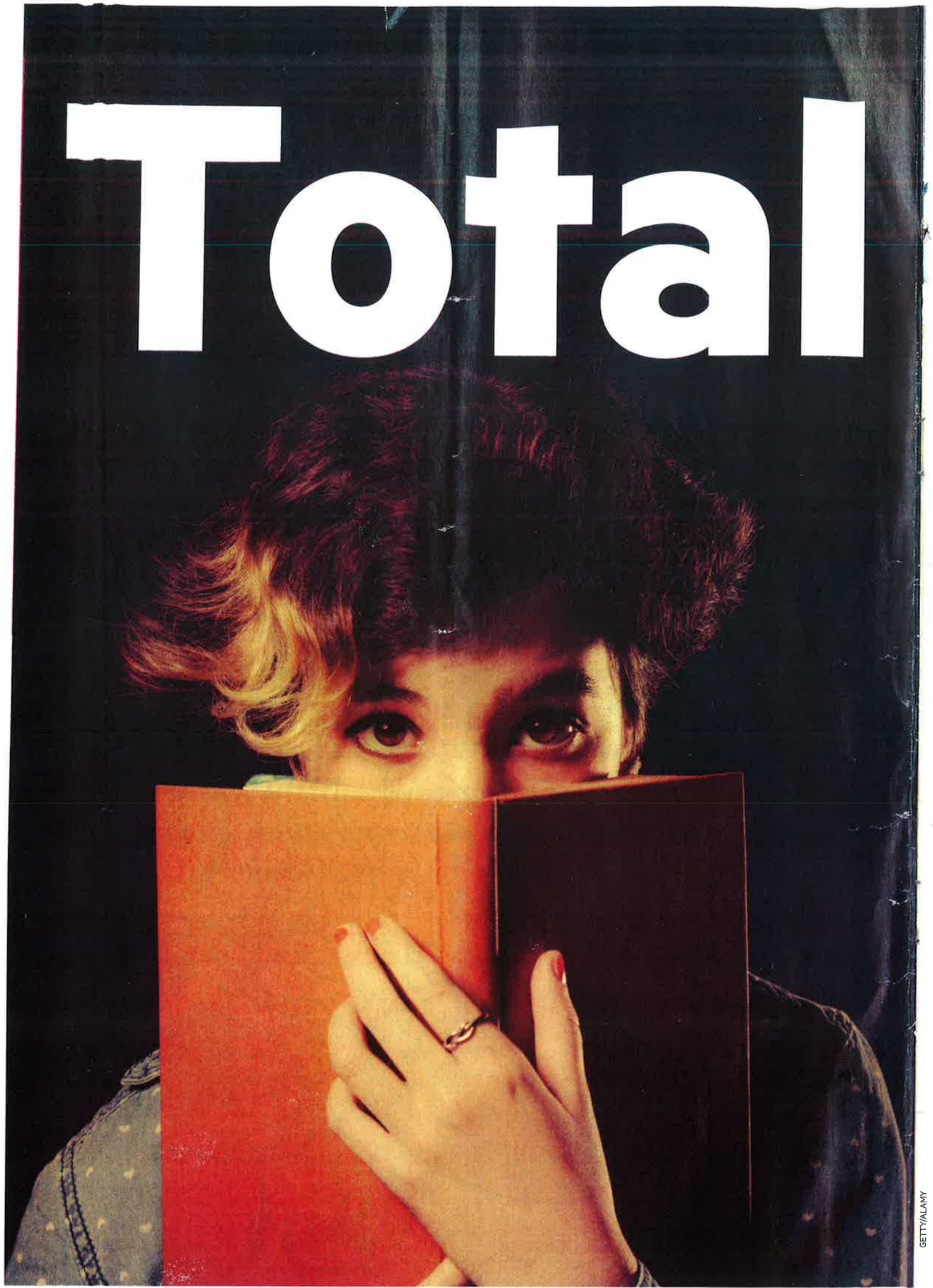
Total recall



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When it comes to retaining information, not all methods are created equal. Here, Alex Quigley separates the revision wheat from the chaff, helping you and your students to employ the most effective strategies for exam success

Every year, we attempt to defy the logic of the teenage mind – of human nature itself – and convince our students that they need to get serious and revise. "Cramming won't be enough," we implore. We dish out the highlighters, flashcards and revision timetables, and we hope.

Our efforts can seldom be questioned. Inspirational assemblies are performed to stoke the fires of student motivation; resilience-filled YouTube videos are peddled to quicken their blood; revision packs are readied, website links checked and parents notified. We'll even plough the scant remainder of our energies into extra revision sessions.

Too often, however, our best-laid plans go awry. Nate Kornell and Robert A Bjork, in their 2007 research on "The promise and perils of self-regulated study" (bit.ly/SelfRegStudy) – aka revision – showed that cramming to deadlines still ruled and that 80 per cent of students ignored the advice of their teacher about revising.

In actuality, ignoring our advice may sometimes be wise. For all our efforts and all our hard work, we can be guilty of leading students to undertake ineffective revision practices. To avoid this, we need to better model and scaffold the most effective revision tools. But how do we know which work best? Happily, there is a growing body of research evidence to show us the way. Here's what it says.

Highlighting

Students love a good pack of highlighters. They buy them by the dozen and transform their notes into a gaudy rainbow of colour. It looks and feels like learning, but the evidence places a question mark over such an assumption.

We like to think we guide our students to use highlighters meaningfully in their revision, instructing them to identify important points or passages, but a substantial range of research evidence, helpfully compiled by John Dunlosky et al, in 2013, in the seminal "Improving students' learning with effective learning techniques" (bit.ly/LearnTechniques), quashes our hopes. Highlighting is, they suggest, a relatively ineffectual tool.

One of the main problems is that it is already a very familiar strategy to students, and teachers, so they employ it in an unthinking fashion. Students may spontaneously highlight, and the evidence shows that how much they highlight is wildly variable given the same text. There's no real strategy evident.

While this isn't necessarily damaging to their learning, it may steal their limited time from a strategy that is proven to have a greater impact. We could redouble our efforts to make students more considered in their use of highlighters, but many of us are doing this already to limited effect. Instead, we should be turning them on to other techniques.

Another major reason for ditching the highlighters is that when a revision strategy feels too easy, it usually is. Compared with a trickier task, such as trying to remember what is on a flashcard, highlighting feels fluent and therefore students enjoy it more, but the research says that all this highlighting isn't as memorable as the difficult stuff.

Bjork has labelled the positive impact of difficult revision tasks "desirable difficulties". The added difficulty is harder to stick with but it proves longer lasting in the memory. Of course, we then have the attendant challenge of convincing students to revise in ways they may least enjoy – but as teachers we have the requisite skills to help us do this successfully!

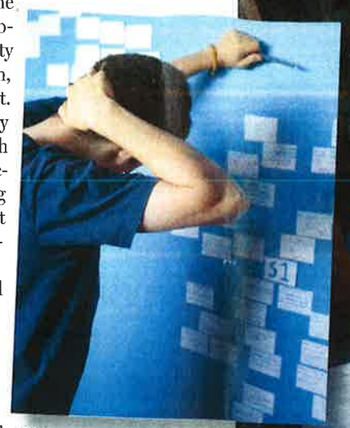
Verdict: ditch the highlighters.

Taking revision notes

Taking notes, or annotating a text, is the stuff of revision through the ages. You can cite the marginalia of great writers, or the

astounding notebooks of Leonardo Da Vinci, as proof of its apparent worth. Because of this weight of "evidence", we often pay too little heed to analysing the skills needed for note-taking. We just do it.

Done well, making notes is perhaps the foundation stone of good revision. All subsequent strategies can build on high-quality note-taking. But much like all good revision, it ain't what you do, it's the way that you do it. Simply copying out chunks of a text is likely to prove an ineffective strategy. The research indicates that elaboration is the key to effective revision notes. That is to say, interpreting what we read and more actively connecting it together, drawing out questions and patterns from the information.



Important related research from Cornell University, in the US, has gone as far as to provide a template for best practice in note-taking. The "Cornell method" (bit.ly/CornellSystem) essentially structures your note-taking for any given situation.

This is a simple elaboration of what students may be doing already but an important one for recall. It is a little tougher, and it requires structure and guidance from teachers to train students to ask good questions and more, but the rewards are worth it.

Of course, note-taking is only the first step. The most important aspect would be to then get students to revisit those notes, in particular the questions, and ensure they continue to test their knowledge and understanding.

Verdict: thorough guidance, modelling and structure required.

Reciting

Mention students learning their times tables by rote, or reciting Shakespeare, and you may be labelled an irredeemable traditionalist. Reciting is quickly (and wrongly) associated with Gradgrindian excess. Facts, facts and more facts: learning with the life sucked out of it.

In reality, what is characterised as mindless rote learning can prove an essential platform of knowledge for more meaningful strategies required for success in exams, such as problem-solving and making inferences from challenging questions.

Cognitive psychology has shown that the working memory of our students is limited. Under the stress and pressure of exam conditions, our short-term memory can falter.

By reciting crucial knowledge pertinent to an exam topic and learning it by rote, we help students make the recall of that knowledge almost automatic. They can then tackle the challenges of tough questions and apply their exam skills more confidently.

For example, a fluent grasp of number facts for a maths exam can free up our students to then undertake problem-solving with tricky equations, while learning quotations for an English literature exam can free students to then make subtle inferences from a Shakespearean speech.

Reciting is also a valuable revision tool that our students can deploy freely at any time. You can take to reciting in any number of memorable places, from up a mountain to in the bath.

Relying on reciting wouldn't prove the most effective method of revision. Mark A McDaniel et al, in their "The read-recite-review study strategy: effective and Portable" (bit.ly/ReadRecite) of 2009, present us with a handy enhancement of the traditional three Rs by adding their own little twist on the tried and tested method. Students read, then recite, before testing their knowledge of what they have recited.

Simply reading the information is never enough but this active addition can prove more memorable. A little reciting, and a little checking, go a long way.

Verdict: if it is good enough for great actors...

Graphic organisers

We are all familiar with the ubiquitous mind map, but in reality it is only one of a number of ways in which you can help students to organise revision topics in a memorable way, under the broad umbrella term of "graphic organisers". They originated in the 1960s (David Ausubel is usually credited with their development) and have been working a treat ever since.

One of the strengths of graphic organisers is their ability to help clarify and organise the often haphazard thinking of our students. There is a whole host of diagrams for different modes of thinking.

For example, if you're looking for comparative thinking, then try Venn diagrams, whereas a concept map (a downward-branching, hierarchical mind map) can help students to explore the nuances of a complex topic. To better classify, sequence, and show cause and effect, you can use everything from spider diagrams to fishbone diagrams.

They all need clear teacher guidance, but if you provide that then each can become an easy revision tool for students to use in a range of subject disciplines.

The research evidence gives us confidence in the tools, too, primarily because there is just so much of it. Robert Marzano and John Hattie, both renowned for their large-scale syntheses of research evidence, have corralled lots of studies supporting the notion that graphic organisers work very effectively.

More specifically, concept maps have been shown to be an excellent device for testing the knowledge of students on a given topic. Jeffrey D Karpicke and Janell R Blunt, in their 2014 research on concept mapping for science topics, "Learning with retrieval-based concept mapping", (bit.ly/ConceptMapping), found that they were an ideal way to test knowledge and understanding.

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Their crucial point is that students have to struggle to remember the topic or concept first.

Verdict: it isn't just pretty pictures – restructuring topics using graphic organisers makes its mark on the memory.

Flashcards

The vast majority of the educational researchers I have already cited have vouched for the humble flashcard. These simple but powerful cards replicate the "look, cover, write" effect we are all so familiar with.

The concept that the evidence shows is most effective for revision is "retrieval practice". Put simply, retrieval practice is any type of revision that gets students to remember information without their study aids to read or check. In short, it is a quick, painless test. Flashcards are perfect for this.

To create an effective flashcard, you need to put some good notes down on paper, perhaps organised with a particular graphic or helpful diagrams or symbols. You can do some lively reciting of the material before then testing yourself with the cards. You can repeat the process ad infinitum – or ad nauseam if you are a student fearing and loathing revision!

Flashcards can provide a flexible, mobile revision strategy for all occasions. With dedicated apps and websites, such as quizlet.com, available for students – or even humble index cards stuffed in your pocket – the approach allows you to revise anywhere.

Using flashcards can be a useful collaborative endeavour, too. Parents can test children in the car on the way to the supermarket; friends can sit in the library and fend off Facebook procrastination with some flashcard fun.

In many ways, the flashcard is the most effective revision tool, as it combines all the high-impact strategies in one handy rectangle. We need only support and scaffold our students to devise them successfully.

Verdict: small cards, big impact. A highly recommended strategy.

Testing

In *Cool Hand Luke*, released in 1967, Paul Newman's character famously eats 50 eggs. I fear being pelted with as many for suggesting that testing and tackling past questions is likely to be the most effective revision strategy. It is akin to teaching your grandmother to suck eggs, I hear you shout. But let's state the obvious, because the evidence heavily supports it.

With the toxic associations attributed to over-testing, there is a call from some not to "teach to the test" but to engage students with more interactive and, dare I say, fun revision activities. This call is to be balanced with the evidence that heavily supports the "testing effect". But actually, we simply need to reframe what we mean by a test.

A quiz is a test. It just isn't a high-stakes, stress-inducing exam-hall-nightmare-style test. It can be fun. Most importantly, it can prove incredibly useful, particularly ideas such as a weekly classroom quiz: Henry L Roediger III and Jeffrey D Karpicke, in their seminal 2010 article, "The power of testing memory" (bit.ly/TestingMemory), showed that tests aren't just for judging learning – they have the added benefit of actually improving learning.

Taking test after test of any kind as a singular strategy would be absurd. But well-timed, tough exam-question practice, along with good corrective feedback, is simply better than more study or flashing a highlighter across some notes. So unveil the past questions and unleash the power of testing for learning.

Verdict: you probably already knew this, but the "testing effect" works.

Alex Quigley is director of learning and research at Huntington School in York and tweets at @HuntingEnglish