WHAT THE BEST COLLEGE STUDENTS DO

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THE BELKNAP PRESS OF HARVARD UNIVERSITY PRESS
Cambridge, Massachusetts, and London, England
2012
Learning How to Embrace Failure

When I was in school, I failed French twice. I also accumulated a few bad grades in Latin before barely mustering enough credits to satisfy the minimum foreign language requirement. Most of the advice I received focused on propping up my faltering confidence. "You just have to believe you can do it," coaxed a good friend. Others in my entourage of well-wishers took a more fatalistic view. "Some people have a knack for language, and others don’t," offered a skinny kid from Seymour, Texas. Still others urged me simply to try a little harder. Meanwhile, I cycled through a range of emotional and intellectual reactions. At first, I blamed the French debacle on the teacher. He assigned us seats, and mine was located in the back of the room, from where I could barely make out the Phi Beta Kappa key that dangled from his waist. Later, I took Seymour’s judgment to heart and decided I just couldn’t learn French.

Ultimately, I survived both the advice and the bad grades, yet my battle with this challenge might have been my undoing. I could have easily slipped into not caring about any learning, or transformed my difficulties with language into a broad generalization about my capacity to master anything.

Everyone fails at some point. It might be a rejection from a friend, difficulty in learning a new language, or solving an algebra problem. It might be an act of omission, a failure to take necessary action, or
a wrong turn deliberately pursued. All of the people we interviewed could tell us stories of some shortcoming. For Neil deGrasse Tyson, director of the Hayden Planetarium, his greatest loss came when the University of Texas booted him from their doctoral program in astronomy. Scientists have experiments that go awry. People lose their jobs, as one of our subjects did soon after we interviewed him. "I failed my freshman year," two people told us at the beginning of our conversations. Forging a creative life didn't depend on avoiding all shortcoming. Rather, it seemed to hinge on how people reacted to them. Ultimately, Neil and all of our other subjects bounced back from those reversals. He eventually finished his doctorate at Columbia University and became an astrophysicist and a leading popularizer of science. Others overcame course failures and other reversals. They learned to weather the inevitable storms of life.

How did they do it? In the last twenty-five years, social scientists have produced some important insights into how successful people overcome their unsuccessful moments. Not surprisingly, our findings among the lives of these remarkable students mirrored the core of that research. The picture that has emerged is both quite simple and far more complex than my well-intentioned friends ever imagined.

One idea has emerged most fully from both that research and the interviews we did. People who become highly creative and productive learn to acknowledge their failures, even to embrace them, and to explore and learn from them. That sounds relatively easy, yet for many people it proves enormously difficult. They won't admit their errors and often pretend they didn't do anything wrong, going to great extremes to justify their actions. They sometimes melt in the face of any mistakes, or refuse to recognize the value they may gain from confronting them. Recently, I conducted a workshop for fac-
ulty at a liberal arts college in Pennsylvania, and one English professor in particular objected strenuously even to the use of the word “failure.” To her, failures were “too negative,” distracting people from the positive thoughts they needed to maintain. She simply could not engage in a process we saw so consistently among our best students. But how and why did our subjects learn the value of admitting failure while so many others didn’t? And why did that admission prove to be so significant?

Fixed and Flexible Views of Life

When Joe was in the first grade, he enjoyed school and did well. He learned to read, count until he ran out of breath, add and subtract. Occasionally, people would tell him he was smart. By the time he reached the sixth grade, however, life began to change. School became more difficult, and when he started the seventh grade, he was going through puberty. His parents told him he needed to do better in school, to try harder. “You can make higher grades,” rang in his ears like a bad song. “You used to be so smart. What happened to you?” Gradually, Joe decided that he wasn’t all that bright and that he would never be a really good student. “I’m just an average guy,” he would tell people, finding comfort in being ordinary. Sometimes he felt quite helpless, and in each class, he fought just to survive.

His friend Karolyn always did well in school, and everyone told her she was smart, something she came to believe deeply about herself. Her father always emphasized that she could do anything she wanted to do, and her teachers said she was one of the brightest students they had ever encountered. When she entered high school, she had a chance to take an advanced course in calculus at a local university, and she signed up without hesitation.
But the course proved to be enormously difficult. The class met
in a large lecture hall with more than two hundred students en-
rolled, and the professor, an older woman with white hair, per-
formed calculus on a series of boards that slid up and down like
windows. This professor could have been a trained monkey doing
a circus act. She certainly wasn’t teaching anybody anything. From
her seat in the back of the room, Karolyn could barely make out the
numbers, symbols, and diagrams that the woman with white hair
scribbled on those windows before showing them upward to reveal
another surface upon which she could splash more chalk shaped
into a new set of numbers, symbols, and diagrams. Karolyn took
careful notes, fairly confident that she could do calculus if she got
down exactly how the professor solved the problems.

On the first examination, she received a forty-three. It contained
a whole series of problems, the likes of which she thought she’d
never seen before. They actually reflected the same principles the
woman in white hair had been using to solve her problems, but be-
cause the whole class had focused on following procedures rather
than understanding concepts, Karolyn didn’t understand the ideas
that would allow her to unravel the exam questions. She felt devas-
tated and betrayed. When her parents asked her about the failing
grade, she told them the teacher was horrible and she didn’t want
to go back, and while she eventually returned to class, her grades
didn’t improve much. She watched in humiliation as other students
collected their exam papers after the second test, flashing grades in
the seventies and eighties. Although none of them learned much
from the instructor either, they had at least encountered most of
the material in advanced courses they had taken in high school.
Karolyn didn’t have that luxury. A few students even made it into
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the nineties. Karolyn got a forty-eight. In the end, she failed the
course.

In the months following that experience, something happened to
her. She told her friends, “I’m just not very good at math,” and in
the inner recesses of her mind, in those dark places where feelings
and thoughts mingle like dance couples, she began to explore a new
self. Maybe that self wasn’t as smart as she had thought. Maybe it
couldn’t do everything. Maybe she had to protect it. And protect she
did. Like a mother guarding a child, she made sure she did not take
on anything that might show her to be less intelligent. When she
went to college, she avoided science and math courses. She asked
her friends about the easiest teachers and then made sure she got
into those classes. Once, when she was a junior, she had a chance to
study with a visiting professor who had done some pioneering work
in her major, but she heard his class was tough, so she took some-
thing else instead.

When David was in the seventh grade, his teacher suggested that
he take some books home with him for the summer and study.
“When you come back in the fall,” she told him, “we’ll give you some
tests on the books, and if you pass those exams—which I’m sure
you will—you can get into a special program for talented and gifted
students.”

That summer, David thought often about the books his teacher
gave him, but for the most part he simply looked at them stacked
up in the corner of his room. Too many distractions. Too many
friends to see. So by the end of the summer, he had yet to crack a
single book. Two weeks before school started again, he began to
worry about a wasted summer, but the worry soon became over-
whelming—too much to think about, too disturbing to consider.
Quickly, he learned to put it out of his mind. He told himself that he probably couldn't have passed the test anyway because "he wasn't all that smart." Getting into the honors program was for really smart kids, he told himself, and I'm not one of those.

To Joe, Karolyn, and David, and to millions of others, intelligence is something you cannot change. In their minds, you are born with lots of brains, very few, or somewhere in between, and something called intelligence determines how well you do in school and life. Joe's refrain about being an average guy was simply a way of saying, "I know what I've got. I'll be OK, but I'm not one of those brainy types." Karolyn held on to her image of being a smart girl, but she was afraid to take a chance, unwilling to risk anything that might question that image. And David concluded that no amount of studying would increase his native intelligence.

When Carol Dweck was a young woman, fresh out of graduate school, she began doing research on such fixed notions of intelligence, and why some highly capable people avoid challenging work. This was an important question because life inevitably involves risks. Think of any long-term goal you might imagine, and it will involve taking chances. There will be roadblocks, tough moments, and, yes, even failures. If some people are afraid to risk making a mistake, if they wilt in the face of coming up short, then they may not even try.

Carol had noticed in her research that she could find two people with almost identical abilities, yet one of them refused to attempt anything challenging while the other pursued the most difficult goals. One would wither and give up in the face of any kind of setback while the other would keep going. One would feel helpless when something proved difficult; the other would try even under the most grueling challenges. Carol could find no difference in their
mental or physical abilities, yet she spotted enormous differences in their power to deal with lack of success. She also noticed—and this is highly significant—that some people who really wanted to do well often shot themselves in the foot, acting in ways that would almost guarantee that they wouldn’t succeed. Why?

To find out, Carol and one of her graduate students, Carol Diener, created two groups of children, all about ten years old, and gave them a series of puzzles to solve. The first eight problems required some careful thought, but none of them was too demanding for kids of that age. The next four, however, were far too hard for anyone that age to solve in the time they had. On the first eight, all of the youngsters in both groups solved the exercises, and there were no differences in the performance of the two groups. They asked the children to talk about the work as they did it, and clearly all of the kids had fun with it. Once they took on the four impossible problems, however, everything changed.

None of the children could solve the new exercises, but their reactions differed enormously. The students in one group—let’s call it Group A—began saying, “I can’t solve these problems. I’m just not very good. I’m not smart enough. I can’t remember that well. I can’t ever solve these exercises. I might as well give up. I’m bored. This is stupid.” They also began talking about matters that had nothing to do with the problems, bragging about how much wealth they had, or the big houses and cars their families owned, telling the researchers how good they were at doing something else. In some cases, they even tried to change the rules of the puzzles. And they did all of that even though just minutes earlier, when these youngsters were working on the exercises within their reach, they had responded with enthusiasm, pleasure, and confidence. They had simply wilted in the face of failure.
The children in the other group, however, did none of that (we'll call them Group B). Instead, they kept telling themselves that they could solve the difficult problems with more effort. They changed their strategies and talked about how they could find the answer, constantly searching for a better way to reach their goal. "I did it before," they spontaneously told the researchers, "I can do it again." One child proclaimed, "I'm sure I have it now," even though she didn't. Failure didn't bother them. Instead, they even seemed to welcome a tough problem. "I love a challenge," one little boy announced, rubbing his hands together and pulling up his chair after getting a wrong solution—as if to say, "bring it on!" One of his classmates in the same group looked up at the researcher after failing to get one of the last four problems and said, with a ring of pleasure in his voice, "You know, I was hoping this would be informative."

Something in addition to delight divided the two groups. As children in Group A encountered failure, they began using very poor strategies. Moments earlier, on the exercises within their reach, they had employed perfectly good approaches, the kind of thinking you might expect from a capable problem-solver of their age. Now, they couldn't seem to do anything right. Dweck and Diener later reported that nearly two-thirds of the students in the first group started thinking like preschoolers, using approaches that would never work, no matter how many times they tried. With the first sign of failure, they didn't want to play anymore. They couldn't think straight or do what they had previously done so well, and they wanted to give up, quite sure that they could not do the problems. In the meantime, the students in Group B were as happy as larks, ready to keep trying, and quite sure they could crack the code, even though none did. None of those students began using poor strategies.
Neither group solved the new problems, but that’s not the point.
Carol had deliberately handed them failure to see how they would
react. In many real-life situations, the kids in Group B might even-
tually solve the tough problems because they kept trying and con-
tinued to use good strategies. Students in the other group would
never conquer a tough problem because the first sign of failure sent
them into a tailspin in which their abilities actually diminished, and
they eventually threw in the towel.

What could account for the difference? Certainly not ability. Stu-
dents in both groups cracked the first eight exercises—the ones ap-
propriate to their age—with equal skill. In fact, the kids in the first
group were probably a little better at using good strategies on those
initial examples. So why did they flounder so badly once they started
failing? Was it interest? No. When the children talked aloud as they
struggled with those first eight problems, both groups had clearly
remained interested and engaged. But as soon as the hard problems
came along and the experimenter had to say “wrong,” only the kids
in the first group changed their tune.

Why? The answer is fairly simple, yet enormously powerful. The
children in Group A, the ones who reacted so poorly to failure, had
a fixed view of intelligence while those in Group B believed that you
could expand your smarts with effort. To the first kids, you were
born at a certain level and nothing could change that. Because they
wanted to believe that they were among the brilliant ones, they
didn’t want anything to challenge that notion. Failure on some stu-
pid puzzle could raise questions in their own mind and in the minds
of others—teachers, friends, parents—about their intelligence. When
they began to hear the word “wrong,” they wanted out. Immediately.
They didn’t want any words that might suggest that they were not
as intelligent as they hoped. They wanted to see some evidence that
they were really smart. As the mistakes piled up, they became more nervous and began thinking like someone half their age.

Meanwhile, the kids in the other group thought that effort mattered most. In their minds, intelligence wasn't some central quality fixed for life. Instead, in their view, it was a collection of different abilities, any one of which could be stretched with the right kind of effort. You could expand your capacity, they believed, if you just kept trying. Nothing was written in stone. Thus, they didn't see failure as a sign that they were dumb. They saw it as something they hadn't learned yet. In fact, the two groups had completely different goals. While the kids in the first group wanted to "look smart," those in the second just wanted to get better at solving the problems because they believed that they could increase their abilities with effort.

Before any of the children tried to solve a single problem, Dweck and Diner had asked them questions about why certain things happened to them in school. In general, the kids in Group A, the ones with the view that intelligence is fixed and who wilted with the tougher problems, blamed most of their failures in the classroom on lack of ability. The second group said their failures reflected a lack of effort. When the experiment was over, the researchers asked the kids why they had difficulty with the last four problems. More than half of the first team said it was because they were not smart enough. No one in the second group gave that excuse.²

Carol Dweck and other psychologists have given these two types of students names that fit them well. She calls people in the first group "helpless" because they develop the idea that they just can't do something because they "aren't that smart," or not that good at math, music, art, foreign language, or whatever gave them difficulty. Or, if they continue to believe that they are generally smart and that
intelligence is something that is fixed at birth, they still often become helpless because they are afraid to try anything new for fear that failure will question their conception of themselves as “one of the bright ones.”

Carol says kids in the second group have a “mastery” or “growth” mindset because they believe that they can master something and grow in their abilities if they try. If they don’t succeed, they look for new strategies rather than deciding they “just can’t do it.” Are the mastery students just smarter than the helpless? No. Carol has found considerable evidence that children in the two groups have roughly the same natural abilities, no matter how you measure those, and that sometimes the helpless demonstrate greater native powers with these kinds of problems. The difference lies in whether they have what she called a “growth mindset.” Mastery students think abilities can expand. The helpless think they’re fixed.

In experiments large and small, Carol and her colleagues have demonstrated the power of a growth mindset. In one prominent study of eleven- and twelve-year-old math students in New York City, they found that kids who believed that intelligence could expand generally improved their math scores during their two years in junior high school while those who thought that it was fixed forever stayed the same. That investigation also demonstrated the relationship between the factors we have pursued in various parts of this book. Students who believed that abilities could grow had a more positive view of effort and were more interested in learning rather than just performing well on an examination. As a result, they took the time and made the effort to understand, which produced higher grades.\(^3\)

Where do helpless students get the notion that intelligence is fixed and you can’t do anything about it? They live in a culture that
constantly bombards them with that idea, telling them about IQ
tests that will measure how bright they are. In her wonderful book
Mindset, Carol Dweck remembers a sixth-grade teacher who ranked
everyone by the scores they received on an IQ test, sitting the students
in order around the room and letting only the "smart kids"
have certain privileges, such as carrying the flag. Some college pro-
fessors, especially in certain fields, believe that only "geniuses" can
succeed in their discipline and that it doesn’t really matter how well
they teach. "The smart kids will get it, and the dumb ones won’t," a math professor at New York University once told me. That atti-
itude seeps into every action and interaction, and students pick up
the message. Every day you can find magazines or Internet sites that
claim they can measure your intelligence and invite you to "take the
test" as if they were going to tell you how much you weigh.

Even well-meaning parents and teachers can foster that fixed view.
We’ve long assumed that positive feedback always has desirable re-
sults. But some recent research has painted a more complex pic-
ture. Melissa Kamin discovered that children who receive primarily
person-praise ("how smart you are") rather than good words about
their efforts will usually develop fixed views of intelligence. When
children are young and family members constantly tell them how
brilliant they are (or how dumb), they get the message: Life depends
on your level of intelligence, not on how you work at something.
You’ve got it or you don’t. Nothing can change that reality, they
think. In short, fixed views of intelligence or growth mindsets stem
from conditioning, not from some inborn character trait. They too
can change.

But wait a minute, you say. I’m not helpless. I think I’m smart,
and I know it. If that’s your attitude, then you deserve a big round
of applause for your belief in yourself. That self-confidence will serve you well. There's nothing wrong with it. But if you believe that you were just born smart, that all your friends can be ranked by their intelligence in the same way you might line them up by how tall they are, and that no amount of effort will change this ranking, then you have a fixed view of intelligence. If you think that while you can learn new things, you cannot change your basic intelligence, you have a fixed mindset. If, on the other hand, you think that no matter how capable you may be, you can get better—and so can anyone else—if you believe that if you don't try you probably will lose abilities, you have a growth mindset, and it is that growth mindset that allows many people to find rewards in failure, "to embrace the bomb," as Stephen Colbert put it.

All of the creative people we interviewed for this book—the deep learners who have crafted such creative lives—exhibited a growth mindset about themselves and their friends, and their stories illustrate well the findings of thirty years of empirical research. "I hardly ever use the word intelligence," Neil deGrasse Tyson noted. "I think of people as either wanting to learn, ambivalent about learning, or rejecting learning." Sherry Kafka put it this way: "I believe everybody is creative, or at least has the potential to be." Because our subjects had that basic concept of human nature, they were willing to take risks and try something new, but they didn't worry about making mistakes or looking stupid. They did not see themselves as participating in a competitive game to be the "smartest kid in the class." Rather, they focused on developing their own talents. Yes, they wanted to play to their strengths, and they realized that they had capabilities. But as we have seen already, they didn't give up easily.
From Disenchantment to Success

On summer afternoons in the sweltering heat along the east coast of Florida, Tom Springer and his two older brothers stretched out on the floor of their cinder-block house listening to their mother read. An electric fan stirred the moist air, whirling in the background as the boys traveled on words and sounds into another place and time. She read *The Wonderful Wizard of Oz* and other L. Frank Baum books about life on the Great Prairie, or Mark Twain's works, set along the Mississippi River in the age of steamboats. On Saturdays they would go together to the local library and bring home a fresh stack of books for her to read. His mother never "read down" to them. She always selected literature that stretched the boys, challenging them to understand new words and ideas, to explore in their minds new places and cultures.

Tom's mother followed the children's interests with care. If she noticed a particular fascination, she picked material on their latest focus, feeding it with carefully selected books to challenge their thinking. When they shifted to something new, so would she. For awhile the boys fell in love with World War II books and wanted to read about battles and politics. As a result, Tom developed a grasp of geography and political developments that went far beyond his years.

In the early grades, Tom went to a school in Melbourne, Florida. His classroom felt the influence of the local space industry in nearby Cape Canaveral. Many of his friends had parents who worked as NASA engineers and scientists, and they made sure their children's school had the best teachers. It was an exciting place to be. A race to the moon unfolded next door, and Tom and his friends explored science, astronomy, and "all that kind of stuff." From their play-
ground, they saw rockets launched into space, unleashing an endless array of speculations about the heavens. They found school stimulating and wonderful.

His parents didn’t have much money. “My dad was a barber,” he explained. “We were basically a working class family.” Nevertheless, they scraped together enough to purchase a small amateur telescope, and Tom and his brothers used it to explore the sky at night. Sometimes they would go to the ocean with their father, and while he waded into the surf with a long cane fishing pole in hand, the boys would wait on shore, digging up little crabs for bait, picking up starfish, and occasionally fishing for shrimp. The boys had a seashell collection, and they accumulated a series of children’s books on nature and the sea. “It was just a really rich, sensual experience,” Tom recalled.

When he was in the fourth grade, that world vanished in a flash. His family moved from Florida to southern Michigan, and life and his new school didn’t have the same vitality for him. “It was a cultural shock,” he remembered. School was slower, both less and more demanding, and filled with petty rules and requirements that gave him less sense of control over his own education. The school also had lower intellectual standards. He became bored, never doing his homework or picking up a book outside of class. His grades plummeted. By the time he finished high school they had sunk below a C− average. “I had become,” he observed, “a disaffected student” with no ambition. “Much of the education I received thereafter came outside of school,” he recalled. “I continued to read about stuff that would fascinate me.”

When he graduated from high school, he got a job with an asphalt paving crew, but that was seasonal, so he worked in a couple of factories in the winter. One day, his boss fired him because he
had been writing smart aleck remarks on his time card and had asked a friend to punch the clock for him. He then got work as an air-conditioning mechanic with a chain-smoking guy named Porky, but he lost that job too. Failures accumulated on every front. He joined the National Guard, and when he got out decided to enroll in an air-conditioning curriculum at a local community college. His life began to change, even though he continued to fail with anything mechanical.

"I just couldn’t get those pipes to fit together," he remembered, "but I had to take a freshman writing class, and that changed my life." In that class, Tom found something that spoke to his childhood in Florida and all the books he had read over the years. He did well and gradually improved his writing, displaying an ability that no one might have suspected a few years before. Eventually, Tom transferred to Western Michigan University, where he appeared on the dean’s list, and then on to Michigan State, where he earned a master’s degree in environmental journalism. Tom became a successful writer and filmmaker. His work began appearing on National Public Radio, and he published an award-winning book with the University of Michigan Press. He went to work for the W.K. Kellogg Foundation, where he became a senior editor and then a project manager, joining the Learning Innovation Team and working on projects that "seek to reconnect children with nature as a way to spur their mental, physical and spiritual growth."

How did Tom Springer fight his way from failure to success? How does anyone overcome a setback? Reading educated him, but Ernest Hemingway, Twain, Baum, and all the other writers transformed his life because he never allowed some fixed notions of intelligence to freeze him into a sense of helplessness. He had an expansive and flexible view of his own abilities and never saw any of his failures as
a reflection on who he was or what he could do as a human being. In general, he didn't think about whether he "had the intelligence" to do something, but only that he often didn't do it, and sometimes didn't want to. Furthermore, as Tom struggled through air-conditioning jobs and classes, he fashioned a deep respect for a wide variety of abilities that went beyond "book smarts," as he put it. "The people who can build a barn or a brick fireplace have an ability that deserves recognition," he told me. "I ultimately had more trouble fitting pipes together than I did constructing sentences." That reverence for what other people could do and for the challenges he faced helped him to find out what made him tick. As he learned to respect works of the "hand, head, and heart," as the architect Frank Lloyd Wright had put it, he learned to draw from the unique experiences and body chemistries that defined his soul and to concentrate on effort rather than on some notion of fixed abilities.

"If something bad happened to me," he said, "I'd try to think about how I could get more power so it wouldn't happen again. It was a kind of 'I'll show you' attitude," he concluded. Tom recognized that he flourished with self-directed learning, staying up nights and reading a book he found fascinating. He would sneak a copy of Sinclair Lewis's *Babbitt* into his lunch pail and then think about the characters he encountered and how they compared to his boss, Porky, and other people around him. In some important ways, Tom never stopped learning, and in one important sense, all those bad grades did not reflect his failure. It reflected instead the inability of the schools he attended to recognize and honor that learning. Ultimately, he found a way to draw on who he was and the life that he had led, to respect himself as he also learned to appreciate others and what they could do. He drew from his past, the interactions with nature he had enjoyed with his father and brother, and all
those wonderful hours he had spent listening to his mother read. “The sounds of good writers reverberated through my mind,” he recalled.

At one crucial moment, he learned to convert his learning from curiosity and reading into academic success and with that marriage of achievements to produce a new family of successful work, all growing in its own ways. Teachers—his writing teacher, in particular—provided him with the opportunity and showed interest in his writing and respect for what he could do. His teachers challenged him to find his own voice, to refine its tenor, and to improve on what he produced. He apparently never lost complete respect for himself, even in those dark days of disaffection with school and everything about it, but the missing piece was someone who could appreciate his work and show him ways to expand on it. He found such teachers at Kalamazoo Valley Community College. He discovered a challenging yet inviting world there.

Blame and Credit

One more important factor often guides people to success, and probably influenced Tom. A growing body of research finds that the way people attribute their successes and failures will have a considerable influence on those achievements and shortcomings. Think of it this way. When something goes wrong, who or what gets the blame? When everything comes up roses, who or what gets the credit?

You could, for example, attribute your successes or setbacks to something that is within you or to some outside force. You could decide that it is only a temporary condition or something perma-
nent, and you could believe that you have considerable influence over it or none at all. In all, there are eight possible combinations, running from "it’s something permanent about me over which I have no control" all the way to "it’s them but I can change that." Furthermore, any one of these combinations can be used to explain either success or failure. How you decide to put those combinations together will shape how well you deal with any setback.

If, for example, you usually blame your failures on something that permanently infests your soul ("I flunked calculus because I’m just not good at math"), you’ll probably think you have no control over that situation. You’ll give up and stop trying. And, guess what? You’ll also never pass calculus. In contrast, if you say something like, "I don’t think I studied the best way; I can do better if I get help from the tutoring center," then you still believe it’s you, not someone else, but your math ability can improve with the right kind of effort. With that way of accounting for your setbacks, you most likely will keep trying and will succeed.

How you explain your success will also matter. Which of these two possibilities will most likely motivate you and bring good results?

I just got lucky on that last exam. All of her questions were right down my alley. But I’m still just not good at math.
I studied with my friends, and we talked through every type of problem until we understood the concept. That’s why we all did well on that exam.

In the first, you attribute your success to something external (luck), temporary, and over which you have no control. In the second, you credit something you did (effort), still temporary, but over which
you have considerable influence. No one can find much incentive in the first—why try if it is all luck?—but everyone can find it in the second.

In general, people who are highly successful in handling failure take responsibilities for those shortcomings and triumphs, yet see either situation as highly changeable. Success can evaporate, and failure can be overcome. Years ago, Albert Bandura, a psychologist at Stanford, observed people trying to learn how to handle snakes. He noticed that in order to use the techniques properly the snake-handling students needed to learn the right procedures, but they also had to believe that they could use them appropriately. He called that potent combination of belief and ability “self-efficacy.” You must know how to do something, but you must also believe that you can. People who overcome failure possess strong measures of self-efficacy.

How do the best students cultivate the perspectives that allow them to hold a flexible view of intelligence, attribute their successes and failures properly, and maintain a sense of self-efficacy? One central practice comes from what Paul Baker urged upon his students: have a conversation with yourself. Know how you work. Understand what moves you. A flexible view of intelligence and ability, Baker suggested, stands at the base of how successful people handle failures. It allows them to attribute successes and failures productively, work hard and properly at developing some new ability, and believe that they can use their new-found powers.

Baker’s ideas escape the debate about whether intelligence remains fixed for life or can be expanded, and most of our subjects managed to take the same route. The distinction I’m making here becomes clear in the metaphors we use to discuss intelligence. The old, rigid view of intellectual prowess was of a ladder with some
people fixed at the top from birth and others arrayed on the various rungs. The flexible view that Carol Dweck came to prize still thought in terms of that ladder but believed that people could climb up it. Baker's ideas represent a different metaphor—a tree with an almost countless number of branches—and it is that metaphor we most frequently heard in the conversations with our subjects. Every fork and limb represents someone unique, and the goal becomes not a mad race up the ladder of abilities but the nourishing of those special perspectives within each individual. In this tree every part feeds off every other part. This branch isn't better than that one, only different, and each one has the potential to grow in its own special way. That doesn't mean that there are no standards. But it does mean that people seek to meet those criteria rather than compete with others, and it can mean that different people will flourish in different ways.

In the old perspective, people can develop something psychologists call "contingent self-worth," which is simply the notion that your value as a person depends on where you rank, on what rung you have achieved on the ladder. Melissa Kamins found such ideas among young children who received a steady diet of personal praise and criticism, and as a result built a fixed view of intelligence—even when that feedback was all positive. If you believe that your value as a human being depends on how well you perform, and you also think that fate has predetermined your ability to do something, you are headed for trouble. Those ideas will influence how you react to failure.  

If you have a sense of contingent self-worth, if your attitude toward yourself depends on whether you "succeed" or "fail" in a certain domain in comparison with other people, you may stop trying. Subconsciously you decide that the best way to avoid losing is to
stay out of the game. If you play, you may give up easily, and retreat into the kind of behavior we saw earlier in Joe, David, and Karolyn. You could even sabotage your efforts, blowing a chance to "win," because you are quite convinced that you will ultimately lose. You may want to withdraw, to give yourself an excuse ("I didn't really try") before tasting the bitter fruits of defeat. As we shall see repeatedly, our best students flourished when they abandoned such comparative thinking; when they looked inside themselves, understood what appealed to them, and focused on what they wanted to do, not on how they wanted to rank or look.

I asked each of the people I interviewed, "Are you highly competitive?" To a person, they all answered, "Yes, but with myself, not with other people." That answer speaks volumes about a highly significant factor in their success. For them, as it was for Susan Bobbitt Nolen's task-oriented students, life was all about achieving a personal best rather than merely winning a competition with someone else. A deep intention defined the nature of their learning, sprang from an intrinsic interest while feeding that internal motivation, and reflected their growth mindsets.

Baker offered his students a new vocabulary for thinking about such matters, words rooted in those five senses with which they would experience all of life (line, sound, space, silhouette, and color), and while some of our subjects who never experienced his teaching also trafficked in such language and concepts, the larger point is that the use of those categories rested in a perspective that we saw repeatedly among people who learned deeply and lived productive lives. They believed in growth, and looked both within themselves and at the works of the mind that others had created to find nourishment for that development. They embraced "failures" as won-
derful opportunities to learn something rather than as judgments about their souls.

Lifelong Learning

In the September after he graduated from Cornell, Jeff Hawkins picked up a copy of *Scientific American*, something the budding scientist and engineer had been doing for years. In that issue each fall, the magazine featured articles on a single subject, and that year, all of the content focused on the brain. Jeff had taken an interest in the human mind ever since he had composed those four big questions before going off to college, but one article in particular caught his eye and changed his life.

In it, Francis Crick, the man who helped discover DNA, wrote that although we’ve learned a lot about the mechanics of that organ that sits in the top of our heads, we still don’t have a general theory of how it works. The claim hit Jeff like a bolt of lightning. “After reading that article,” he reported, “I became totally devoted to the idea that we’re going to figure out in my lifetime how brains function, and I’m going to work on the problem.” He had found his life’s work: “I’m going to do brains.”

While he continued to focus on that three-pound mass of cells in the head and to wonder how it worked, Jeff took a job as an engineer with Intel, first at an office in Oregon, and then in Boston, where he would be closer to his girlfriend. Initially, the young engineer saw a connection between his job and his passion for understanding the brain. If he could understand how the human mind worked, he could build one, and Intel might let him spend his time doing just that. Surely a company that had “invented the silicon
memory chip and the microprocessor” would let him use part of his day thinking about “how we could design brain-like memory chips.” So he wrote a letter, addressed to the chair of the company. Here was a kid, fresh out of college, writing the chairman of the company, asking if he could get paid to “do brains.” That takes passion . . . and nerve. What could anyone expect? Maybe one huge cold shoulder, or a reprimand: “Don’t spend your time writing me letters about how you should spend your time.”

Instead, Gordon Moore may have laughed to himself, but he also sent young Jeffrey to see Intel’s chief scientist, Ted Hoff. Jeff flew off to California and met with Hoff. As it turned out, the head scientist had studied human thinking himself, and after listening to this young upstart from Boston, he poured cold water on the whole idea. We don’t know enough about biological thinking organs to build artificial ones any time soon, he said. “Hoff was correct,” Jeff wrote years later. “Still, at the time, I was pretty disappointed.”

Yet that failure didn’t stop him. Jeff decided to go back to school and applied to the Massachusetts Institute of Technology, located just across the Charles River from his Boston office. MIT had a big program in artificial intelligence, and Jeff thought he would win admission easily. He didn’t. He wrote on his application that he wanted to understand how brains work, but the professors who read that document had other priorities. They wanted to write programs to get computers to do the same things people could do—see, talk, move, calculate, and so forth—but from their perspective, that didn’t require an understanding of how the “human computer” functioned. They rejected his application.

I mention this story in part to illustrate the passion that drove Jeff’s life, both in college and after, and that ultimately fed his deep approach to learning. He was convinced that brains and computers
were fundamentally different, and he wanted to understand how intelligence operates, how we think, create, remember, predict, and all those other wonderful things humans can do.8  

Jeff Hawkins's intellectual journey illustrates something else about our "best students." They don't give up easily. After rejections from both MIT and Intel, Jeff and his girlfriend, now his wife, moved to California, where he took a job at GRID Systems, a company in Silicon Valley that had invented the first laptop computer. One day while he was working there, something special happened. It might have been an accident, but I think it occurred partly because Jeff took such a deep interest in learning. He had helped design the first tablet computer, and he let some of his colleagues play with it. As he watched them use this strange device with a touch screen and no keyboard, he marveled at how much they enjoyed carrying it around and using it. The company wasn't thinking of selling this device to consumers, only to businesses. But Jeff observed something, maybe out of his habit of looking behind the obvious, that would send him in a whole new direction. "I noticed how much they enjoyed holding this gadget, and touching the screen, and somebody said, 'I wish I could put my personal contact information in here.'"  

That simple observation, plus Jeff's lifetime habit of thinking deeply, sparked a notion that would change forever how we handle and think of information, and land Jeff eventually in the National Academy of Engineers. He simply mused to himself, "I think the future of computing is in mobile devices, things that people can carry around. Why couldn't you put a small computer in people's pockets?" It would be cheaper, easier to use, and more reliable than a big computer. Most of the world's population couldn't afford a computer, but Jeff thought if he could make one small enough "to
fit in your pocket," more people would have the money to buy the device.

At the time, this dream of putting small computers in people's pockets looked as wild as those weird boats he and his family had built in their garage back on Long Island, or the even crazier idea of understanding how brains work. "The technology wasn't there to build a small computer and neither was the software." GRiD Systems didn't want to put up the money to develop one because they didn't think anyone would buy it. Another immediate failure.

So Jeff went back to school, still intrigued with the possibilities of building that small computer. He became increasingly convinced that the future lay in gizmos you could carry around with you. But he went to school to follow an old passion, his fascination with the way people think and how it all works. At first he started taking correspondence courses. As Jeff wrote much later, "no one ever got rejected by a correspondence school." He boned up on physiology and other subjects related to biology, and then applied to study human intelligence within a biophysics program at the University of California at Berkeley. As Jeff told the story, "I studied hard, took the required entrance exams, prepared a resume, solicited letters of recommendation, and voila, I was accepted as a full-time graduate student." He was not quite thirty years old.

He took a leave of absence from GRiD Systems, and a few years later, he returned to the computer industry to invent the first successful mobile computer, the Palm Pilot. He had found a way to let people simply write into the computer with a stylus. Millions of people around the world began buying his new device and carrying these little computers in their pockets. Three years later, he and some of his colleagues created a new company, named Handspring,
where he designed a small computer that you could use as a telephone, the world's first smart phone, the Treo.

His success in business now gave him the financial resources to follow his passion and "do brains." First, he created the nonprofit Redwood Neuroscience Institute in Menlo Park, California, where he and other scientists studied how the human neocortex processes information. Three years later, he gave the institute to the University of California at Berkeley and created another new company, named Numenta. In this small business, tiny in comparison to the giants that he had helped create at Palm and Handspring, he could explore how the mind works and perhaps build a machine that would think like humans do.

Jeff developed an uncanny optimism about life, and in that perspective, he found further backbone for his deep approach to learning and his willingness to keep trying, even in the face of considerable discouragement. "I understood very early in life that there is a lot of chance in what happens to you, so I never worried about it," he said. Instead, he simply pursued his own curiosity. "If something bad happened, I tried not to become obsessed with it, but to try to find a solution if I could." To believe in solutions is to believe that the world is flexible, that you can change it with effort. That's a growth mindset.

Changing a Mindset

Can anyone learn to think of intelligence as expandable, and thereby realize the rewards of that growth mindset? Charlie Geaers and his buddies demonstrated that you can. The shy young boy from New York City had never done well on any of the standardized math tests
that he took in school. In the sixth grade, he’d scored worse than sixty-five percent of the students who took the same exam across the country. Because his family didn’t have much money, he received a free lunch every day. When he came back to school after the New Year’s holiday during the seventh grade, a group of psychologists from Columbia and Stanford universities offered him and some of his friends a chance to participate in a weekly workshop for eight weeks to learn about the brain and receive some advice on how to study. Charlie got the required permission from his parents and signed up for the program. Nearly one hundred other students registered as well. Most of them had struggled with math.

The psychologists formed the volunteers into classes of twelve to fourteen students each, and then secretly divided those classes into two large groups. But neither Charlie, his parents, or his teachers knew about the two large groups. Both groups of classes learned about the brain and how it works. They all received instruction on how to use their time most effectively and tips on how to organize, study, understand, and remember new material. Every student also explored how stereotypes can influence thinking about other people and discussed ways they might escape those threats.

Students in both groups had the same experiences—except for two vital sessions. On those special days, Charlie and his friends read aloud an article that Lisa Blackwell, one of the psychologists, had written especially for seventh graders: “You Can Grow Your Intelligence.” As they read, the students heard themselves say that when they learn, the brain physically changes. The article explained some recent scientific research which found that the nerve cells in the brain responsible for carrying messages make stronger connections after learning something new. The brain actually grows, the article told them, just like a muscle after daily exercise, sprouting
new connections between the cells. The active, learning brain will weigh more than one that doesn’t practice. Think about a baby learning to talk, the article concluded. A newborn can’t say a word, but by practicing sounds, that infant can eventually acquire a new language. When scientists look inside a child’s brain using Magnetic Resonance Imaging (MRI), they can actually see the changes that go on as the kid learns to talk.

When Charlie and his classmates finished reading, the two college students who led the session asked them to think about something they had learned to do by practicing, and got them to explain how their brains might have changed as they learned. The exercise bore a remarkable resemblance to one that Ernest Butler, Sarah Goodrich, Sherry Kafka, and their classmates had experienced in Paul Baker’s Integration of Abilities class. They had thought about some creative act they had accomplished and then explored what conditions had led them to undertake that work.

Meanwhile, students in the other group spent those same two days reading an article about how memory works. They learned new strategies for recalling material, and even had an opportunity to practice those memory tricks. In essence, then, they received both study and memory tips.

How did the students do? Most of the students went into the sessions generally believing that intelligence was fixed for life, but Charlie’s group emerged from the experience with much stronger notions that intelligence could improve with effort. That shouldn’t be surprising, since they read an article about how that happens and the other students didn’t. More important, Charlie’s group also generally showed greater motivation to do well in math class in the weeks and months following the experience. They sometimes stayed up late to get work done or asked for greater help during...
lunch periods, something they'd never done before. Most important, for students like Charlie who went into the experience believing that intelligence couldn't change and came out thinking that it might, academic performances in math classes suddenly reversed and started climbing rather than going down.

Lisa Blackwell, who headed the study in Charlie's school, noted that your theory about whether intelligence can change may not make much difference when times are easy and you don't face many challenges, but when you hit a bump in the road and failures accumulate, those who believe that they can improve their basic abilities are far more likely to weather the storm. That's precisely the pattern that we found among highly creative and productive people.

Weathering Unusual Storms

Debra Goldson lived in Jamaica until she was eight years old, enjoying the upper-class existence of her family's position. But her parents separated that year, and she and her mother moved to Queens in New York City, where life changed significantly. "We moved in with my grandmother and cousins. At one point, we had ten people living in a tiny apartment," she recalled. "It was a big switch moving from grass and trees to concrete and apartment buildings." She loved to read, and the big city gave her plenty of opportunities. "I would go to the library and get 10 books at a time and be done with them before it was time to go back." Murder mysteries fascinated the young girl, and she devoured all of Agatha Christie's novels.

New York City has specialized high schools. "You have to decide when you are about fourteen what you want to do in life and then go to the high school that will prepare you for that career. I was twelve when I decided to become a physician." Debra liked people
and taking care of them. "My mom had a heart condition, and no one could tell her what was wrong, so I wanted to become a cardiologist to help her." She had discovered the purpose that would guide her schooling. "I thought if I learned medicine that I could figure out what was wrong and fix my mom."

In the years to come, whenever Debra got sick and had to visit a doctor, her mother would always take the occasion to promote her daughter's career. "By the way," she would say, "my daughter wants to be a doctor; can you give her some advice on what she should be doing." But such requests often fell on deaf and prejudiced ears. "I would get this look," Debra remembered years later, "that said, 'Oh, that's not going to happen.'" That "look," as she called it, said to her, "You're a poor black girl from Queens who doesn't have a prayer of getting into medical school." It was not the last time someone would pass such judgments on her.

Discouraging looks aside, Debra enrolled in the Bronx High School of Science when she was thirteen. "It was a 2½ hour commute," she explained. "I had to leave at 6:00 in the morning and ride the subway." Her grades suffered. For the first time in her life, she faced challenging courses and had to struggle. Literature and math became her soulmates, and in one of those courses she discovered Robert Frost's poem "The Road Not Taken," and it made a deep impression on her. "Like the traveler in that verse, I've always taken the 'one less traveled,'" she explained.

Debra always looked for ways to push herself. "I could have gone to easier schools," she noted, "but that wouldn't have been good for me." By the time she graduated from Bronx Science, her grades had soared, and although she didn't get into the college of her choice, Vassar, she did well enough and packed her bags for Boston University. During the admissions interview for Vassar, they had asked her
what she would do with a million dollars. “Give it to my mom,” she’d declared proudly, but at that moment she knew she’d blown the interview. “He clearly expected some grand statement, but what did you expect from a child with a single mom who had lived in Queens with 10 other people?”

She chose every course at Boston University with one goal in mind: getting into medical school and becoming a physician. She majored in social psychology because she thought it would help her become a better physician. Social psychology and math—where she also took many courses—made enormous sense to her. Her grades skyrocketed. Yet the experience that made the deepest impression on her was a talk she had with a counselor after she had compiled an impressive academic record. The university required all premed students to see a counselor to make sure they were making the right choice. “He tried to explain to me why I wasn’t going to get into medical school. He keep telling me how difficult it would be and that I should give up the dream.”

Debra didn’t listen. Everything she did in school centered on getting into medical school and becoming a physician. She went to Bronx Science for that reason. She studied social psychology and pushed herself through difficult science classes for that reason. She ignored her counselor for that reason. Yet when she received her first offer to medical school, she turned it down.

Even before she finished college, a friend had arranged for her to interview with the dean of a medical school in Pennsylvania. She had already taken the Medical College Admission Test (the MCAT), and had done “really well,” scoring in the ninety-ninth percentile on the essay portion. Even though she hadn’t yet finished all of her premed courses, the dean accepted her on the spot. “It was a decent enough school, but they had this one annoying requirement.”
black student had to start taking medical school classes in the summer before everyone else started in the fall. "They didn't give me a choice, which might have made a difference in my decision. They just said I had to do it." When Debra described the requirement years later, she called it a "remedial program," and still bristled over the insult.

"I turned them down, much to the disappointment of my boyfriend at the time, and his father, who had arranged for the interview with the dean. But if I had accepted, I would have always wondered if I could have made it on my own." Debra had been told repeatedly that she couldn't make it. To defeat those skeptics, she had to feel in control of her own education. A requirement suggesting that she needed special help didn't sit well.

The next year she won admission to the medical college at Columbia University, one of the top schools in the country. In the first two years of medical school, students take basic science classes in everything from neurology to physiology. They attend classes, hear lectures, and take tests that often require them to remember large bodies of information. But they don't practice medicine. That comes in the last two clinical years and beyond. "I don't think your performance in those classes indicates what kind of doctor you will be," Debra concluded.

Once she was in the clinic, she excelled, winning constant praise for her abilities. She was finally doing what she had wanted to do since she was twelve years old. Doctors must reason through the evidence they have about a patient, consider all the possible explanations for some health problem, and make a judgment about what's wrong and how to treat it. They must then convince a patient to take their medicine or undergo treatment. Dr. Goldson mastered the science and art of doing that "differential diagnosis" that would
eliminate unlikely explanations and center on the one account that
most probably explained an ailment. "I would often continue to
think about a case while I slept, sometimes waking up in the mid-
dle of the night with a conclusion." She became a scientific sleuth,
weighing the evidence carefully. Her background in psychology in-
fluenced how she convinced a patient to follow her prescription. Af-
ter her medical training, she established a practice in northern New
Jersey that became one of the most respected in the state.

Through all of the struggles, the condescending looks, the dis-
couraging advice from a counselor, and the insult of a required pro-
gram she saw as remedial, Debra maintained a strong conviction
that she could do it. "Negative stereotypes never bothered me," she
said recently: "that's not my problem." As for intelligence, she came
to believe that effort paid the biggest rewards. "I now define being
smart in terms of how hard you try."