Grasp

The Science Transforming How We Learn

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12-minute read

Synopsis

Grasp (2020) covers the development of modern education systems and the ways in which their current forms conflict with recent scientific insights into how the brain works. It describes a variety of experimental techniques being applied to improve education and discusses how they might become more broadly generalized.

Who is it for?

- Academics, teachers, school administrators
- Students
- Anyone interested in improving their own ability to learn

About the author

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What's in it for me? You'll get a grip on the latest science about learning and how our schools can use it to do better.

It's becoming ever clearer that traditional schooling just doesn't work. Cramming students' heads full of facts and knowledge and then testing them to within an inch of their lives doesn't help them learn or become more rounded, creative individuals. So what can be done?

These blinks should help you come away with a clearer understanding of some of the main characteristics that make our education systems clash with the ways our brains work and learn best, as well as some of the techniques that are being developed to try to change that.

In these blinks, you'll learn

- why common measurements like standardized testing are letting us down;
- techniques to improve your own learning and memory; and
- how new schools are harnessing the power of curiosity.

Our schools aren't always built for our brains – and we pay a heavy price.

Pretend you're back at school. Where do you see yourself? Crammed into a desk beside a bunch of other students, staring at a teacher droning on in front of a blackboard covered with indecipherable scribbles?

You wouldn't be alone. It's a classic image of how education works, and at this point in time, it's pretty much universal. But in a lot of ways, this system doesn't even come close to matching up with the latest science about how the brain works and how humans learn best. In fact, it often cuts directly against it.

The key message here is: Our schools aren't always built for our brains – and we pay a heavy price.

Over the past few decades, cognitive science has given us a lot of insights into how we can improve our schools. But before we dive into the details, it's worth backing up and asking exactly what we mean by "education."

According to the author, education means imparting knowledge that is deep, contextualized, and useful. Put another way, it's not just memorizing what the teacher says, it's also understanding how that information connects to the world around you and how you can activate it when the time comes.

Let's take an example. Say you just took an engineering class and learned all about how pressure waves work in pipes – at least, in theory. Sure, you can cough up the information for the test and get a good grade. But what if you take a job on an oil rig? If you can't actually stop the pipes from bursting – or fix them when they do – then what exactly was the point?

Unfortunately, many schools neglect this bigger picture. Why? Well, one reason might be because the education system has been designed not just to teach but also to separate "worthy" students from the "unworthy." The author calls the process "winnowing."

The logic of winnowing is everywhere. IQ scores, standardized tests, high-pressure exams – they're all used as signals of innate ability, intended to separate the wheat from the chaff, despite loads of evidence they do nothing of the sort. Not only do these metrics fail to capture intelligence fully, but they also encourage us to learn inefficiently. They unfairly winnow out a lot of promising minds.

We pay a big price for this. How many Einsteins have been lost to history because of geography, gender, class, or other factors the system couldn't account for? If we're going to solve the big problems like climate change, we're going to need all the minds we can get. So we need to get education right.

But first, we're going to have to unlearn a couple of myths.

Learning doesn't have to be unpleasant. In fact, it works better if it's not.

Since we're trying to unlearn a few things, let's go back to a time before we'd learned much of anything at all: childhood. Imagine you're a little kid, playing around at the beach. Everything feels new. You touch the water and realize it's cold. You splash water on the sand and realize it clumps. You stay in the sun too long and realize it stings.

As you take all this in, you're building a picture of how the world works. You're contextualizing information to help structure the way you interact with your environment in the future. In a way, you're not that different from a scientist.

We often think of education as something that's imposed from above, but learning is our natural state. It's the reason we've been able to survive as a species. So the first myth we need to overturn is that learning needs to be difficult.

The key message here is: Learning doesn't have to be unpleasant. In fact, it works better if it's not.

But if that's the case, then why does the classroom often feel so tragically distant from playing and exploring on the beach?

One reason is that our education systems grew out of some outdated assumptions. For example, the idea that learning should be kind of like weight-lifting: no pain, no gain. A lot of modern teaching is also based on century-old ideas that favored methods you could easily measure and standardize. Those kinds of techniques can be a boon when you're trying to build a system on a big scale – but they're not always good at stimulating our natural love of learning.

Successful education needs to be more engaging than that. The point shouldn't just be to learn physics, for example. It should be to learn how to think using the principles of physics – to see the world and engage with it in a different way. For that, you need more than raw information; you need context. Memorizing the names of world capitals is fine, but it would be better to understand them within a broader arc of events and people. Or, to return to our engineering example, to see how those pressure waves really work in oil pipes.

School can do this. Consider "Course 2.007," an engineering class at MIT. There, students are not only taught theory but are also constantly asked to put it into practice through hands-on challenges. Instead of a final exam, they build robots to face off in an end-of-semester competition. It's all the perks of an exam without that nasty winnowing effect.

Not everyone can go to MIT. But plenty of insights from cognitive science can help us structure learning just as successfully as they do – including many you can apply yourself.

Spacing learning isn't just useful, it's fundamental – but schools rarely take that into account.

I know it's a drag, but let's leave the beach and head back to school. It's the night before your big exam, and you're just now sitting down with your notes. You're amped up on caffeine, trying to cram as much information into your skull as you can.

If you attended school, you've probably crammed for an exam. That's because most systems use tests to evaluate students. And even though cramming is terrible for remembering information over the long term, it can be pretty effective for those kinds of trials.

It's another example of where the winnower slams up against how our brain learns best. The science of learning and memory is vast and rife with unknowns. But one thing pretty much everyone agrees on is that cramming is bad for learning. This has to do with a process called *long-term potentiation*, whereby synapses are strengthened over time. It turns out, when you space learning out, the synapses are strengthened more intensely.

The key message here is: Spacing learning isn't just useful, it's fundamental – but schools rarely take that into account.

There are many ways in which you can put *spaced learning* into practice. For example, schools could give *pre-tests* to students before their actual tests. This can help them in the long run because it compels them to call up information multiple times. Another technique known as *interleaving* involves alternating different subjects in study schedules, like switching between golf clubs at the driving range. Both have been shown to improve retention.

Another tactic might be to forget more. Ironically, we remember better when we forget a little. In fact, some theories suggest forgetting may actually be a way of pruning our memory – after all, if we remembered *everything*, we'd have a hard time functioning. When we forget something and recall it later, we clear a trail through the bramble of discarded associations and forge a deep and lasting connection.

For example, let's say you meet someone at a party and repeat their name to yourself. Chances are, you'll forget it a little while later because the repetition only helps you retrieve the information in the short term. But if you think about something else for a while, let yourself forget the name and *then* recall it, it's far more likely to stick.

These are just a few of the cognitive science insights that education still hasn't grasped. To explore some others, we need to go back to the beach.

Curiosity can supercharge the learning process and be a big part of enhanced learning.

Alright, you're a kid again, back at the beach. You dig your feet into the sand and scan the shore, searching for something new. There's a patch of gravel to your left, but why linger on that? Then a flash in a nearby tidepool catches your eye. You go over to look, spotting a beautiful piece of coral. Suddenly, your mind bubbles with questions: What is it? What made it? Why is it here?

We all know what drove you to look at the coral and pass over the gravel: curiosity. It's what happens when the brain realizes it doesn't know something that it *could* know.

Recent neuroscience has shown that curiosity can turbo-charge long-term potentiation, and thus learning. But decades before techniques like fMRIs allowed that process to be studied in detail, many educators had already recognized the power of curiosity and tried to harness it to make better schools.

The key message here is: Curiosity can supercharge the learning process and be a big part of enhanced learning.

For example, the influential American educator John Dewey worked hard to build learning environments that were structured around students' natural interests, even if his schools never really caught on. The better-known Montessori schools have recently had more success within the same tradition. The classic image of the Montessori student is a young child playing freely with colorful sticks or blocks – the ideas of learning and play merge, just like on that beach.

Montessori is only one of many experimental learning approaches sometimes called *discovery education*. The common thread among them is the belief that internal motives and imagination can and should drive the education process. Early last century, the influential psychologist Jean Piaget went so far as to argue that knowledge is something people actively create – that is, it's not something we're passively fed, like in those droning classroom lectures.

There's evidence that approaches based on views like Piaget's do work. Montessori graduates, for instance, have outperformed peers in standard schools in some studies.

But they aren't without pitfalls and limitations. For one, they're hard to scale up and replicate, partly because they require a lot of resources and skilled teachers. For education to work, it has to be accessible to a lot of people – not just a lucky few.

Maybe even more importantly, the motivational power of discovery and curiosity only goes so far without at least some instruction to give it shape. Which brings us back to the classroom.

Structure and formal instruction are necessary for effective learning at scale.

It's sadly time to leave the beach for good. You learned a lot about the world that you'll now take with you, though. Like the fact that sand clumps together when it's wet. Still, you have no idea where sand comes from or why it acts like that. Maybe you tell yourself a story – it was crafted by tiny gnomes, for instance.

Later, you're back in the classroom. It's a science lecture, and the topic is – you guessed it – sand. The teacher explains all about erosion, friction, and molecular structures. Suddenly, your experience on the beach starts to make sense. So it wasn't gnomes after all.

The point here, of course, is that while discovery and imagination are effective drives, sometimes you do need plain, old-fashioned instruction to tie your knowledge together. Done right, structured instruction can enhance your experience of the world, bringing inert knowledge to life rather than stifling you.

The key message here is: Structure and formal instruction are necessary for effective learning at scale.

As you've seen, many of our current education systems still fall sadly short on that front. Too many schools are biased toward what can be measured, quantified, and scaled. But there are signs that more flexible teaching styles can harness the insights of cognitive science while also retaining the power and scalability of structured learning.

One intriguing example is "42," a private, nonprofit coding school with branches in Paris and California. Instead of moving through classes and receiving grades, students can advance only after they complete projects of increasing complexity – a process known as *mastery learning*. In another twist, there are very few instructors at the school, meaning students often need to teach each other.

MIT has made similar strides with a system known as *technology-enabled active learning* or TEAL. Here lectures, simulations, experiments, and group work are merged into a cohesive experience. TEAL has been shown to improve academic performance and help students overcome damaging factors like the *stereotype threat*, where disadvantaged groups continue to underperform because they are distracted by discouraging thoughts about their own abilities.

It increasingly seems that the choice between traditional, structured learning and discovery learning is a false one. You can have it both ways. How? By unlocking the motivational power of the inquiring mind. By opening up curiosity gaps. By deploying technology to shape raw knowledge. And by scaling that methodology up to larger educational systems through more traditional techniques.

The moment is ripe for a new approach to education – but there are no quick fixes.

The beach is now a happy childhood memory, as is the classroom. Now it's time to get serious. Now you're in college – in fact, you're at MIT.

It's the end of the semester in Course 2.007, and the quality of the robots on display is stunning. As you watch them topple barriers, leap over obstacles, and soar through the air, you can hardly believe a few lowly first-year students have summoned them into life.

The course has succeeded in that most thorny of challenges – getting students not just to memorize the principles they've learned, but to use them. And it did so by both delivering hard information through instruction and giving students space to experiment and put that new knowledge into action.

The key message here is: The moment is ripe for a new approach to education – but there are no quick fixes.

Effective education like this must combine both elements of the Latin expression "*mens et manus*" – which means "mind and hand." It's a tricky balance, but Course 2.007 shows that it's possible.

Of course, it would be great if we could just export MIT classes around the world. That's sadly still not possible, even if advancing technology has vastly expanded the potential to put the school's best practices into action.

That doesn't mean we shouldn't try to do better, though. We live in a world rife with upheaval. Why not use this moment to reflect on the legacy of our educational structures and toss out old, unquestioned practices that aren't doing us any good and put newer, science-based methods in their place?

As we do that, it's worth remembering that technology is no panacea. No technology can be separated from its social and economic context. In some underfunded schools, for instance, e-learning has been used as a way to replace actual teachers lost due to budget cuts. That doesn't do anyone any good.

There are other pitfalls, too. Technology offers the chance to reach more students, but it can also allow schools to record and monitor them, categorize them based on facial expressions and register their every pen stroke on a permanent record. Is this what we want?

Still, there's no question that change needs to come. We all need to challenge the parts of our education structure that have held us back. It's time to improve access, drop the emphasis on innate differences, and develop methods that give students both facts and the skills to use them.

There's a long way to go, but we have the technology and the moment is ripe. Taking the chance is a lot better than losing another generation of Einsteins to the winnower.

Final summary

The key message in these blinks:

Our education systems are not always designed in ways best suited to our brains. By applying modern science, we can make major improvements – both by harnessing new technology and the innate powers of our own minds. For instance, spacing out studying can make huge improvements in retention – as can techniques like interleaving. Experimental schools are also finding new ways to harness the power of curiosity and our natural love of learning.

Actionable Advice

Next time you're trying to remember something, try forgetting it first

The next time you want to remember something important, repeat it to yourself first and then allow yourself to move on to other things. A while later, come back to it. By recalling the information after letting some time pass, you will be encoding that piece of information much more strongly in your memory.

Got feedback?

We'd love to hear what you think about our content! Just drop an email to remember@blinkist.com with Grasp as the subject line and share your thoughts!

What to read next: *How We Learn*, by Benedict Carey

If you're interested in going deeper into the science of learning and developing more techniques to improve your own learning, the blinks to Benedict Carey's *How We Learn* are a great chance to continue the journey. Based on the author's decades of research, they explore what our common perceptions about education get right and wrong – and how we can use insights to learn better.