

Classroom practice – Effortless learning is a dangerous illusion



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Teachers understandably want to smooth the path to knowledge for their students. But for true mastery you must make them struggle

Mary Pat Wenderoth stops herself mid-lesson and asks her class a question about the day's work. The students turn to their notes but she stops them. "Don't look it up. Imagine your brain is a forest and your memory is in there somewhere. The more times you make a path to that memory, the stronger that path becomes. Try to figure it out."

Wenderoth is a principal lecturer in biology at the University of Washington in Seattle, US. She keeps close tabs on research into how humans learn and knits the findings into her teaching methods. One of the most fundamental conclusions may appear contradictory: the best way to make learning stick is to focus less on getting knowledge into the brain and more on getting it out.

This is because we learn best by trying to retrieve an answer and this holds true even before we have been taught what the answer is. The struggle to figure it out opens the mind to gaps in our knowledge and helps to embed new learning, connecting it to what we already know and making it easier to get hold of again when we need it later.

This is one of many areas where teachers do the opposite of what is most beneficial for students. We try to make learning easy, but science shows that when learning is easy, it is soon forgotten. Our fear of causing stress for students means that we try to minimise testing, but – surprise – it turns out that students favour frequent low-stakes quizzing once they discover how it locks in learning and carries it forward through the term. As a result, they need to study less at exam time and experience less anxiety because the learning is stronger.

The uncomfortable reality is this: the most effective learning strategies do not feel productive, whereas the less effective strategies we often favour create illusions of mastery that keep us hooked like junkies. There are many such misconceptions and education needs to expose them. Here are four of the most pernicious.

Illusion 1

Repeated exposure burns new knowledge into memory

This conviction underlies students' faith in re-reading and cramming. Unfortunately, you cannot transform new knowledge into lasting memory simply through intention or repeated exposure. Re-reading fails as a technique on two counts: it does not get below the surface of the text and it does not embed the learning in a way that interrupts forgetting. It is a hollow exercise compared with retrieving and elaborating on what you have learned. Yet in surveys of American college students, 80 per cent say that reviewing texts and lecture notes is their preferred study strategy.

If this technique is so ineffective, why do students persist with it? They do so because repetition creates a fluency in reading the text that fools them into thinking they know the material and will be able to recall it at test time. That feeling is illusory. Like a sugar high, the nutritional value is nil. Mastery requires understanding of the concepts behind a text, connecting them to what you already know and elaborating on them in your own words. For memory to be durable, you need to periodically practise retrieving it.

Illusion 2

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Single-focus, rapid-fire practice hones new skills

It is true that when you practise something over and over, you experience gratifying improvement. What you do not perceive is that these improvements from rapid-fire repetition (what scientists call “massed practice”) are propped up by short-term memory and quickly melt away.

Durable learning requires consolidation. In layman’s terms, consolidation is how the brain gives meaning to something new by filling in the gaps, connecting it to what you already know and transferring it to the regions of the brain that store long-term memories. Consolidation takes place over hours or days and seems to be aided by sleep. Practice that is spaced out (so that a little forgetting has set in between retrieval attempts), or interleaved with different but related activities, requires that you “reload” learning from long-term memory. The mental effort involved in this process causes the brain to reconsolidate the memory, making the key aspects even more salient and the connections to other knowledge stronger – creating a clearer path through the forest of your brain.

Spaced or interleaved practice can be arduous and the resulting performance can be ragged. It feels less productive than massed practice, where the gains are immediately evident but the rapid loss of knowledge that follows is not. The maths student believes that she learns better by solving many examples of the volume of a cone before moving on to the volume of a wedge. But at test time, and in life, those who have been taught and practised skills in a random sequence outperform those who have relied on rapid repetition.

Illusion 3

If learning feels easy, it is a sign you are mastering it

When you hear something that is utterly clear, the odds are that you will feel that you already know the material, or at least that you will readily recall it at test time. Not likely. You learn better when understanding requires effort. If a teacher organises a lesson differently from the way it is represented in the textbook being studied, students have to reconcile this discrepancy and the effort of doing so makes the central learning stronger. Psychologists coined the term “desirable difficulties” to describe such impediments. As with spaced and interleaved practice, they make learning feel slower and more difficult but yield more robust and long-lasting mastery.

Illusion 4

We are good judges of what we know and don’t know

The notion that learning should be student-directed – that young people are the ones who know best what they need to study and how to go about it – is appealing. Although it is true that students must take responsibility for their own learning, it is also true that we are all subject to a long list of illusions and cognitive biases that undermine our judgement of what we know and what we don’t. Sometimes students with the lowest scores on tests have the highest confidence in their performance and are the least able to recognise competence in others when they see it.

How can we dispel these illusions and help students to succeed? We must do as Wenderoth does: teach students how learning works and then model the various forms of spaced and interleaved retrieval practice in class and in homework assignments. The value of these skills is neither broadly understood nor often taught. Yet something as simple as spaced, low-stakes quizzing or self-testing – so potent for locking in learning – is also central to helping students calibrate their judgement, discover where mastery is weak and target their efforts to improve.

For Kiley Hunkler, a Rhodes scholar at the University of Oxford, these skills were an integral part of her undergraduate training at the United States Military Academy at West Point. She uses the phrase “shooting an azimuth” to describe the practice tests she takes in order to refocus her studying. In overland navigation, shooting an azimuth means climbing to a height, sighting an object on the horizon in the direction you are travelling and adjusting your compass to make sure you are still gaining on your objective as you trek through the forest below.

Such skills, when taught and practised, put the tools of mastery into the hands of students.

Peter C Brown, Henry L Roediger III and Mark A McDaniel are the co-authors of Make it Stick: the science of successful learning, published by Harvard University Press in 2014. Brown is a US-based writer. Roediger and McDaniel are psychology professors at Washington University in St Louis and McDaniel is also co-director of the Center for Integrative Research on Cognition, Learning, and Education

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