and rapid-fire repetition give rise to feelings of fluency that are taken as mastery, but are largely a waste of time.
4. Mechanical recitation relies heavily on working memory, which has limits on what one can keep in mind. However, practicing elaboration (giving new material meaning by expressing it in one's own words and connecting it with what that person already knows) has no limitation.
5. Extracting key ideas from new material, organizing them into a framework, and connecting that framework to prior knowledge help a person achieve complex mastery.
6. Trying to solve a problem *before* being taught the solution leads to better learning, even when errors are made.
7. Spaced practice, particularly practice that is interleaved with two or more topics or skills, produces long-term memory and enables versatile applications.