When Homework is a Waste of Time

Most after-school assignments are based on out-of-date and often ineffective methods

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We often hear passionate arguments about how American students have too much homework, or too little. But I believe that we ought to be asking a different question altogether. What should matter to parents and educators is this: How effectively do children's after-school assignments advance learning?

The evidence suggests that as of now, homework isn't making the grade. Although surveys show that the amount of time our children spend on homework has risen over the past three decades, American students are mired in the middle of international academic rankings: 17th in reading, 23rd in science, and 31st in math, according to the latest results from the Program for International Student Assessment (PISA). In a 2008 survey, one-third of parents polled rated the quality of their children's homework assignments as fair or poor, and four in ten said they believed that some or a great deal of homework is busywork. A recent study, published in the Economics of Education Review, reports that homework in science, English and history has "little to no impact" on students' test scores. (The authors did note a positive effect for math homework.)

Fortunately, research is available to help parents, teachers and school administrators make homework smarter, although these particular innovations have yet to be applied outside the classroom. A new discipline, known as Mind, Brain and Education, has recently emerged that is devoted to understanding and improving how people absorb, retain and apply knowledge. A collaboration between psychologists at Washington University in St. Louis and teachers at nearby Columbia Middle School, for example, lifted seventh- and eighth-grade students' science and social studies test scores by 13 to 25 percent. The field's methods may seem unfamiliar and even counterintuitive, but they are simple to understand and easy to carry out. After-school assignments are ripe for the kind of improvements this new science can offer.

"Spaced repetition" is one example of the kind of evidence-based technique that researchers have found has a positive impact on students' learning. Here's how it works: instead of concentrating the study of information in large one-shot doses, as many homework assignments currently do—reading about, say, the Civil War one evening, and Reconstruction the next—learners encounter the same

material in briefer sessions spread out over a longer period of time. With this approach, students would be re-exposed to information about the Civil War and Reconstruction in their homework a number of times during the semester. It sounds unassuming, but spaced repetition produces impressive results. Eighth-grade history students who tried a spaced approach to learning had nearly double the retention rate of students who studied the same material in a consolidated unit, reported researchers from the University of California-San Diego in 2007. The reason the method works so well goes back to the brain: when we first acquire memories, they are volatile, subject to change or to disappear. Exposing ourselves to information repeatedly over time fixes it more permanently in our minds, by strengthening the representation of the information that is embedded in our neural networks.

A second learning technique, known as "retrieval practice," employs a familiar tool—the test—in a new way: not to assess what students know, but to reinforce it. We often conceive of memory as something like a storage tank, and a test as a kind of dipstick that measures how much information we've put in there. But that's not actually how the brain works. Every time we pull up a memory, we make it stronger and more lasting—so that testing doesn't just measure, it changes. Simply reading over material to be learned, or even taking notes and making outlines, as many homework assignments require, doesn't have this effect. In one experiment, language learners who employed the retrieval practice strategy to study vocabulary words remembered 80 percent of the words they studied, while learners who used conventional study methods remembered only about a third of them. Study subjects who used retrieval practice to learn from a science textbook retained about 50 percent more of the material than those who studied in traditional ways, reported researchers from Purdue University in 2011. [10] Students—and parents—may groan at the prospect of more tests, but the self-quizzing involved in retrieval practice need not provoke any anxiety. It's simply an effective way to focus less on the input of knowledge (passively reading over textbooks and notes) and more on its output (calling up that same information from one's own brain).

Another common misconception about how we learn can render homework much less effective than it might be. Most of us assume that if information feels easy to absorb, we've learned it well. In fact, just the opposite is true. When we work hard to understand information, we recall it better; the extra effort expended signals the brain that this knowledge is worth keeping. This phenomenon, known as cognitive disfluency, promotes learning so effectively that psychologists have devised all manner of "desirable difficulties" to introduce into the learning process: for example, sprinkling a passage with punctuation mistakes, deliberately leaving out letters, shrinking font size until it's tiny, or wiggling a document while it's being copied so that the words come out blurry. Teachers are unlikely to start

sending students home with smudged or error-filled worksheets, but there's another kind of desirable difficulty—called interleaving—that can readily be applied to homework. An interleaved assignment mixes up different kinds of situations or problems to be practiced, instead of grouping them by type. When students can't tell in advance what kind of knowledge or problem-solving strategy will be required to answer a question, their brains have to work harder to come up with the solution—and the result is that they learn the material more thoroughly.

A study published in 2010 in the journal Applied Cognitive Psychology asked fourth-graders to work on solving four types of math problems, and then to take a test evaluating how well they had learned. The scores of those whose practice problems were mixed up were more than double the scores of those students who had practiced one kind of problem at a time. The effectiveness of interleaving has been demonstrated many times in the laboratory, yet real-world homework assignments still commonly present problems of a single type together.

Homework has long been an academic laggard, slow to adopt scientifically-supported approaches to learning. No wonder it's assailed by critics on all sides, whether they believe homework is piled on too heavily or given too sparingly. Maybe the heated debates about the amount of homework children are assigned would cool if it became clear that the homework was effectively advancing their learning. At our resource-strapped public schools, the application of such research-based strategies to homework is an untapped opportunity. Science has shown us how to turn homework into a potent catalyst for learning. Our assignment now is to make it happen.