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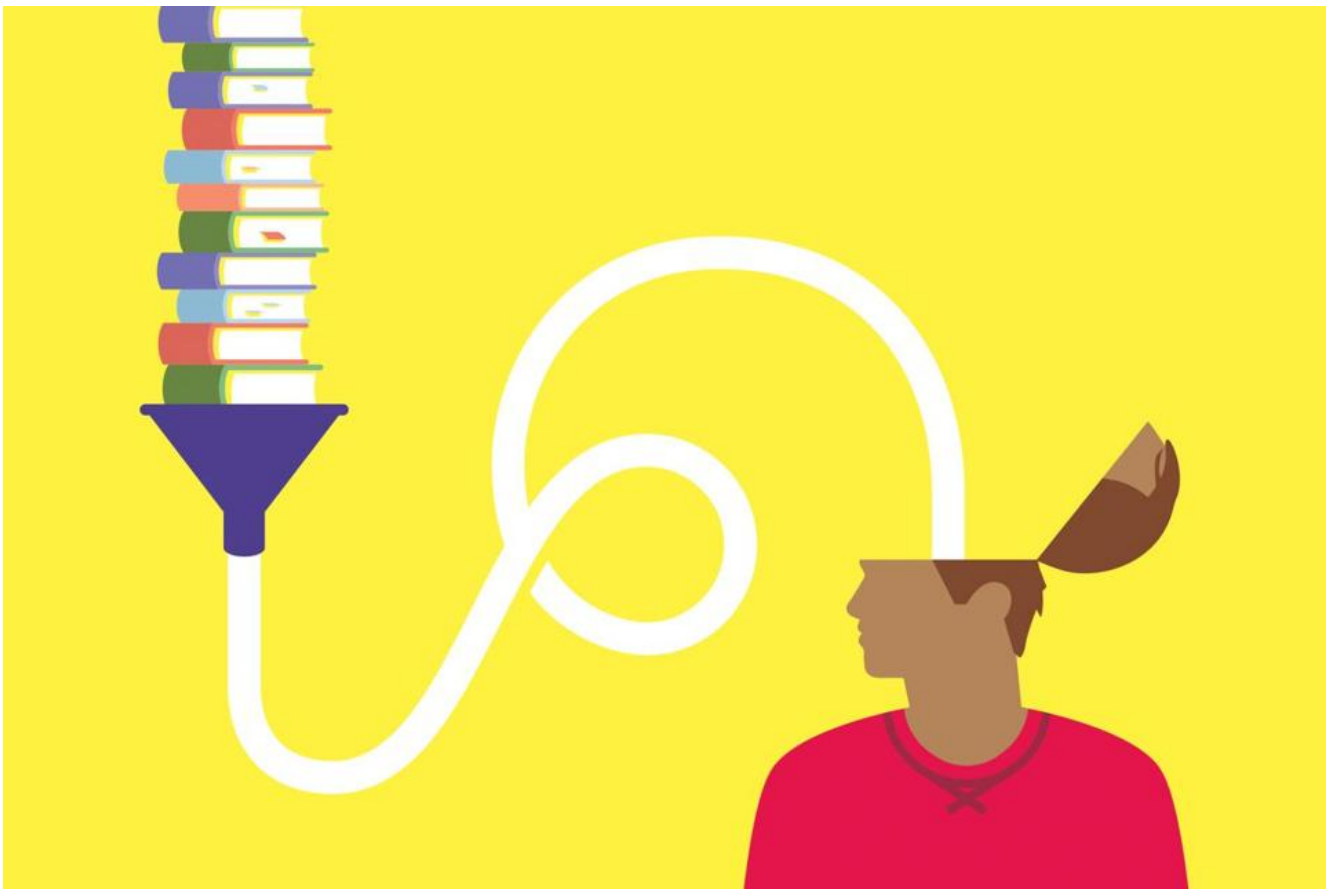
LEARNING & EARNING 2014

How to learn better at any age

You're studying wrong. But don't worry, it's not too late to get much, much better.

By Peter C. Brown, Henry L. Roediger III and Mark A. McDaniel | MARCH 09, 2014



BEN WISEMAN

PEOPLE COMMONLY BELIEVE that if you expose yourself to something enough times [illegible] burn it into memory. Not so. Many teachers believe that if they can make learning easier and faster, the learning will be better. Much research turns this belief on its head: When learning is harder, it's stronger and lasts longer. It's widely believed by teachers, trainers, and coaches that the most effective way to master a new skill is to give it dogged, single-minded focus, practicing over and over until you've got it down. What's apparent from research is that gains achieved during such practice are transitory and melt away quickly.

In fact, what students are advised to do is often plain wrong. For instance, study tips published on a website at George Mason University include this advice: "The key to learning something well is repetition; the more times you go over the material, the better chance you have of storing it permanently." Another, from a Dartmouth College website, suggests: "If you intend to remember something, you probably will." Belief in the power of rereading, intentionality, and repetition is pervasive, but the truth is, you usually cannot embed something in memory simply by repeating it over and over.

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Consider a simple example called the "penny memory test," which presents a dozen different images of a common penny, only one of which is correct. As many times as you've seen a penny, you're hard pressed to say with confidence which one it is.

The finding that rereading textbooks is often labor in vain ought to send a chill up the spines of educators and learners, because it's the number one study strategy of most people — including more than 80 percent of college students in some surveys — and is central in what we tell ourselves to do during the hours we dedicate to learning. Rereading has three strikes against it: It is time-consuming; it doesn't result in durable memory; and it often involves a kind of unwitting self-deception, as growing familiarity with the text comes to feel like mastery of the content. The hours immersed in rereading can seem like due diligence, but the amount of study time is no measure of mastery.

It turns out that much of what we've been doing as teachers and students isn't serving us well. But some comparatively simple changes in how we study could make a big difference, regardless of age. Here are some of the principal insights that we and other cognitive scientists have gathered from our research into effective learning:

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Learning is deeper and more durable when it costs effort. Learning that's easy is like writing in sand, here today and gone tomorrow.

We are poor judges of when we are learning well and when we are not. When the going is harder and slower and it doesn't feel productive, we are drawn to strategies that feel more fruitful, unaware that the gains from these strategies are often temporary.

Rereading text and massed practice of a skill or review of new knowledge are common study strategies of learners of all stripes, but they're also among the least productive. By massed practice, we mean the single-minded, rapid-fire repetition of something you're trying to burn into memory, the "practice-practice-practice" of conventional wisdom. Cramming for exams is an example. Rereading and massed practice give rise to feelings of fluency that are taken to be signs of mastery, but for true mastery or durability these strategies are largely a waste of time.

Retrieval practice — recalling facts or concepts from memory — is a more effective learning strategy than review by rereading. Flashcards are a simple example. Retrieval strengthens the memory and interrupts forgetting. A single, simple quiz after reading a text or hearing a lecture produces better learning and remembering than rereading the text or reviewing lecture notes. While the brain is not a muscle that gets stronger with exercise, the neural pathways that make up a body of learning do get stronger. Periodic practice arrests forgetting, strengthens retrieval routes, and is essential for hanging onto the knowledge you want to gain.

When you space out practice at a task and get a little rusty between sessions, or you interleave — that is, alternate between — the practice of two or more subjects, retrieval is harder and feels less productive, but the effort produces longer-lasting learning and enables more versatile application of it in later settings.

Trying to solve a problem before being taught the solution leads to better learning, even when errors are made in the attempt.

The popular notion that you learn better when you receive instruction in your preferred learning style — for example, as an auditory or visual learner — is not supported by the empirical research. People do have multiple forms of intelligence, and you learn better when you "go wide," drawing on all of your aptitudes and resourcefulness, than when you limit instruction or experience to the style you find most amenable.

When you're adept at extracting the underlying principles or "rules" that differentiate types of problems, you're more successful at picking the right solutions in unfamiliar situations. This skill is better acquired through interleaved and varied practice than massed practice. For instance, interleaving the identification of different types of birds or the works of different oil painters improves your ability both to learn the unifying attributes within a type and to differentiate between types, improving your skill at categorizing new specimens you encounter later.

We're all susceptible to illusions that can hijack our judgment of what we know and can do. Testing helps calibrate our judgments of what we've learned. In virtually all areas of learning, you build better mastery when you use testing as a tool to identify and improve your areas of weakness.

In a "Far Side" cartoon by Gary Larson, a bug-eyed kid asks his teacher: "Mr. Osborne, can I be excused? My brain is full!" If you're just engaging in mechanical repetition, it's true, you quickly hit the limit of what you can retain. However, if you practice elaboration, there's no known limit to how much you can learn. Elaboration is the process of giving new material meaning by expressing it in your own words and connecting it with what you already know. The more you can explain about the way your new learning relates to your prior knowledge, the stronger your grasp of the new learning will be and the more connections you create that will help you remember it later.

Putting new knowledge into a larger context helps learning. For example, the more of the unfolding story of history you know, the more of it you can learn. And the more ways you give that story meaning, say by connecting it to your understanding of human ambition and the untidiness of fate, the better the story stays with you. Likewise, if you're trying to learn an abstraction, like the principle of angular momentum, it's easier when you ground it in something concrete that you already know, like the way a figure skater's rotation speeds up as she draws her arms to her chest.

Many people believe that their intellectual ability is hard-wired from birth and that failure to meet a learning challenge is an indictment of their native ability. But every time you learn something new, you change the brain — the residue of your experiences is stored. It's true that we start life with the gift of our genes, but it's also true that we become capable through the learning and development of mental models that enable us to reason, solve, and create.

In other words, the elements that shape your intellectual abilities lie to a surprising extent within your own control.

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