

00:05

So, I'd like to talk about the development of human potential, and I'd like to start with maybe the most impactful modern story of development. Many of you here have probably heard of the 10,000 hours rule. Maybe you even model your own life after it. Basically, it's the idea that to become great in anything, it takes 10,000 hours of focused practice, so you'd better get started as early as possible.

00:27

The poster child for this story is Tiger Woods. His father famously gave him a putter when he was seven months old. At 10 months, he started imitating his father's swing. At two, you can go on YouTube and see him on national television. Fast-forward to the age of 21, he's the greatest golfer in the world. Quintessential 10,000 hours story.

00:47

Another that features in a number of bestselling books is that of the three Polgar sisters, whose father decided to teach them chess in a very technical manner from a very early age. And, really, he wanted to show that with a head start in focused practice, any child could become a genius in anything. And in fact, two of his daughters went on to become Grandmaster chess players.

01:06

So when I became the science writer at "Sports Illustrated" magazine, I got curious. If this 10,000 hours rule is correct, then we should see that elite athletes get a head start in so-called "deliberate practice." This is coached, error-correction-focused practice, not just playing around. And in fact, when scientists study elite athletes, they see that they spend more time in deliberate practice -- not a big surprise. When they actually track athletes over the course of their development, the pattern looks like this: the future elites actually spend less time early on in deliberate practice in their eventual sport. They tend to have what scientists call a "sampling period," where they try a variety of physical activities, they gain broad, general skills, they learn about their interests and abilities and delay specializing until later than peers who plateau at lower levels.

01:52

And so when I saw that, I said, "Gosh, that doesn't really comport with the 10,000 hours rule, does it?" So I started to wonder about other domains that we associate with obligatory, early specialization, like music. Turns out the pattern's often similar.

02:06

This is research from a world-class music academy, and what I want to draw your attention to is this: the exceptional musicians didn't start spending more time in deliberate practice than the average musicians until their third instrument. They, too, tended to have a sampling period, even musicians we think of as famously precocious, like Yo-Yo Ma. He had a sampling period, he just went through it more rapidly than most musicians do.

02:27

Nonetheless, this research is almost entirely ignored, and much more impactful is the first page of the book "Battle Hymn of the Tiger Mother," where the author recounts assigning her daughter violin. Nobody seems to remember the part later in the book where her daughter turns to her and says, "You picked it, not me," and largely quits.

02:45

So having seen this sort of surprising pattern in sports and music, I started to wonder about domains that affect even more people, like education. An economist found a natural experiment in the higher-ed systems of England and Scotland. In the period he studied, the systems were very similar, except in England, students had to specialize in their mid-teen years to pick a specific course of study to apply to, whereas in Scotland, they could keep trying things in the university if they wanted to. And his question was: Who wins the trade-off, the early or the late specializers? And what he saw was that the early specializers jump out to an income lead because they have more domain-specific skills. The late specializers get to try more different things, and when they do pick, they have better fit, or what economists call "match quality." And so their growth rates are faster. By six years out, they erase that income gap. Meanwhile, the early specializers start quitting their career tracks in much higher numbers, essentially because they were made to choose so early that they more often made poor choices. So the late specializers lose in the short term and win in the long run. I think if we thought about career choice like dating, we might not pressure people to settle down quite so quickly.

03:49

So this got me interested, seeing this pattern again, in exploring the developmental backgrounds of people whose work I had long admired, like Duke Ellington, who shunned music lessons as a kid to focus on baseball and painting and drawing. Or Maryam Mirzakhani, who wasn't interested in math as a girl -- dreamed of becoming a novelist -- and went on to become the first and so far only woman to win the Fields Medal, the most prestigious prize in the world in math. Or Vincent Van Gogh had five different careers, each of which he deemed his true calling before flaming out spectacularly, and in his late 20s, picked up a book called "The Guide to the ABCs of Drawing." That worked out OK. Claude Shannon was an electrical engineer at the University

of Michigan who took a philosophy course just to fulfill a requirement, and in it, he learned about a near-century-old system of logic by which true and false statements could be coded as ones and zeros and solved like math problems. This led to the development of binary code, which underlies all of our digital computers today.

04:43

Finally, my own sort of role model, Frances Hesselbein -- this is me with her -- she took her first professional job at the age of 54 and went on to become the CEO of the Girl Scouts, which she saved. She tripled minority membership, added 130,000 volunteers, and this is one of the proficiency badges that came out of her tenure -- it's binary code for girls learning about computers. Today, Frances runs a leadership institute where she works every weekday, in Manhattan. And she's only 104, so who knows what's next.

05:12

(Laughter)

05:14

We never really hear developmental stories like this, do we? We don't hear about the research that found that Nobel laureate scientists are 22 times more likely to have a hobby outside of work as are typical scientists. We never hear that. Even when the performers or the work is very famous, we don't hear these developmental stories.

05:30

For example, here's an athlete I've followed. Here he is at age six, wearing a Scottish rugby kit. He tried some tennis, some skiing, wrestling. His mother was actually a tennis coach but she declined to coach him because he wouldn't return balls normally. He did some basketball, table tennis, swimming. When his coaches wanted to move him up a level to play with older boys, he declined, because he just wanted to talk about pro wrestling after practice with his friends. And he kept trying more sports: handball, volleyball, soccer, badminton, skateboarding ... So, who is this dabbler? This is Roger Federer. Every bit as famous as an adult as Tiger Woods, and yet even tennis enthusiasts don't usually know anything about his developmental story. Why is that, even though it's the norm?

06:12

I think it's partly because the Tiger story is very dramatic, but also because it seems like this tidy narrative that we can extrapolate to anything that we want to be good at in our own lives. But that, I think, is a problem, because it turns out that in many ways, golf is a uniquely horrible model of almost everything that humans want to learn.

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(Laughter)

06:31

Golf is the epitome of what the psychologist Robin Hogarth called a "kind learning environment." Kind learning environments have next steps and goals that are clear, rules that are clear and never change, when you do something, you get feedback that is quick and accurate, work next year will look like work last year. Chess: also a kind learning environment. The grand master's advantage is largely based on knowledge of recurring patterns, which is also why it's so easy to automate. On the other end of the spectrum are "wicked learning environments," where next steps and goals may not be clear. Rules may change. You may or may not get feedback when you do something. It may be delayed, it may be inaccurate, and work next year may not look like work last year.

07:09

So which one of these sounds like the world we're increasingly living in? In fact, our need to think in an adaptable manner and to keep track of interconnecting parts has fundamentally changed our perception, so that when you look at this diagram, the central circle on the right probably looks larger to you because your brain is drawn to the relationship of the parts in the whole, whereas someone who hasn't been exposed to modern work with its requirement for adaptable, conceptual thought, will see correctly that the central circles are the same size.

07:38

So here we are in the wicked work world, and there, sometimes hyperspecialization can backfire badly. For example, in research in a dozen countries that matched people for their parents' years of education, their test scores, their own years of education, the difference was some got career-focused education and some got broader, general education. The pattern was those who got the career-focused education are more likely to be hired right out of training, more likely to make more money right away, but so much less adaptable in a changing work world that they spend so much less time in the workforce overall that they win in the short term and lose in the long run.

08:13

Or consider a famous, 20-year study of experts making geopolitical and economic predictions. The worst forecasters were the most specialized experts, those who'd spent their entire careers studying one or two problems and came to see the whole world through one lens or mental model. Some of them actually got worse as they accumulated experience and credentials. The best forecasters were simply bright people with wide-ranging interests.

08:39

Now in some domains, like medicine, increasing specialization has been both inevitable and beneficial, no question about it. And yet, it's been a double-edged sword. A few years ago, one of the most popular surgeries in the world for knee pain was tested in a placebo-controlled trial. Some of the patients got "sham surgery." That means the surgeons make an incision, they bang around like they're doing something, then they sew the patient back up. That performed just as well. And yet surgeons who specialize in the procedure continue to do it by the millions.

09:07

So if hyperspecialization isn't always the trick in a wicked world, what is? That can be difficult to talk about, because it doesn't always look like this path. Sometimes it looks like meandering or zigzagging or keeping a broader view. It can look like getting behind. But I want to talk about what some of those tricks might be. If we look at research on technological innovation, it shows that increasingly, the most impactful patents are not authored by individuals who drill deeper, deeper, deeper into one area of technology as classified by the US Patent Office, but rather by teams that include individuals who have worked across a large number of different technology classes and often merge things from different domains.

09:43

Someone whose work I've admired who was sort of on the forefront of this is a Japanese man named Gunpei Yokoi. Yokoi didn't score well on his electronics exams at school, so he had to settle for a low-tier job as a machine maintenance worker at a playing card company in Kyoto. He realized he wasn't equipped to work on the cutting edge, but that there was so much information easily available that maybe he could combine things that were already well-known in ways that specialists were too narrow to see. So he combined some well-known technology from the calculator industry with some well-known technology from the credit card industry and made handheld games. And they were a hit. And it turned this playing card company, which was founded in a wooden storefront in the 19th century, into a toy and game operation. You may have heard of it; it's called Nintendo.

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Yokoi's creative philosophy translated to "lateral thinking with withered technology," taking well-known technology and using it in new ways. And his magnum opus was this: the Game Boy. Technological joke in every way. And it came out at the same time as color competitors from Sega and Atari, and it blew them away, because Yokoi knew what his customers cared about wasn't color. It was durability, portability, affordability, battery life, game selection. This is mine that I found in my parents' basement.

10:58

(Laughter)

10:59

It's seen better days. But you can see the red light is on. I flipped it on and played some Tetris, which I thought was especially impressive because the batteries had expired in 2007 and 2013.

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(Laughter)

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So this breadth advantage holds in more subjective realms as well. In a fascinating study of what leads some comic book creators to be more likely to make blockbuster comics, a pair of researchers found that it was neither the number of years of experience in the field nor the resources of the publisher nor the number of previous comics made. It was the number of different genres that a creator had worked across. And interestingly, a broad individual could not be entirely replaced by a team of specialists. We probably don't make as many of those people as we could because early on, they just look like they're behind and we don't tend to incentivize anything that doesn't look like a head start or specialization. In fact, I think in the well-meaning drive for a head start, we often even counterproductively short-circuit even the way we learn new material, at a fundamental level.

12:02

In a study last year, seventh-grade math classrooms in the US were randomly assigned to different types of learning. Some got what's called "blocked practice." That's like, you get problem type A, AAAAA, BBBBB, and so on. Progress is fast, kids are happy, everything's

great. Other classrooms got assigned to what's called "interleaved practice." That's like if you took all the problem types and threw them in a hat and drew them out at random. Progress is slower, kids are more frustrated. But instead of learning how to execute procedures, they're learning how to match a strategy to a type of problem. And when the test comes around, the interleaved group blew the block practice group away. It wasn't even close.

12:45

Now, I found a lot of this research deeply counterintuitive, the idea that a head start, whether in picking a career or a course of study or just in learning new material, can sometimes undermine long-term development. And naturally, I think there are as many ways to succeed as there are people. But I think we tend only to incentivize and encourage the Tiger path, when increasingly, in a wicked world, we need people who travel the Roger path as well. Or as the eminent physicist and mathematician and wonderful writer, Freeman Dyson, put it -- and Dyson passed away yesterday, so I hope I'm doing his words honor here -- as he said: for a healthy ecosystem, we need both birds and frogs. Frogs are down in the mud, seeing all the granular details. The birds are soaring up above not seeing those details but integrating the knowledge of the frogs. And we need both. The problem, Dyson said, is that we're telling everyone to become frogs. And I think, in a wicked world, that's increasingly shortsighted.

13:45

Thank you very much.

13:46

(Applause)