

Why Teachers Should Help Students Learn Effective Study Strategies

By Katrina Schwartz May 21, 2017

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For teachers, the carefully controlled conditions of education research can seem ridiculous when the reality of the classroom involves regular interruptions, absences and general chaos. **Professor John Dunlosky** is **trying to bridge these two worlds**, intentionally studying the effectiveness of strategies that lab studies indicate are promising, but that don't require special technology or extra resources. He is trying to figure out what few strategies could actually make a big difference for learners, and which ones are a waste of time.

“The most difficult aspect of this entire project was deciding which strategies we should evaluate,” Dunlosky said during a presentation at **Learning and the Brain** in San Francisco. There are hundreds of teaching strategies, most of which can be effective in certain situations. But Dunlosky was looking for **strategies that are broadly applicable** and don't just aid memorization; he wanted to find the approaches

that deepen understanding and help students transfer learning to new situations.

RETRIEVAL PRACTICE

Some of the best learning strategies aren't often used by teachers or students largely because of time pressures in the classroom. Frequent low-stakes quizzes that force students to recall information from their memories, combined with spaced out practice show some of the clearest results.

“Most people don't realize that taking the test can have a direct impact on subsequent retention,” Dunlosky said. In his college courses he regularly quizzes students using word stems so that they repeatedly have to recall the information in their notes from memory. Many quiz formats can work for retrieval practice including multiple choice, fill-in the blank, or essay questions. The important thing is that they be low-stakes, so they don't produce anxiety in students or affect their grade.

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— *Francesca Timms (@fran_timms) April 19, 2017*

“When your students take more low stakes tests they get more familiar with what they're struggling with, and so do you, so you can focus more of your teaching and homework on that more challenging content,” Dunlosky said. In many ways he's describing formative assessment, a practice teachers have

always used, but quizzing isn't just for teachers to take the pulse of the class, it's good for students' brains too.

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A study conducted by Andrew Butler in 2010 compared how well students performed on a variety of tests when they either restudied material or took practice tests and restudied. He found that not only did students who studied and took a practice test remember more of the specific information than those who merely restudied, they also performed almost two times better on questions that required them to make inferences.

“Students get a really powerful boost in their learning and ability to utilize that knowledge in other contexts,” Dunlosky said. Butler’s study is often cited as an example that retrieval practice can lead to transfer both within a domain and to new ones. “Testing the content, just retrieving the content from memory, allows them to use that content flexibly later,” Dunlosky said.

Blake Harvard teaches AP Psychology to students at James Clemens High School near Huntsville, Alabama. His students are mostly high achieving and college-bound, but still they often don't know much about effective study strategies. He regularly gives them low-stakes quizzes on material he covered a few days before to both **force them to recall the information** and to show them the gaps in their learning.

“I find often that with high schoolers it makes sense when they hear it so they believe they’ve got it, but if you ask them a couple of days later they don’t know what they thought they did,” Harvard said. He’s always clear with students that the quizzes are a learning tool, something they can use in all their classes, not another score in the gradebook.

“If they know it’s not in the gradebook the stress isn’t there,” Harvard said. And, paradoxically, when the quiz doesn’t affect their grade, students are more willing to both take it and put some effort in. Harvard then tries to **put the onus back on students** to fill in the gaps, pointing them to banks of practice AP questions, for example. If everyone missed a concept, he’ll revisit it.

He’s pretty sure these practices are helping students because he has focused more on retrieval strategies this semester and on average his student test scores are up six percent. “There are a ton of variables there, but the one thing I know I’ve changed is my focus on these strategies,” he said. He also hears from students that they find frequent quizzing effective enough that they are using the strategy in other classes.

DISTRIBUTED PRACTICE

If retrieval practice is the "what" then distributed practice is the "when" of smart studying. Spreading practice out over time is effective in many contexts. Often courses move linearly and teachers explain a concept, assign homework that requires students to

practice that concept, and then move on. That is called mass practice and is less effective than spreading practice out in smaller amounts over time.

“Distributed practice really has a major impact on long term retention,” Dunlosky said. “This is something we want students to do for the most important concepts.” Students often intuitively know they should spread their studying out over time, but when the rubber hits the road they end up cramming. Teachers can help them ingrain better habits through the way they assign work and by talking about the benefits.

In a **study of seventh grade math**, Doug Rohrer and colleagues focus on some of the trickiest concepts like slope, graphing equations, linear equations, and word problems with proportions. During the nine week study, one group of students received grouped practice of problems, while another spread different kinds of problems out over the nine weeks. Two weeks after the end of the trial period all students took a surprise test. Those who had spread their practice out got 72 percent of the problems correct on the test, while those who had done grouped practice only got 38 percent of the problems correct. Distributed practice is most effective when students repeat problems types across class days and in homework across weeks.

Fourth grade teacher Tony Zobeck tries to use both low-stakes quizzing and distributed practice regularly

in his Kendell View Elementary classroom in Morrison, Colorado. He uses a tool called ClassFlow in math to embed questions into activities that both force students to recall old information and helps them see where they need more work. If they “red out” on an exit ticket Zobeck will review strategies they can use to relearn information that they’re missing.

He finds interleaving or distributing practice harder to achieve on the timetable he’s supposed to follow. His curriculum moves forward in a linear way, but he does his best to cue prior knowledge in his students and remind them of how new concepts connect to old ones.

“Unless you're not going to cover everything in the year, the best you can do is provide those prior links and keep pushing forward,” Zobeck said. He’s a member of the **International Mind, Brain and Education Society**, so he knows the constant march through content isn’t always best for students. He said he’s always trying to walk the line between what the structures of public education require of him and what he knows is best for how his students learn.

He’s also constantly surprised that most of his fourth graders can’t remember anything they’ve learned before. Many can’t identify an adjective or a verb until it’s reviewed; they even forget content they learned a month earlier. “It really is quite shocking,” Zobeck said.

That's why he focuses on what he calls "thinking patterns," basically learning strategies, that he tries to mix into everything he does. His students get a lot of retrieval practice on things like how to tackle a text and how to stay organized. He hopes if those things are hardwired then at least his students will have the tools to relearn content more quickly if they forget it.

SUCCESSIVE RELEARNING

To supercharge both retrieval and distributed practice, Dunlosky and others have been building on the work of **Harry Bahrick**, an early pioneer of research into how to use the two strategies together. When students practice until they can get every answer correct and then repeat that process every few days, they encode the information much better.

In all of the retrieval and relearning strategies it's "important that the responses are eventually correct," Dunlosky said. "Students get a lot more bang for their buck when they come up with the right answer."

Dunlosky also points out that successive practice is the norm for many activities students are passionate about like sports or music. "Most of your students use successive relearning for almost everything they enjoy doing outside of classroom studies," he said. For example, a student learning to play an instrument will regularly practice a piece until it sounds good and then practice again a few days later. After the first practice session some notes or phrasing are forgotten, but when they are relearned during the

next practice session they are encoded even more strongly.

Katherine Rawson, John Dunlosky and Sharon M. Sciartelli conducted a study in 2013 to see how well successive relearning works in the context of a real college classroom. For some units students learned psychology terms pertinent to what they were studying in class and had to write the definitions. They then got feedback on their answers and kept practicing until they got them all correct. They continued to do this over three successive relearning sessions. For other class units they were left to study as they usually would.

At the end of the semester, students took a multiple-choice final exam that required students to use their knowledge of the definitions in new situations. Students scored a letter grade and a half higher on items they had successively relearned, as opposed to ones that they had studied using their own tactics.

Even more telling, the researchers gave students another test three days later and a third test 24 days later. These follow-up exams were "recall" exams, where a concept term was listed and students had to write its meaning. Rawson and colleagues found "devastating memory loss" in the control group, from 72 percent correct to 24 percent correct after three days. Those same students got only 17 percent correct 24 days later. Students in the successive relearning condition had very little loss.

The researchers were also interested in whether they would see similarly positive improvements when the study schedule wasn't tightly controlled, so they conducted a follow-up extension study. They gave students in the trial condition a flash drive with a suggested study schedule. Students also received reminder emails to use the program. In both supervised and unsupervised conditions students showed durable learning.

STUDENTS NEED COACHING

While these practices work well for what might be termed “superficial learning” for a test, they also seem to help students make inferences and connections within and across domains. They are some of the most studied and well-researched learning strategies and yet most students don't use them.

When **students report** on the study strategies they use most often many say they reread the textbook or their notes, underline, and highlight. None of those approaches are as effective or efficient as others they could be using. Summarizing, another popular strategy, is mostly good for memorization, but doesn't create transfer. But often students have never been taught effective study strategies and experience deep frustration when they put hours of work into studying and see no results in their performance.

That's where teachers can have an outsized impact by structuring class time and homework to include

strategies like retrieval, spaced practice and successive relearning. Not only will students do better in that class itself, they may learn strategies that will serve them well throughout their academic career. Teachers like Blake Harvard take this practice a step further, making sure students understand why the strategies fit how the brain learns and emphasizing that students can use the same strategies beyond his class.

“They may be good at memorizing right now, but when the professor gets in there for an hour and a half and the test isn’t for a month, well you can’t memorize for that long,” Harvard said.

