Ultralearning: Master Hard Skills, Outsmart the Competition, and Accelerate Your Career
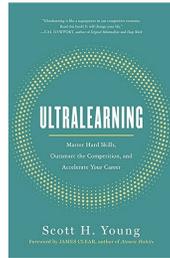
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86 Highlight(s) | 0 Note(s)

Location: 62

Passive learning creates knowledge. Active practice creates skill.

Page: 5

Technology has made learning easier than ever, yet tuition costs are exploding.

Page: 7

Use visual mnemonics to memorize vocabulary.

Page: 27

Your deepest moments of happiness don't come from doing easy things; they come from realizing your potential and overcoming your own limiting beliefs about yourself. Ultralearning offers a path to master those things that will bring you deep satisfaction and self-confidence.

Page: 30

Technology exaggerates both the vices and the virtues of humanity.

Page: 33

The ability to learn hard things quickly is going to become increasingly valuable, and thus it is worth developing to whatever extent you can, even if it requires some investment first.

Page: 34

The best ultralearners are those who blend the practical reasons for learning a skill with an inspiration that comes from something that excites them.

Page: 34

Doing hard things, particularly things that involve learning something new, stretches your self-conception. It gives you confidence that you might be able to do things that you couldn't do before.

Page: 44

Gendler told him after listening to one of de Montebello's speeches. "I understand why this is important to you, but the audience doesn't care about you. You have to make me care."

Page: 48

There are nine universal principles that underlie the ultralearning projects described so far. Each embodies a particular aspect of successful learning, and I describe how ultralearners maximize the effectiveness of the principle through the choices they make in their projects.

Page: 54

Being able to see how a subject works, what kinds of skills and information must be mastered, and what methods are available to do so more effectively is at the heart of success of all ultralearning projects.

Page: 57

As you learn more things, you'll acquire more and more confidence, which will allow you to enjoy the process of learning more with less frustration.

Page: 57

Ultralearning is a skill, just like riding a bicycle. The more practice you get with it, the more skills and knowledge you'll pick up for how to do it well.

Page: 58

Practically speaking, the projects you take on are going to have one of two broad motivations: instrumental and intrinsic.

Page: 58

Instrumental learning projects are those you're learning with the purpose of achieving a different, nonlearning result.

Page: 59

The main way you can do research of this kind is to talk to people who have already achieved what you want to achieve. Let's say you want to become a successful architect and think that

mastering design skills might be the best step to take. Before you get started, it would be a good idea to talk to some successful architects to get a sense of whether they think your project will actually help with your intended goal.

Page: 61

A good way to do this is to write down on a sheet of paper three columns with the headings "Concepts," "Facts," and "Procedures." Then brainstorm all the things you'll need to learn.

Page: 62

Concepts are ideas that you need to understand in flexible ways in order for them to be useful.

Page: 62

Facts are anything that suffices if you can remember them at all. You don't need to understand them too deeply, so long as you can recall them in the right situations.

Page: 62

In the third column, write down anything that needs to be practiced. Procedures are actions that need to be performed and may not involve much conscious thinking at all.

Page: 64

I suggest following two methods to answer how you'll learn something: Benchmarking and the Emphasize/Exclude Method.

Page: 66

good rule of thumb is that you should invest approximately 10 percent of your total expected learning time into research prior to starting. If you expect to spend six months learning, roughly four hours per week, that would be equal to roughly one hundred hours, which suggests that you should spend about ten hours, or two weeks, doing your research.

Page: 72

In the realm of great intellectual accomplishments an ability to focus quickly and deeply is nearly ubiquitous. Albert Einstein focused so intensely during his formulation of the general theory of relativity that he developed stomach problems.

Page: 73

The struggles with focus that people have generally come in three broad varieties: starting, sustaining, and optimizing the quality of one's focus. Ultralearners are relentless in coming up with solutions to handle these three problems, which form the basis of an ability to focus well and learn deeply.

Page: 75

This awareness is necessary for progress to be made, so if you feel as though procrastination is a weakness of yours, make building this awareness your first priority before you try to fix the problem.

Page: 75

Therefore, a good first crutch is to convince yourself to get over just the few minutes of maximal unpleasantness before you take a break. Telling yourself that you need to spend only five minutes on the task before you can stop and do something else is often enough to get you started.

Page: 81

Multitasking may feel like fun, but it's unsuitable for ultralearning, which requires concentrating your full mind on the task at hand. It's better to rid yourself of this vice than to strengthen bad habits of ineffective learning.

Page: 90

Just as Jaiswal struggled to get work with his university portfolio, many of us are building the wrong portfolio of skills for the kinds of career and personal achievements we want to create. We want to speak a language but try to learn mostly by playing on fun apps, rather than conversing with actual people. We want to work on collaborative, professional programs but mostly code scripts in isolation. We want to become great speakers, so we buy a book on communication, rather than practice presenting. In all these cases the problem is the same: directly learning the thing we want feels too uncomfortable, boring, or frustrating, so we settle for some book, lecture, or app, hoping it will eventually make us better at the real thing.

Page: 93

One of the big takeaways of Jaiswal's story might not be the triumph of his self-directed learning project but the failure of his formal education.

Page: 94

Although this may sound technical, transfer really embodies something we expect of almost all learning efforts—that we'll be able to use something we study in one situation and apply it to a new situation.

Page: 94

Unfortunately, transfer is also something that, despite more than a century of intense work and research, has largely failed to occur in formal education.

Page: 95

In his book The Unschooled Mind: How Children Think and How Schools Should Teach, the developmental psychologist Howard Gardner pointed to the body of evidence showing that even "students who receive honors grades in college-level physics courses are frequently unable to solve basic problems and questions encountered in a form slightly different from that on which they have been formally instructed and tested."5

Page: 104

The overkill approach is to put yourself into an environment where the demands are going to be extremely high, so you're unlikely to miss any important lessons or feedback.

Page: 104

But these fears are often only temporary.

Page: 104

One way you can overkill a project is to aim for a particular test, performance, or challenge that will be above the skill level you strictly require.

Page: 105

Doing a lot of direct practice in the environment where you want to eventually use your skills is an important start. However, in order to master skills quickly, bulk practice isn't enough. This brings us to our next principle of ultralearning: drill.

Page: 109

Learning, I'd like to argue, often works similarly, with certain aspects of the learning problem forming a bottleneck that controls the speed at which you can become more proficient overall.

Page: 117

This practice of starting too hard and learning prerequisites as they are needed can be frustrating, but it saves a lot of time learning subskills that don't actually drive performance much.

Page: 117

Drilling problems without context is mind-numbing. However, once you've identified that it's the bottleneck preventing you from going further, they become instilled with new purpose. In ultralearning, which is directed by the student, not an external source, drills take on a new light.

Page: 122

The actual results, however, weren't even close. Testing yourself—trying to retrieve information without looking at the text—clearly outperformed all other conditions.

Page: 122

On questions based directly on the content of the text, those who practiced free recall remembered almost 50 percent more than the other groups.

Page: 124

Karpicke's research points to a possible explanation: Human beings don't have the ability to know with certainty how well they've learned something. Instead, we need to rely on clues from our experience of studying to give us a feeling about how well we're doing. These so-called judgments of learning (JOLs) are based, in part, on how fluently we can process something. If the learning task feels easy and smooth, we are more likely to believe we've learned it. If the task feels like a struggle, we'll feel we haven't learned it yet.

Page: 124

The feeling that you're learning more when you're reading rather than trying to recall with a closed book isn't inaccurate. The problem comes after. Test again days later, and retrieval practice beats passive review by a mile.

Page: 124

If through experimental intervention, however, they were forced to practice retrieval earlier, they learned more. Whether you are ready or not, retrieval practice works better. Especially if you combine retrieval with the ability to look up the answers, retrieval practice is a much better form of studying than the ones most students apply.

Page: 125

The idea of desirable difficulties in retrieval makes a potent case for the ultralearning strategy.

Page: 126

Delaying the first test of a newly learned fact has some benefits over testing immediately.6

Page: 128

There will always be some things you choose to master and others you satisfy yourself with knowing you can look up if you need to.

Page: 129

Being able to look things up is certainly an advantage, but without a certain amount of knowledge inside your head, it doesn't help you solve hard problems.

Page: 131

Tactic 2: Free Recall

Page: 138

More interestingly, the research on feedback shows that more isn't always better. Crucially, what matters is the type of feedback being given.

Page: 140

Fear of feedback often feels more uncomfortable than experiencing the feedback itself. As a result, it is not so much negative feedback on its own that can impede progress but the fear of hearing criticism that causes us to shut down.

Page: 146

This illustrates that ultralearning isn't simply about maximizing feedback but also knowing when to selectively ignore elements of it to extract the useful information.

Page: 148

A noise-cancelling technique used in audio processing is filtering.

Page: 150

One important type of metafeedback is your learning rate. This gives you information about how fast you're learning, or at least how fast you're improving in one aspect of your skill.

Page: 159

Losing access to previously learned knowledge has been a perennial problem for educators, students, and psychologists. Fading knowledge impacts the work you do as well.

Page: 160

Over the intervening years, psychologists have identified at least three dominant theories to help explain why our brains forget much of what we initially learn: decay, interference, and forgotten cues.

Page: 162

The idea here is that in order to say that one has remembered something, it needs to be retrieved from memory. Since we aren't constantly experiencing the entirety of our long-term memories simultaneously, this means there must be some process for dredging up the information, given an appropriate cue. What may happen in this case is that one of the links in the chain of retrieving the information has been severed (perhaps by decay or interference) and therefore the entire memory has become inaccessible. However, if that cue were restored, or if

an alternative path to the information could be found, we would remember much more than is currently accessible to us.

Page: 162

It might also suggest that relearning things is much faster than learning them initially, because relearning is closer to repair work, while original learning is a completely new construction. Forgetting cues seems highly likely as a partial, if not complete, explanation of forgetting many things.

Page: 165

Finding the exact trade-off point between too long and too short has been a minor obsession for some ultralearners. Space your study sessions too closely, and you lose efficiency; space them too far apart, and you forget what you've already learned. This has led many ultralearners to apply what are known as spaced-repetition systems (SRS) as a tool for trying to retain the most knowledge with the least effort.

Page: 167

Scheduling this kind of maintenance in advance can also be helpful, as it will remind you that learning isn't something done once and then ignored but a process that continues for your entire life.

Page: 167

There's evidence that procedural skills, such as riding a bicycle, are stored in a different way from declarative knowledge, such as knowing the Pythagorean Theorem or the Sine Rule for triangles. This difference between knowing how and knowing that may also have different implications for long-term memory. Procedural skills, such as the ever-remembered bicycling, are much less susceptible to being forgotten than knowledge that requires explicit recall to retrieve.[11]

Page: 169

Most skills we learn are incompletely proceduralized. We may be able to do some of them automatically, but other parts require us to actively search our minds.

Page: 171

However, those same people may trip over fairly basic phrases, because they learned every fact and skill evenly, rather than overlearning the smaller subset of very common patterns.

Page: 172

One group, however, did not show such a steep decline in forgetting: those who had taken calculus. This suggests that moving up a level to a more advanced skill enabled the earlier skill to be overlearned, thus preventing some forgetting.

Blue highlight | Page: 174

For a good introduction to this topic, I highly recommend Joshua Foer's book Moonwalking with Einstein: The Art and Science of Remembering Everything.

Page: 183

He, too, focused on principles first, building off examples that cut straight to the heart of what the problem represented rather than focusing on superficial features.

Page: 185

One way you can introduce this into your own efforts is to give yourself a "struggle timer" as you work on problems. When you feel like giving up and that you can't possibly figure out the solution to a difficult problem, try setting a timer for another ten minutes to push yourself a bit further. The first advantage of this struggle period is that very often you can solve the problem you are faced with if you simply apply enough thinking to it. The second advantage is that even if you fail, you'll be much more likely to remember the way to arrive at the solution when you encounter it. As mentioned on the chapter on retrieval, difficulty in retrieving the correct information—even when the difficulty is caused by the information not being there—can prime you to remember information better later.

Orange highlight | Page: 187

Interestingly, Rebecca Lawson's study asked participants to do exactly this. As

Page: 189

Human beings don't learn things very well in the abstract. As the research on transfer demonstrates, most people learn abstract, general rules only after being exposed to many concrete examples. It's not possible to simply present a general principle and expect that you can apply it to concrete situations. As if presaging this observation, Feynman himself would supply concrete examples even when they were not given. Working through an explicit example in his mind's eye, he could follow along and see what the math was trying to demonstrate.

Page: 194

In this application of the method, instead of focusing on explaining every detail or going along with the source material, you should try to focus on generating illustrative examples, analogies, or visualizations that would make the idea comprehensible to someone who has learned far less than you have.

Page: 195

How could you make something confusing feel obvious?

Page: 196

When people hear about geniuses, especially the iconoclastic ones such as Feynman, there's a tendency to focus on their gifts and not their efforts.

Page: 196

But perhaps his greatest one was his ability to merge tenacious practice and play. He approached picking locks with the same enthusiasm for solving puzzles that he did for unraveling the secrets of quantum electrodynamics.

Page: 202

These two factors, variation and aggressive exploration, enabled him to push through his early obstacles and produce some of the most iconic and brilliant works ever painted.

Page: 203

In discussing the principles of ultralearning, metalearning comes first. Understanding how a subject breaks down into different elements and seeing how others have learned it previously, thus providing an advantageous starting point.

Page: 205

This kind of experimentation is useful in helping you discover the guides and resources that work best for you. It's important, however, that your impulse to experiment be matched with a drive to do the necessary work. Although van Gogh tried many different approaches when he first started teaching himself to draw and paint, he also produced an enormous quantity of work based on each of those methods.

Page: 206

After you've matured in your learning a bit, the difficulty often switches from which resources to learn from or which techniques you'd like to master to the style you'd like to cultivate.

Page: 211

For instance, you might be an engineer who becomes really good at public speaking. You may not be the best possible engineer or the best possible presenter, but combining those two skills could make you the best person to present on engineering topics for your company at conferences, thus giving you access to new professional opportunities. Scott Adams, the creator of Dilbert, likened his own success to following this strategy by combining his background as an engineer with an MBA and a cartoonist.8

Page: 224

Not all of your projects will be successful. I've had ultralearning projects that I felt good about. I've had others that didn't work out as well as I had hoped. Although the tendency is to blame willpower and motivation, very often the problems with projects can be traced back to their conception.

Page: 224

This struggle illustrates that mastering the principles is a lifelong process.

Page: 225

With ultralearning, as with all self-education, the goal isn't merely to learn one skill or subject but to hone and enhance your overall learning process. Each successful project can be refined and improved for the next one.

Page: 230

The decision of whether the right step forward is to set up long-term habits or to create a concentrated ultralearning project is often not crystal clear and may depend more on your personality and life constraints than a hard-and-fast rule.

Page: 249

The success of the Polgárs follows the same pattern as that of most of the ultralearners I have met: aggressive, enthusiastic self-education following the key principles of learning.

Page: 250

Inspiration is an essential starting point in the process of ultralearning.

Page: 254

Although this is purely hypothetical, I imagine two benefits of this approach. First, it will create a culture of learning within an organization where people are always willing to try to solve problems they don't yet know how to solve, instead of expecting someone else to know the answer already. Second, it will help reveal talent by giving people challenges they can rise to.

Page: 258

It's this aspect of learning that I find most interesting. Many pursuits in life have a kind of saturation point, after which the longing for more of a thing eventually diminishes as you get more of it. A hungry person can eat only so much food. A lonely person can have only so much companionship. Curiosity doesn't work this way. The more one learns, the greater the craving to learn more. The better one gets, the more one recognizes how much better one could become. If you finish reading this book and have been encouraged to try your own project, this would be

my greatest hope—not that you'd be successful at your project but that your ending would be a beginning.