

# ULTRALEARNING

## Master Hard Skills, Outsmart the Competition, and Accelerate Your Career

**SCOTT H. YOUNG**

**SCOTT YOUNG** is a writer and business owner. In 2012, he ran his own self-directed education project where in twelve months and for less than \$2,000, he was able to learn how to code sufficiently well that he could pass the same final exams that MIT computer science graduates are required to pass at the end of their four-year degree programs. To achieve this, Scott Young used open-source computer science lectures available online along with his own self-organized learning activities and exercises. His TEDx talk about his learning approach has been viewed more than half a million times. To further refine his learning methodology, Scott Young then went on to learn four languages in twelve months. Scott Young is a graduate of the University of Manitoba and Montpellier Business School.

The website for this book is at: [www.scotthyoung.com](http://www.scotthyoung.com).

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**MAIN IDEA**

Is it really possible to get an MIT-level education without attending MIT? Or to learn a new language to the point of becoming fluent and conversant in just three months? Or to develop your own video game from scratch and make it a commercial success without being a professional game developer working for a big studio?

The answer to these and similar questions is an unqualified "Yes". In fact, there is an entire culture of people who have achieved these and other compelling goals on the basis of their self-education projects. These are the ultralearners.

"Ultralearning" is a strategy for acquiring skills and knowledge in a self-directed and intense manner. You make a decision about what you want to learn and then undertake concentrated learning activities which push you to your limits and compress your learning into the shortest feasible time.



Ultralearning can be used to accelerate the career you already have, to transition to the career you always wanted to have, or to rescue your career by adding new hard skills that are more valuable. Ultralearning is the very best way to deal with a changing world.

There are nine principles that are involved in running successful ultralearning projects. Master them and you can learn anything you set your mind to. This is the ultimate competitive advantage of the future, because no matter what happens, you'll be able to learn and adapt.

The world belongs to the ultralearners. Join their ranks by mastering the art of learning hard things quickly. It will serve you well.

**NINE PRINCIPLES OF  
 ULTRA  
 LEARNING**

1	<b>METALEARNING</b>	<b>DRAW A MAP FIRST</b>
2	<b>FOCUS</b>	<b>SHARPEN YOUR KNIFE</b>
3	<b>DIRECTNESS</b>	<b>GO STRAIGHT AHEAD</b>
4	<b>DRILL</b>	<b>ATTACK YOUR WEAKEST POINT</b>
5	<b>RETRIEVAL</b>	<b>TEST TO LEARN</b>
6	<b>FEEDBACK</b>	<b>DON'T DODGE THE PUNCHES</b>
7	<b>RETENTION</b>	<b>DON'T FILL A LEAKY BUCKET</b>
8	<b>INTUITION</b>	<b>DIG DEEP FIRST, THEN BUILD UP</b>
9	<b>EXPERIMENT</b>	<b>EXPLORE OUTSIDE YOUR COMFORT ZONE</b>

**Principle #1 – Metalearning – Draw a map first . . . . . Page 2**

Start any ultralearning project by learning what is the most effective way to learn the subject or acquire the skill you're after. Figure out how to learn efficiently.

**Principle #2 – Focus – Sharpen your knife . . . . . Page 3**

Carve out chunks of time where you can concentrate and focus on what you're trying to learn consistently well.

**Principle #3 – Directness – Go straight ahead . . . . . Pages 3 - 4**

Learn by doing the things you're trying to become good at. Don't trade hands-on experience for other more convenient alternatives.

**Principle #4 – Drill – Attack your weakest point . . . . . Page 4**

Break complex skills into their component parts and then be ruthless about improving your weakest points. Master the component parts and then reassemble them.

**Principle #5 – Retrieval – Test to learn . . . . . Page 5**

Use the testing process to learn more as you go along. Always test yourself before you feel confident, and push yourself to recall information, not just review it.

**Principle #6 – Feedback – Don't dodge the punches . . . . . Pages 5 - 6**

Put aside your ego and look for the harshest feedback you can find. Extract the signal from the noise, and pay attention to what that feedback highlights you need to learn.

**Principle #7 – Retention – Don't fill a leaky bucket . . . . . Page 6**

Be aware and understand what you're consistently forgetting, and do something about it. Learn to remember things not just for now but forever.

**Principle #8 – Intuition – Dig deep first, then build up . . . . . Page 7**

Play and explore to develop your intuition, and work to understand what you learn. Don't resort to memorization tricks but get to know your subject deeply.

**Principle #9 – Experiment – Explore outside your comfort zone . . . . . Pages 7 - 8**

Don't lose sight of the fact you can't become a true master of your subject by following the paths trodden by others. Explore possibilities others have not imagined.



Start any ultralearning project by learning what is the most effective way to learn the subject or acquire the skill you're after. Figure out how to learn efficiently.

The term "metalearning" is of Greek origin and it refers to the idea of learning about learning. Before you launch into your ultralearning project, sit down and analyze what will be the most effective way to learn about the subject at hand.

*"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. Metalearning thus forms the map, showing you how to get to your destination without getting lost."*

– Scott Young

Taking the time to do some metalearning and planning out your best approach to your learning project will have both short-term and long-term benefits:

1. Short-term metalearning will stop you going off on tangents which are dead-ends. You make sure you choose topics for study wisely and look for other tweaks or add-ons which might give you an advantage over those who go through the conventional schooling path in that topic.
2. Over the long-term, the more ultralearning projects you do, the better you will get at them. You will develop learning skills and competencies which will be helpful no matter what you study. You'll also gain experience in how to schedule your time effectively, stay motivated, and deal with the normal problems which crop up. In short, you'll be more confident about your ability to learn.

The best way to draw up your metalearning map is usually to break your map down into answers to three specific questions:



1. **WHY?** – What is your personal motivation for wanting to learn this subject? You might have an external goal in mind (Get a job in that field) or you might be intrinsically motivated and learning about a subject because it appeals to you. Clarifying why you want to learn is extremely helpful. A good way to do your research on this is to talk to an expert in that field to get a sense of whether your proposed learning project will help achieve your intended goal. Get their advice and suggestions on how to make your learning plan robust and useful.
2. **WHAT?** – Once you clarify why you're learning, you next should identify how knowledge in that topic or field is structured. This can be simply done by taking a piece of paper and making three columns with the headings "Concepts", "Facts" and "Procedures". You then research what you will need to learn and write them in the appropriate column. You can add more detail as you go along so don't try and get this perfect immediately. Concepts are the ideas you'll need to understand. Facts will need to be memorized. Procedures will be actions which will need to be practiced.

Once you better understand the concepts, facts, and procedures involved in mastering your new subject, you can start drawing up a learning map. This will give you a sense of where your bottlenecks are likely to be. You can then start making preparations. For example, if you study medicine, it will soon become clear this will require lots of memorization of parts of the human anatomy. Therefore, you might decide to invest in software which will give you spaced-repetition exercises to assist in your memorization. By drawing a realistic learning map, you can then start making sound decisions about the tools you should use.

3. **HOW?** – Once you know the lay of the land a bit better, you can then start figuring out how you will learn what's required. The first approach here is usually to benchmark how schools or universities teach that topic. Look at the curriculum schools use. You can also get detail about the textbooks these courses use. That will signal where you can find state-of-the-art information and resources for learning.

Of course once you have a curriculum as your starting point, you can then modify it to personal preferences. You can decide which topics you want to emphasize and specialize in, and which topics you will put less emphasis on. If you don't know enough to make those judgement calls, you should stick to the established benchmark for now. For example, if you're learning French with the idea of going to Paris for two weeks, then you would focus more on pronunciation of everyday terms than on being able to spell correctly. That kind of thing.

It makes sense to plan on investing around 10 percent of your anticipated total learning time into this pre-start research into the why–what–how of what you're planning to do. You should also schedule regular periods where you evaluate how things are going as you move through your project. Doing that will help you identify when you're reaching a point where the Law of Diminishing Returns is coming into effect.

*"Each project you do will improve your general metalearning. Every project has the opportunity to teach you new learning methods, new ways to gather resources, better time management, and improved skills for managing your motivation. Success in one project will give you confidence to execute your next one with boldness and without self-doubt and procrastination. Ultimately, this effect far outweighs the effect of doing a specific project. Unfortunately, it's also something that can't be boiled down to a tactic or tool. Long-term metalearning is just something you acquire with experience. Each project you complete will give you new tools to tackle the next, starting a virtuous cycle. Many ultralearners told me a similar story: that they were proud of their accomplishments in individual projects but that the real benefit had been that they now understood the process of learning hard things."*

– Scott Young

ULTRA LEARNING 2 FOCUS

SHARPEN YOUR KNIFE

Carve out chunks of time where you can concentrate and focus on what you're trying to learn consistently well.

In practice, there are generally only three reasons why people have trouble focusing on their ultralearning projects:



1. *Procrastination* – you struggle to start focusing at the time you have scheduled this for. You know you should be spending time on your ultralearning project but other tasks keep cropping up which soak up your time and attention. Fortunately, recognizing when you're doing this is the first step to avoiding it. Whenever you recognize that you are avoiding what you should be doing, you can and should:
  - Make a promise that you'll work for 5-10 minutes on your project and then if you still feel the same way, you can do something else. You'll often find you end up doing much more.
  - Promise yourself that you can take a five-minute break once you've gone twenty-five minutes on your project.
  - Make it a rule that you can only quit once you achieve some milestone – like memorizing something important.
2. *Distractions* – where your phone rings or someone comes to the door just when you're settling in to work on your learning project. To address distractions, plan ahead. Some ideas:

- Look at your personal environment in advance and get rid of the most obvious distractions like music, TV going in the background, etc. Get serious about learning.
  - Choose a learning tool which always sparks your focus, and put that first on your list of tasks to do today. Be smart about sequencing. Start with an attention grabber.
  - Acknowledge when you have negative emotions bubbling away in your life, and make a conscious decision to put that to one side for now and start learning. Bring your focus back to your learning project and hopefully you'll find the negative feelings will evaporate.
3. *Variety* – you're failing to create the right kind of focus. Some learning tasks require intense focus – like an athlete who is trying to throw darts. More complex tasks (such as writing an essay or solving a tricky problem) require a more extended and relaxed type of focus. You should experiment and find out what preparation activities put you into the type of focus you need and then make that happen.

*"With practice you can improve your ability to focus. My advice is this: recognize where you are, and start small. If you're the kind of person who can't sit still for a minute, try sitting still for half a minute. Half a minute soon becomes one minute, then two. Over time, the frustrations you feel learning a particular subject may become transmuted into genuine interest. The impulse to engage in distractions will weaken each time you resist it. With patience and persistence, your few minutes may become large enough to accomplish great things."*

– Scott Young

*"Ultralearning isn't a cookie-cutter method. Every project is unique, and so are the methods needed to master it. The uniqueness of ultralearning projects is one of the elements that ties them all together. If ultralearning could be bottled or standardized, it would simply be an intense form of structured education. What makes ultralearning interesting is also what makes it hard to boil down into step-by-step formulas."*

– Scott Young

ULTRA LEARNING 3 DIRECTNESS

GO STRAIGHT AHEAD

Learn by doing the things you're trying to become good at. Don't trade hands-on experience for other more convenient alternatives.

The best way to learn pretty much anything is to plunge in and try doing it. Be direct. Learn in a situation which is closely tied to how you want to use what you learn in the future. Most schools don't do this but you can and should because it will enhance your learning.

*"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."*

– Scott Young

Schools typically use indirect learning. You study facts, and look at skills from a distance at school. A self-directed ultralearning project can be the opposite. Instead of learning things in the abstract, you make direct connections to the settings in which you eventually want to apply new skills and competencies. Admittedly this is hard, but the end result of doing this can be quite impressive.

So how do you do this? Some ideas:

- Organize your learning project around the goal of producing something. If you want to learn computer coding, for example, create your own computer game. That will be much more fun and will make your learning relevant.

- Look for immersive learning opportunities – along the lines of go live in the country where the language you want to learn is the native tongue. Immerse yourself in the environment in which your targeted skill is practiced.
- Join communities of people who are actively engaged in learning projects of their own. Borrow some of their drive and motivation.
- Look for simulators that you can use. Pilots and surgeons don't learn their craft by physically piloting planes or performing operations. They start with simulators first – and you can do the same. Take full advantage of any experience simulators you can access in your field.
- Look for overkill environments – where you will be critiqued bluntly and mercilessly. For example, if you want to learn public speaking, you can go to Toastmasters, where everyone is trying to overcome their fears. An overkill approach, by contrast, would be to go speak at high schools or middle schools where the feedback you will get will be much more brutal. Students will tell you if your jokes are funny or not in a very direct manner. Putting yourself into an overkill environment will accelerate your learning – if your ego survives.

Go straight to the source whenever and wherever you learn. Take the plunge and give it a go. That's always the best way to learn anything.

*"Learning directly is one of the hallmarks of many of the successful ultralearning projects I've encountered, particularly because of how different it can be from the style of education most of us are used to. Whenever you learn anything new, it's a good habit to ask yourself where and how the knowledge will manifest itself. If you can answer that, you can then ask whether you're doing anything to tie what you're learning to that context."*

– Scott Young

*"He who can go to the fountain does not go to the water jar."*

– Leonardo da Vinci

*"If I have seen further it is by standing on the shoulders of giants."*

– Isaac Newton

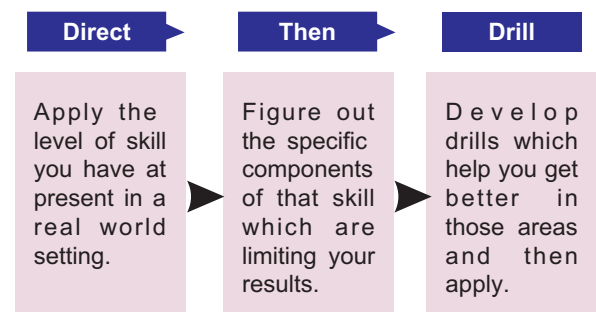
**ULTRA LEARNING 4 DRILL**  
**ATTACK YOUR WEAKEST POINT**

Break complex skills into their component parts and then be ruthless about improving your weakest points. Master the component parts and then reassemble them.

Ben Franklin was one of the writers of the Declaration of Independence. He edited Thomas Jefferson's words to become: "We hold these truths to be self-evident". It would be easy, therefore, to assume his skills for writing and persuasion were natural-born gifts but nothing could be further from the truth.

As a young man, Benjamin Franklin's father pointed out Ben's writing skills were below par. Franklin was alarmed by this and set out to practice to improve his writing skills. He would take a magazine and rewrite the arguments in various articles from memory. Franklin would then meticulously compare his version with the original, in order to discover his faults and address them. He did that for years until a few of his articles were published under a pseudonym.

That painstakingly careful analysis and deliberate practice Ben Franklin undertook is a great template for the fourth ultralearning principle: drill. To learn a new skill, you've got to do some drills that force you to use that skill and then get corrective feedback. Ultralearners commonly employ what can be termed the "Direct-Then-Drill" strategy:



Direct-Then-Drill works well but there are three major problems which tend to crop up when you do this:

1. It's not always easy to figure out when and what to drill. Identifying which aspect of the skill will generate the greatest improvements to your overall abilities for the least amount of effort is not always obvious. All you can do is experiment. Form a hypothesis about what's holding you back, attack it with some drills, and then get some quick feedback about whether you're right.
2. Designing a drill to improve what you're weak at can be hard. You don't know what you don't know. You may not be able to recognize your specific deficits, or see the drills which will address those weaknesses.
3. Doing drills is hard and uncomfortable at the best of times. Focusing on what you're obviously bad at takes guts and determination.

With these points in mind, some workable ideas for organizing and structuring these drills are:

- Do some time slicing where you isolate one action in a sequence and practice just that and get it perfect before integrating it back into context. You can do this with a specific skill or a cognitive component.
- Try and copy the parts of the skill you don't want to drill so you can focus. For example, if you're learning how to draw, start with a line drawing someone else has done rather than with a photo. That allows you to draw on their framing of the scene and decisions about what details to include and what to leave out. You can practice improving your rendering skills.
- Use a magnifying glass approach and deliberately spend more time on one component of the skill than you normally would. For example, to improve your writing, spend ten hours on the headline and first paragraph. Get really good at specific components one by one.
- Look at what the prerequisites are for the skill you want to learn, and invest the time to learn those foundational steps. Progressively go back and fill in the gaps in your skills.

Again, drills are hard to do, which is why they are easy to avoid. To be an ultralearner, you have to do drills. Attack your weakest point with those drills to make the most progress.

ULTRA LEARNING 5 RETRIEVAL

TEST TO LEARN

Use the testing process to learn more as you go along. Always test yourself before you feel confident and push yourself to recall information, not just review it.

Numerous studies have shown quite decisively the best study strategy is to regularly test yourself. Trying to retrieve information without looking at the text outperforms all other approaches.

Why is self-testing so good?

YOU GET SPECIFIC

YOU GET HONEST FEEDBACK

YOU MEASURE PROGRESS

- It forces you to get specific. There's no way to fudge your test scores.
- Self-testing gives you candid feedback. It highlights what you know and what you don't know.
- Self-testing is an artifact of the way success is measured. It's aligned with how actual testing gets carried out in lots and lots of disciplines.

The paradox is even though testing and recalling of facts and concepts from memory is so much better for learning, you will still probably prefer other alternatives like drawing concepts maps, or simply reviewing the material over and over until you're sure you can recall it.

Closing the books and testing what you can recall is an essential component in becoming an ultralearner. In fact, if you're really motivated, it makes sense to take the final exam before the class even begins. If you do this, you'll get a good perspective on what's important to know. Doing this kind of advance or forward-testing can also be highly motivational.

*"The research is clear: if you need to recall something later, you're best off practicing retrieving it. However, this neglects an important question: What kinds of things should you invest the time in to remember in the first place? Retrieval may take less time than review to get the same learning impact, but not learning something at all is faster still. This is an important practical question. Nobody has time to master everything. 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."*

– Scott Young

Retrieval works, but it isn't always easy to run. Some methods you can use to develop retrieval exercises for almost any subject would include:

- Flash cards** – either in paper format or electronic. Great for testing elements which must be memorized.
- Free recall** – take a piece of paper and write down everything you can remember after sitting through a lecture or reading a chapter in a book.
- Questions** – rephrase what you're studying as questions which must be answered later on.
- Create challenges** – that you have to solve later on by yourself. Great for practicing skills.
- Closed-book learning** – force yourself to draw a concept map of what you're learning without being able to access your text book.

Anytime you force yourself to recall information without consulting the source, you get a true measure of what you've learned. Retrieval practice – whatever form it takes – is an essential part of every ultralearning project. It also helps if you have obsessive intensity about learning as well.

*"In nearly every biography of great geniuses and contemporary ultralearners I have encountered, some form of retrieval practice is mentioned. Benjamin Franklin practiced his writing by reconstructing essays from memory. Retrieval is not a sufficient tool to create genius, but it may be a necessary one."*

– Scott Young

ULTRA LEARNING 6 FEEDBACK

DON'T DODGE THE PUNCHES

Put aside your ego and look for the harshest feedback you can find. Extract the signal from the noise and pay attention to what that feedback highlights you need to learn.

Nothing beats immediate feedback for fine-tuning and improving your ultralearning project. Feedback on your performance is an essential component to reaching expert levels of performance. You have to know how you're doing at present if you aspire to improve in the future.

Feedback comes in three varieties:

OUTCOME FEEDBACK

INFO FEEDBACK

CORRECTIVE FEEDBACK

- Outcome feedback is where you're told how well you're doing (pass/fail, A, B or C) but there is no detail about what you're doing better or worse. This feedback is easy to get but offers no clues on how and where to improve.
- Informational feedback tells you what you're doing wrong but doesn't really tell you how to fix it. The reaction of an audience to a joke is informational feedback.
- Corrective feedback is the best kind of feedback to get. Here you're told not only what you're doing wrong but also how to fix it. This is the type of feedback a good coach, a trusted mentor, or an effective teacher will give.

Corrective feedback is great because it is both informative and usable. The only problem is corrective feedback is directly correlated to the expertise of the person giving it. If you get corrective feedback from

someone who doesn't know what they're doing, it can send you off on tangents.

To get better feedback for your ultralearning project, there are several tactics worth trying:

- *Always look for ways to filter out the background noise* – by being selective about the feedback you pay attention to, and discount random events. Look for feedback which is detailed enough that you can draw good, systematic conclusions.
- *Try and hit the sweet spot in terms of difficulty* – because good feedback needs to be unpredictable. Don't get feedback on tasks which you're always going to succeed at because that won't help. Similarly, feedback on long shots you were never going to win will be too random to be useful. Avoid situations where you always feel great or feel bad about your performance.
- *Look for metafeedback* – which is feedback about the viability of the learning strategy you are applying. Analyze your learning rate and run some experiments to see if you're missing out on the benefits another approach might provide.
- *Seek out high-intensity, rapid feedback* – even if this makes you nervous. Immediate feedback situations like getting on stage can supercharge your learning and motivate you.

*"Receiving feedback isn't always easy. If you process it as a message about your ego rather than your skills, it's easy to let a punch become a knockout. Though carefully controlling the feedback environment so it is maximally encouraging may be a tantalizing option, real life rarely affords such an opportunity. Instead, it's better to get in and take the punches early so that they don't put you down for the count. Though short-term feedback can be stressful, once you get into the habit of receiving it, it becomes easier to process without overreacting emotionally. Ultralearners use this to their advantage, exposing themselves to massive amounts of feedback so that the noise can be stripped away from the signal."*

– Scott Young



Be aware and understand what you're consistently forgetting and do something about it. Learn to remember things not just for now but forever.

Feedback about your learning is great, but it's only useful if you apply the lessons it is teaching you. You have to keep working at retaining what you're learning as you go along.

Remembering facts is hard mental work. It's generally hard to remember things for three reasons:



- Facts and details decay relatively quickly. Over time, we can quickly forget the finer details.
- In the human mind, many memories overlap. Therefore, it's easy for facts to become jumbled. You'll also find that having previously acquired information can make acquiring new knowledge harder at times.
- We can lose the cues to our memories relatively quickly as well. If we forget the cues, their linked memories can be lost as well.

Overall, forgetting things is the default setting for our minds. Ultralearners understand this so they devise tactics for coping with this. There are at least four mechanisms which ultralearners use to stop forgetting what they learn as they go along:

1. *Space your learning rather than trying to cram* – and have a system where you methodically revisit what you have learned and refresh it in your mind. Allow enough time to absorb what you're learning.

2. *Embed what you learn into procedures* – so as you follow your regular routines you're refreshing what you've learned. Touch typists start out memorizing the positions of keys on a keyboard but then get to the stage where they can type without looking down. Eventually they start thinking in words rather than individual letters. If you can proceduralize core skills, then you can pay more attention to what you want to learn rather than obsessing over the mechanics.
3. *Do some overlearning* – where you do additional practice even when you can do something perfectly. Overlearning key facts will enhance your ability to recall them in the future. Repeat what you want to learn and retain again and again. Try immersion in some micro-project that will use the core knowledge and skills you want to remember. Go one level higher on the skills ladder.
4. *Try using mnemonics* – translate what you want to remember into vivid images or maps. Many memory experts use this method to produce prodigious displays of remembering long sequences. This can, however, be a brittle memory tool because there is a lot of time invested up-front to develop detailed mental images. It can also take some time for ideas to be recalled this way.

The key point is to acquire and then retain knowledge, you have to combat the somewhat inevitable human tendency to forget things. Figure out what specific blend of spaced learning, procedurization, overlearning, and mnemonics will counteract your long- and short-term rates of forgetting, and this can make a huge difference.

*"Ultralearners, with their ruthless focus on efficiency and effectiveness, may have landed on some universal principles in the art of learning. Beyond principles and tactics is a broader ultralearning ethos. It's one of taking responsibility for your own learning: deciding what you want to learn, how you want to learn it, and crafting your own plan to learn what you need to. You're the one in charge, and you're the one who's ultimately responsible for the results you generate. Learning well isn't just about following a set of prescriptions. You need to try things out for yourself, think hard about the nature of the learning challenges you face, and test solutions to overcome them."*

– Scott Young

ULTRA LEARNING 8 INTUITION

DIG DEEP FIRST, THEN BUILD UP

Play and explore to develop your intuition and work to understand what you learn. Don't resort to memorization tricks but get to know your subject deeply.

Intuition arises when you understand how things work. You go from memorizing various components to being able to see the big picture connections. Simply spending a lot of time studying a subject isn't going to help you develop intuition. To achieve that, there are four rules you need to apply:

1. *Don't give up on hard problems too easily.*  
 When you feel like you've struggled with a problem for too long, force yourself to spend another ten minutes trying to come up with a solution. As you push further than others, you may find some creative ideas come to you. This is how intuition grows and can be sharpened.
2. *Prove things to understand them.*  
 Don't just settle for reading someone else's results. When you see something, review in your mind how you would prove that. Doing this will help you understand systems much better.
3. *Always start with a concrete example.*  
 Visualize principles or problems as a working example. Then you can visualize how ideas being proposed will impact on your mental model. Doing this forces you to pay attention.
4. *Don't fool yourself.*  
 Never fall into the trap of assuming you know more about a subject than the specialists in that field. You don't. You have not uncovered something new and novel. Be prepared to ask the "dumb" questions everyone else is afraid to ask.

*"Do not ask whether a statement is true until you know what it means."*

– Errett Bishop, mathematician

One way to try and develop some intuition about what you're studying rather than merely memorizing facts is to do this:

1. Take a blank piece of paper. At the top of it, write down the concept or the problem you're trying to understand.
2. Next write down how you would explain or convey that idea to someone who has never heard of it before.
3. If you're solving a problem, write down your solution and detail why that solution makes sense to you.
4. If you look at your solution and realize it does not provide a clear answer, go back to your text book and study some more until you have this.

The whole learning benefit here is this forces you to articulate your thinking. It forces you to be clear and specific about the idea you want to understand. This exercise will also highlight where you have gaps in your knowledge or understanding so you can circle back and address those gaps.

Over a period of time, this kind of exercise will help you develop more intuition about your subject. As you write out your ideas, your knowledge gaps will be glaringly obvious. You can then go back and hit the books to add more detail in the future.

This general approach also works well for problems you can't seem to solve at first. Going through something step-by-step forces you to go deep. You create a framework for your thinking which can then be enhanced and layered as you get more knowledge.

To expand the effectiveness of these kinds of exercises, you can also imagine you've been commissioned to write an article for a magazine on that topic. Plan out what illustrative examples you would use and how you would go about explaining this idea to someone who does not have your background.

*"Everybody has a plan until they get punched in the mouth."*

– Mike Tyson

*"In many fields a year of focused work plus caring a lot would be enough."*

– Paul Graham, entrepreneur

ULTRA LEARNING 9 EXPERIMENT

EXPLORE OUTSIDE YOUR COMFORT ZONE

Don't lose sight of the fact you can't become a true master of your subject by following the paths trodden by others. Explore possibilities others have not imagined.

Vincent van Gough didn't start painting until he was twenty-six years old. The usual route to becoming a painter was to attend art school, or to apprentice in a studio to an established painter, but van Gough had a prickly personality so those options were off the table. Therefore, he became a self-educated ultralearner.

He bought three big books which described how to paint and devoured them. He then studied other artists, friends, and mentors with intensity. Van Gough experimented with materials, methods, philosophies, and more. As he was not naturally talented, van Gough eventually developed his own signature style which combined bold forms and bright colors. He also sought out feedback which was uniformly negative about his art. Van Gough was known to produce a new painting every day as he experimented with different elements.

Even though he died at age thirty-seven, van Gough's 11-year art career is now considered to be extraordinary. He has become one of the most famous painters of all time. On four separate occasions, van Gough's paintings have broken records for the most expensive paintings ever sold. His *Portrait of Dr. Gachet* was sold for more than \$82 million. Pretty impressive for a self-educated painter.

The big lesson to take from van Gough for ultralearners is that ultimately, you have to take what you learn and start experimenting to keep learning. You have to experiment to keep moving forward. Specifically:

- You've got to experiment with new learning methods, materials, and resources. Find new ways to expand your skills and competencies in your field.
- You've got to experiment with different techniques in your field. Find your strengths.

- You've got to experiment with different styles, and eventually come up with your own signature style.

To run some worthwhile experiments around learning styles, some ideas are:

1. *Copy what others are doing* – and then go in your preferred direction. Find your voice. Copy first, then start creating your own stuff.
2. *Compare other methods side-by-side* – to give you information quickly about what works best for your personal style. You might then come up with a hybrid style which combines and integrates the best features of many different styles.
3. *Introduce some new constraints* – ideally which make doing things the traditional way impossible. Force yourself to develop new capabilities by adding some constraints.
4. *Come up with a new superpower* – by making a hybrid combination of two skills which ordinarily would not overlap. A great example of this was Scott Adams who combined his background as an engineer with skills as a cartoonist to come up with the highly acclaimed *Dilbert* series.
5. *Explore the extremes* – and see if that throws up some interesting possibilities. There's no magic in sticking to the middle and being average. Most painters worked in thin layers of glaze but Van Gough used thick applications of bold colors. Pick some aspect of the skill you're trying to cultivate and push it out to an extreme. You can always pull back to something more moderate later on.

Great learning is an ongoing act of constant experimentation. You have to keep trying new things, get feedback, and adjust your course forwards all the time. You'll never really know which approach to learning works best for you until you try out a number of alternatives. Be prepared to adjust your learning program frequently, and never forget this is an individual experience.

*"Experimentation is the principle that ties all the others together. Not only does it make you try new things and think hard about how to solve specific learning challenges, it also encourages you to be ruthless in discarding methods that don't work. Careful experimentation not only brings out your best potential, it also eliminates bad habits and superstitions by putting them to the test of real-world results."*

– Scott Young

Ultralearning projects are never easy but they can be incredibly good fun if you're learning about something you're passionate about. To choose and execute your first ultralearning project:

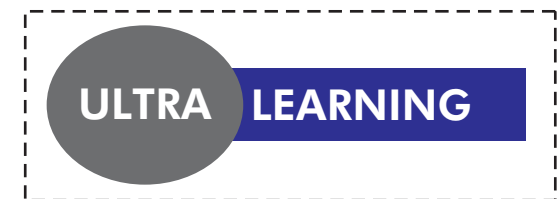
1. *Do your research* – identify the topic you want to learn about, the scope and aim of your ultralearning project, and the primary resources you will access. Benchmark how others have done before you, and look at the drills and backup materials you might use.
2. *Schedule your time* – figure out how much time you're going to commit. It's usually best to have a set time each week you allocate and reserve for your project. Try doing a pilot week to make sure your estimates are correct and then calendar your entire ultralearning project.
3. *Execute your plan* – taking care to ask yourself questions periodically to stay on track. Some good questions to ask:
  - Metalearning - Have I prepared properly?
  - Focus – What is my dedicated focus time?
  - Directness – Am I learning the way I will use it?
  - Drill – Am I working on my weak points?
  - Retrieval – How am I testing what I learn?
  - Feedback – Am I gathering robust feedback?
  - Retention – How will I keep what I'm learning?
  - Intuition – Do I deeply understand the topics?
  - Experimentation – How will I try new things?

4. *Review your results* – analyze your results once you finish. Identify what went well and where you struggled so you can do better on your next ultralearning project.
5. *Choose how you will maintain or go on to master what you've learned* – have a plan for what you will do with the new skills you have gained. Specifically:
  - Schedule how often and when you will practice in order to sustain your new skills and get better.
  - Clarify how you will integrate your new skill into your personal or business life.
  - Analyze what would be involved in diving deeper into the skill you have learned and consider that. Think about what it would take to master that skill and whether you want to go down that route.
  - Look for opportunities to transfer a skill learned in your ultralearning project into a new domain. See if that opens up some interesting opportunities.

By the end of any ultralearning project, you've come a long way. You then want to kick on and make the most of all the effort you've invested.

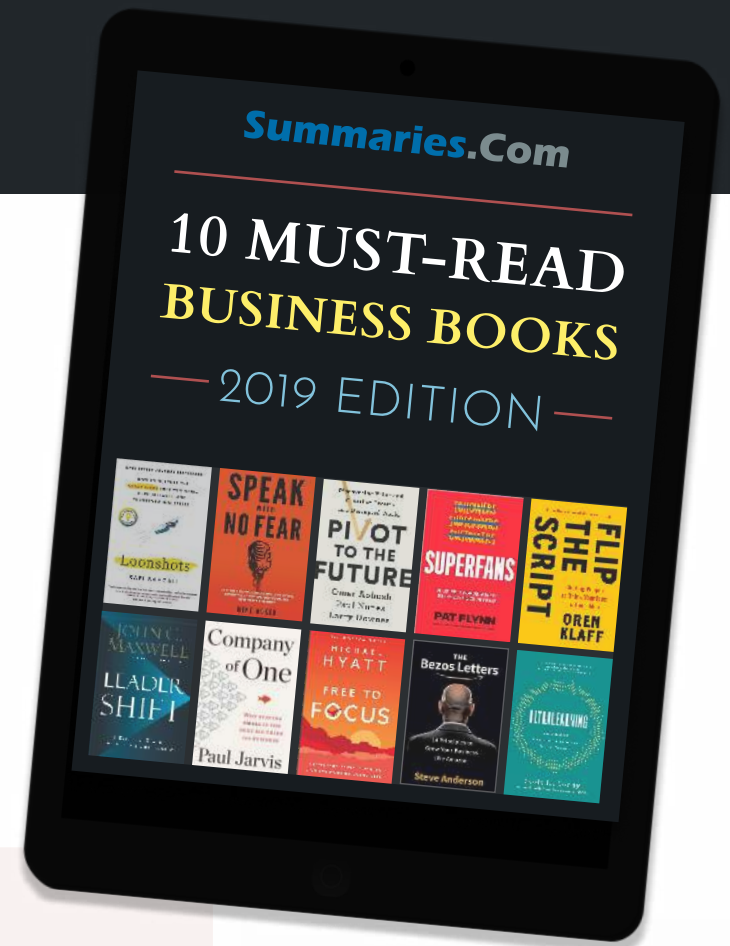
*"The goal of ultralearning is to expand the opportunities available to you, not narrow them. It is to create new avenues for learning and to push yourself to pursue them aggressively rather than timidly waiting by the sidelines. This is not going to be a method suitable for everyone, but for those who feel inspired to use it, I hope it provides a start."*

– Scott Young



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