

InGenius: A Crash Course in Creativity

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INTRODUCTION: IDEAS AREN'T CHEAP THEY'RE FREE

- Provocative. !. Just one word... provocative. Until recently, prospective students at All Souls College, at Oxford University, took a “one-word exam.” The Essay, as it was called, was both anticipated and feared by applicants. They each flipped over a piece of paper at the same time to reveal a single word. The word might have been “innocence” or “miracles” or “water” or “provocative.” Their challenge was to craft an essay in three hours inspired by that single word. There were no right answers to this exam. However, each applicant’s response provided insights into the student’s wealth of knowledge and ability to generate creative connections. The New York Times quotes one Oxford professor as saying, “The unveiling of the word was once an event of such excitement that even non-applicants reportedly gathered outside the college each year. Waiting for news to waft out.” This challenge reinforces the fact that everything—every single word—provides an opportunity to leverage what you know to stretch your imagination.
- On the first day of class, we start with a very simple challenge redesigning a name tag. I tell the students that I don’t like name tags at all.
- I then ask, “Why do we use name tags at all?” At first, the students think that this is a preposterous question. Isn’t the answer obvious? Of course, we use name tags so that others can see our name. They quickly realize, however, that they’ve never thought about this question. After a short discussion, the students acknowledge that name tags serve a sophisticated set of functions. Including stimulating conversations between people who don’t know each other, helping to avoid the embarrassment of forgetting someone’s name, and allowing you to quickly learn about the person with whom you are talking. With this expanded appreciation for the role of a name tag. Students interview one another to learn how they want to engage with new people and how they want others to engage with them. These interviews provide fresh insights that lead them to create inventive new solutions that push beyond the limitations of a traditional name tag. One team broke free from the size constraints of a tiny name tag and designed custom T-shirts with a mix of information about the wearer in both words and pictures. Featured were the places they had lived, the sports they played, their favorite music, and members of their families. They vastly expanded the concept of a “name tag.” Instead of wearing a tiny tag on their shirts, each shirt literally became a name tag, offering lots of topics to explore. Another team realized that when you meet someone new, it would be helpful to have relevant information about that person fed to you on an as-needed basis to help keep the conversation going and to avoid embarrassing silences. They mocked up an earpiece that whispers information about the person with whom you are talking. It discreetly reveals helpful facts, such as how to pronounce the person’s name, his or her place of employment. And the names of mutual friends. Yet another team realized that in order to facilitate meaningful connections between people, it is often more important to know how the other person is feeling than it is to know a collection of facts about them. They designed a set of colored bracelets, each of which denotes a different mood. For example, a green ribbon means that you feel cheerful, a blue ribbon that you are melancholy, a red ribbon that you’re stressed, and a purple ribbon that you feel fortunate. By combining the different colored ribbons, a wide range of emotions can be quickly communicated to others, facilitating a more meaningful

first connection. This assignment is designed to demonstrate an important point: there are opportunities for creative problem solving everywhere. Anything in the world can inspire ingenious ideas—even a simple name tag. Take a look around your office, your classroom, your bedroom, or your backyard. Everything you see is ripe for innovation.

- Every new venture begins by addressing a problem or responding to an opportunity and relies upon the creativity of the founders.
- Students learn how to polish their powers of observation, practice connecting and combining ideas, and train themselves to challenge their assumptions and reframe problems.

ONE SPARK A REVOLUTION

- **Albert Einstein is quoted** as saying, “If I had an hour to solve a problem and my life depended on the solution, I would spend the first fifty-five minutes determining the proper question to ask, for once I know the proper question, I could solve the problem in less than five minutes.”
- A classic example of this type of reframing comes from the stunning **1968 documentary film Powers of Ten** written and directed by Ray and Charles Eames. The film, which can be seen online, depicts the known universe in factors of ten:
 - Starting at a picnic by the lakeside in Chicago, this famous film transports us to the outer edges of the universe. Every ten seconds we view the starting point from ten times farther out until our own galaxy is visible only as a speck of light among many others. Returning to earth with breathtaking speed, we move inward—into the hand of the sleeping picnicker—with ten times more magnification every ten seconds. Our journey ends inside a proton of carbon atoms within a DNA molecule in the white blood cell.
- Another example comes from the composer John Cage, who created a work called 4’33” (pronounced “four minutes, thirty three seconds”). It was composed in 1952 for any instrument or combination of instruments. The score instructs the performers to sit quietly, not playing their instruments for the entire duration of the piece. The goal is for the audience to focus on the ambient sounds in the auditorium rather than performed music. This controversial piece is provocative in that it shifts our attention to the sounds with which we are surrounded all the time.
- To shake up your frame of reference is to change your environment altogether. A wonderful example is described by Derek Sivers, founder of CD Baby, in his TED talk called “Weird, or Just Different?” He describes the way cities in Japan are organized. Instead of naming the streets and numbering the buildings as we do in the United States, in Japan the city blocks are numbered. The streets are seen as the spaces in between the blocks. In addition, on each block buildings are numbered in the order of when they were constructed rather than where they are located.
- According to Deborah Stipek, the dean of the School of Education at Stanford, instead of textbooks, high-school students are now given original sources to study, such as copies of letters from a wide range of people who lived during the period being studied that covered the story from different perspectives. In the new “Reading like a Historian” project, led by Abby Reisman and Sam Wineburg, the students get to study the information from all different points of view and come up with their own opinion about what really happened during that period. They discuss and debate the issues with their classmates. Not only does this approach provide a much deeper understanding of the material, but the students also make insightful connections and discoveries which propel them to discover even more when evaluated on the mastery of the factual material,

the students in the history classes that used original sources did better than those who were in standard classes using textbooks.

- Reframing problems takes effort, attention, and practice, and allows you to see the world around you in a brand-new light. You can practice reframing by physically or mentally changing your point of view, by seeing the world from others' perspectives, and by asking questions that begin with "why." Together, these approaches enhance your ability to generate imaginative responses to the problems that come your way.

TWO BRING IN THE BEES

- What happens when you cross a checkerboard with a midnight snack? You get edible checkers, sold with the motto "Beat 'em and Eat 'em." What if you cross high-heeled shoes with a tricycle? You get pumps with training wheels. Or, what do you get when you cross a dessert plate with an ice-cube tray? An ice cream bowl that melts after use so you don't have to wash it.
- These are just a few of the wonderfully fanciful ideas in John Cassidy and Brendan Boyle's *The Klutz Book of Inventions!*
- This is similar to the philosophy behind the Japanese art of chindogu which involves coming up with "unuseless" inventions. Essentially, chindogu involves combining products that are completely unrelated to create inventions that are wonderfully unusual. For example, an outfit worn by a baby with a mop on its belly.
- Being able to connect and combine non-obvious ideas and objects is essential for innovation and a key part of the creative thinking process
- **Many of the Japanese** creations that enhanced the functionality of existing objects involved clocks. For example, one person combined an alarm clock with vocabulary flash cards. In the morning, when the alarm clock goes off, you need to get a certain number of words correct in a flash quiz in order to turn off the alarm. Another person combined a clock with a room fragrance spray such that the clock released different scents at different times of day; morning scents are energizing, and evening scents are relaxing.
- The program is open to the public and is followed by an informal (Stanford Technology Ventures Program)
- He goes on to say that what made the original Macintosh computer great is that the people working on it were "musicians, and poets, and artists, and zoologists, and historians, who also happened to be the best computer scientists in the world. Apple took inspiration from their knowledge of these diverse fields to create something that was completely novel.
- Another example from scientific research comes from Robert Lane and Gary Quistad, of UC-Berkeley, who were investigating Lyme disease in northern California. It was a real mystery why there are pockets in the Bay Area with a lower incidence of Lyme disease. There are just as many ticks—the vector for this disease—across all the regions, but some ticks appear to be immune to the disease. By looking beyond the obvious, Lane and Quistad realized that there are many more blue-belly lizards in the areas where there is low Lyme disease. It turns out that the lizards are naturally immune to Lyme disease. So if a tick consumes the blood of a lizard, the Lyme disease in its system is destroyed. With a large number of lizards in an area, it is much more likely that a person there will be bitten by a tick that has already bitten a lizard and is now immune. This

surprising and important finding was only revealed because the scientists were killing and able to connect seemingly unrelated observations and patterns.

Three: Build, build, jump!

- Please line up according to your birthdays, from January 1 to December 31. Without talking.” As soon as I give these simple instructions to a room full of people, everyone typically freezes. It’s easy to read the looks on their faces. They’re saying, “Wait, that’s not possible.”
- In fact, there are dozens of ways to accomplish this task, most of which are more effective than using one’s hands to sign the dates. As suggested, they could have written their birthdays on a piece of paper. They could have taken out their driver’s licenses and shown their birth dates. Someone could have jumped up on a chair and played the role of director, instructing others to move into the right places. They could have created a time line on the floor and had everyone find their spot. Or they could have sung their birthdays. I said they couldn’t talk, but I didn’t say they couldn’t sing. And, of course, they could have used any combination of these approaches.
- The results of this simple exercise are surprisingly predictable across ages and cultures, and it uncovers a very important point: ‘most people fall into the trap of running with the first solution they find, even though it might not be the best solution. The first answers to any problem are not always the best answers. In fact. Much better solutions are usually waiting to be unearthed. Unfortunately, most people are satisfied with the first solution they find, missing the opportunity to come up with innovative approaches that require more effort to discover.
- How is this actually done? This is an age-old question that has been addressed in innumerable ways. Some of the approaches are very formal, such as the “Theory of Inventive Problem Solving,” or TRIZ (the Russian acronym) methodology, which was originally developed in the 1950s by Genrich Altshuller.

FOUR are you paying attention

- **Richard Wiseman**, of the University of Hertfordshire in the United Kingdom, handed test subjects in his laboratory a newspaper and asked each of them to count all the photos inside. Wiseman picked subjects for this experiment by recruiting individuals who identified themselves as being either extremely lucky or terribly unlucky. He wanted to see whether those people whose lives are filled with good fortune actually see the world differently than do those who are star-crossed. What do you think happened?
- In this experiment, the unlucky people took several minutes to count all the photos in the newspaper, and most came back with an incorrect answer. The lucky people, on the other hand. Took only a few seconds to find an answer, and they were all correct. Why was this?
- Wiseman designed special newspapers for this experiment. Inside the front cover of each newspaper there was a two-inch high message that read, “stop COUNTING. THERE ARE 43 PHOTOGRAPHS IN THIS NEWSPAPER.” Both groups WCTC looking for photos, as requested, but the lucky people also read this message and responded accordingly. In contrast, the unlucky people were focused only on counting the photos—since that was their specific assignment—and they didn’t see the message with the answer they needed. To test this result further, Wiseman gave the unlucky participated a second large notice that said, “Stop counting,

tell the EXPERIMENTER YOU HAVE SEEN THIS AND WIN £250.” Not a single —person claimed the money.

- This elegant experiment shows that people see the world very differently. In addition, it demonstrates beautifully that by ignoring information in your environment, you miss important clues that are the keys to solving problems. In fact, the world is filled with endless two-inch-high messages, and it is up to each of us to discover them.
- My colleagues Michael Barry and Anne Fletcher teach a class at the d.school on need-finding, which deals specifically with focused observation in order to identify opportunities for innovation. The entire class is designed to prepare students to be keen observers. They start out with a wonderful story by the late American novelist David Foster Wallace:
 - Two young fish swim past an older fish. As they pass the older fish, he says, “Morning, boys. How’s the water?” The two young fish continue on for a while until one eventually asks the other, “What the heck is water?”
- Another compelling example comes from David Friedberg, the founder of the Climate Corporation. While working at Google, David passed a small bike-rental shack each day as he drove to work. Over time he noticed a pattern: whenever it rained, the shack was closed for business. This observation led to the insight that millions of businesses are influenced by the slather, including farms, movie theaters, and ski resorts. He decided to leave Google to start a company that sells insurance to protect businesses from weather-related losses. David would never have come up with this idea, and launched this successful venture, had he not paid careful attention to the world outside his car while driving to work.
- Unfortunately, I hadn’t gone through the same training as my son. Josh. My father played a game with him and his cousins, Adam and Noah, when they were growing up, to teach them to pay careful attention to their environment. Whenever they were in a new place, my father would playfully ask the boys to shut their eyes, and he would quiz them about the details of the room. He’d ask questions such as how many windows there were, how many doors, and how many lights were on the ceiling. They loved this game and learned to be incredibly observant in order to be prepared for these pop quizzes from their grandfather.
- She picks up all six cards. Looks at them carefully, and puts five cards back down on the table, telling you that the card you selected will be missing from the lineup. She’s right. Your card is gone! How did she know? If you were really paying careful attention, you would see that all five of the cards she placed on the table had changed. The magician didn’t need to know which card was yours. She just had to count on the fact that while you were focusing on one card, you wouldn’t notice the difference between cards that look similar. Such as a king of hearts and a king of diamonds; or between a queen of spades and a queen of clubs. Magicians take full advantage of our lack of focus and our ability to be distracted as they make objects appear to disappear, as they cut people in half, and when they pull rabbits out of hats.
- **OBSERVATION LAB**
 - Before Entering
 - What is in the window of the store?
 - Does this store draw you in? If so, how?
 - Is the door to the store open or closed?
 - How big is the lettering of the store name?
 - Environment

- What is the color scheme of the store?
- What type of floor does the store have
- How high is the ceiling?
- How does this feel?
- How brightly lit is the store?
- How does this affect you?
- How loud is the environment?
- Is there music playing? What type?
- Is the store crowded with merchandise, or is it sparse?
- Does the store appear very organized, or is it cluttered?
- Does the store have a distinctive smell?
- Where is the cash register located?
- How visible is the store security?
- Personnel
 - How long does it take a salesperson to initiate contact?
 - Does the salesperson have a script to follow?
 - What is the ratio of salespeople to customers?
 - What age and gender are the employees?
 - Do the salespeople appear to have a uniform?
- Products
 - Is there a central display table with featured products?
 - Which products are at eye level?
 - Which items in the store are least accessible?
 - Where are the most and least expensive products?
 - Are the prices of the products easy to find?
 - Are there impulse items near the cash register?
- Customers
 - What is the average age of the customers?
 - How long do customers stay in the store on average?
 - Do most customers appear to be on a mission?
 - What percentage of customers purchase products?
 - Is this store equally accessible to disabled customers?

FIVE: The Table Kingdom

- The spaces in which we live and work are the stages on which we play out our lives. As such, they have a huge impact on our thoughts and behavior. From the moment we are born we respond to the space around us. It has been shown that children who grow up in stimulating environments have brains with a more highly developed neo-cortex, the outer layer of the brain. And there is evidence that such people are more capable of solving complex cognitive problems later in life. That's why new parents often try to create a rich environment for their babies and young children. They surround them with bright images and toys that activate their nervous system and spark their imagination. Kindergartens strive for an equally stimulating environment. Rooms are filled with manipulative such as blocks and Legos there is an abundance of brightly colored books and

games, and the furniture is designed so that kids can work independently, in groups, or as an entire class.

- You have a very different relationship with those who work near you than with those who are far away. Studies have shown that if someone works more than fifty feet away, your collaboration and communication is comparable to that of workers who are in different buildings.
- Remarkably, the students in the ecosystem on the side of the room with the chairs (but no tables) almost instantly started to collaborate with one another. Within minutes, the chairs were rearranged into one large circle or pushed aside altogether, as they worked on the puzzles on the floor. They figured out that by working together, they earned the maximum number of points for the game. On the other hand, the teams on the side of the room with tables (but no chairs) all anchored themselves to their respective tables. They did not collaborate at all and thus ended up limiting the number of points each team earned. Since the tables in the room have wheels and move easily, it would have been a trivial matter to push them together to create one big team. However, in the dozens of times I have run this exercise, this never happens. The participants are always shocked when I point this out to them. They think that they have been making well-thought-out strategic decisions and are blown away by the realization that the space literally dictated what they would do.
- **No variable** should be overlooked when designing a creative space. Including the color of the walls or the music played in the background. Recent studies suggest that red walls help you focus your attention, while blue walls foster creative thinking. The explanation is that blue conjures up images of the sky and thus opens up your mind. This is consistent with the finding that people have more expansive ideas when outside or in spaces with high ceilings.
- A 1984 study shows that hospital patients recover at different rates depending on the view outside their window. Researchers at a suburban Pennsylvania hospital found that twenty-three surgical patients who had rooms with windows that looked out on a natural scene had significantly shorter postoperative hospital stays and took fewer painkillers than twenty-three similar patients who were in rooms with windows that faced a building
- Ewan McIntosh, who is an international expert on learning and technology spends considerable time thinking about learning spaces. He describes seven different types of spaces that can exist in both the physical and the online world. Based upon prior work with Matt Locke, Ewan describes how different types of spaces dramatically change how we interact with one another.

SIX think of coconuts.

- **The results have** been astounding. The students have three “Times more work to do, but they do a much better job and enjoy it much more. The pressure is there from the start, and their energy never wanes, since there is no time to waste. Constraints of all types play an important role in creative output. As Marissa Mayer, head of product development at Google, says, “Creativity loves constraints.”

High Creativity	EXPEDITION	MISSION
Low Creativity	AUTO-PILOT	TREADMILL
	Low Pressure	High Pressure

- **A memorable example** comes from Monte Python's movie *Monte Python and the Holy Grail*. In a scene in this low-budget movie you hear horses coming toward you through a thick fog. As they get closer, you realize that there are no horses—just a soldier banging two coconuts together to sound like the clapping of horses' hooves. The budget was so low that they couldn't afford horses. As an alternative, the actors decided to bang two coconut shells together to create the sound. The scene, which would have worked with horses, is so much funnier with coconuts instead. This is a poignant reminder that less is often more. In addition, it echoes the message about framing problems. By asking the question "How can we re-create the sound of horses," as opposed to "How do we get horses," the range of solutions shifts dramatically.
- To stimulate the students' imagination and get to know them on the first day of our creativity course, we asked them to introduce themselves to each other using their own six-word memoir. The severe limitations produced interesting results. Here are some samples:
 - My greatest ideas involve duct tape.
 - Corpses no longer follow me home.
 - Two eyes open, but still nearsighted.
 - I never turn down a dare.

SEVEN Move the Cat Food

- First, Chatfield describes the need to give individuals both accurate and frequent feedback about their progress in any game
- The complete opposite of this approach is seen in typical company performance reviews, which are usually conducted once a year, before salaries and bonuses are calculated. Not only does this infrequent feedback result in greater stress for employees; it also diminishes creativity. With infrequent feedback, employees do what is safe and avoid taking creative risks for fear of a negative review at the end of the year. They do what they know will work rather than trying something novel. By contrast, if managers provide frequent feedback, employees have a chance to modify their behavior rapidly before deep-seated patterns and set expectations are set.
- Right after class, the teaching team and the students gather to participate in an "I Like, I Wish, What If" discussion. We roll in a whiteboard and sit around in a circle
- A humorous example comes from a new website called *Written? Kitten!* Which is designed to encourage writing.
- And in the "kamikaze" mode, if you stop writing, the program will start to erase your written work, one word at a time, until you start again."
- Creativity, as well as gaming, has many dead ends, and people need to be rewarded for exploring and finding out that a particular approach won't work
- Scientists who study animal behavior have known this for many years. The famous psychologist B. F. Skinner found that intermittent, or random, rewards lead to more robust behavior. For example, if a monkey discovers that sometimes pressing a bar produces a piece of fruit and other times it doesn't, the monkey will press the bar more consistently, knowing that sometimes the effort will pay off
- Games are a great way to demonstrate that small changes in the rules have a big impact on creative behavior.

- In other cases the FDA has rules in place that appear to inhibit innovation. One person who has taken on the challenge of trying to improve medical innovation in the United States by changing these policies is Josh Makower. Josh is a physician, engineer, and serial entrepreneur who has started several successful medical technology businesses. Josh is concerned that the current situation at the FDA is seriously threatening the evolution of the next generation of medical devices, such as stents, artificial joints, and implanted devices that can help with illnesses as diverse as migraine headaches or menstrual cramps.
- Right now, there is a daunting array of restrictions on testing and adoption of these new devices. For example, because of conflict-of-interest concerns, the FDA puts significant restrictions on the way physicians can test medical technology inventions. In addition, the FDA officials who make the decisions about which devices are approved receive no rewards for approving successful innovations, but do risk punishment if a device they approve later has problems. As a result, FDA officials are much more likely to deny approval of new innovations, and most new medical technology devices that are invented in the United States are released internationally long before they are available in the U.S.
- Many leading medical technology inventors, such as Josh Makower, are working hard to encourage the FDA to achieve an ‘appropriate balance between safety and innovation, so that the pipeline to the marketplace is much smoother

EIGHT Marshmallow on Top

- No matter how prepared you are, almost all teams face challenges at one time or another. At the Stanford d.school, we have a psychologist on staff whose job is to help with team dynamics in order to avoid common pitfalls and to help solve problems when they arise. Known as the d.shrink, Julian Gorodsky teaches classes on working in groups and coaches teams when they run into roadblocks as they tackle problems that have multiple possible solutions. Julian and his team develop and test team communication tools, such as a checklist for teams to fill out to help them evaluate and improve their working relationships.
- And when you feel better, you are much more creative and deliver more. To quote Pixar’s Brad Bird, who directed *The Incredibles* and *Ratatouille*, “The most significant impact on a movie’s budget—but never in the budget—is employee morale. If you have low morale, for every dollar you spend, you get about twenty-five cents of value. If you have high morale, for every dollar you spend you get about three dollars of value. Companies should pay much more attention to morale.

NINE Move Fast-Break Things

- According to a recent study by Laura Schulz at MIT, giving people facts and specific directions rather than allowing them to discover information on their own not only inhibits their natural experimentation, but dulls their curiosity. Here is a short excerpt from an article by Jonan Lenner about this research:
 - This research consisted of giving 4-year-olds a new toy outfitted with four tubes. What made the toy interesting is that each tube did something different. One tube, for instance, generated a squeaking sound, while another tube turned into a tiny mirror. The first group of students was shown the toy by a scientist who declared that she’d just found it on the floor. Then, as she revealed the toy to the kids, she “accidentally” pulled one of the tubes

and made it squeak. Her response was sheer surprise: “Huh! Did you see that? Let me try to do that again!” The second group, in contrast, got a very different presentation. Instead of feigning surprise, the scientist acted like a typical teacher. She told the students that she’d gotten a new toy and that she wanted to show them how it worked. Then, she deliberately made the toy squeak.

- After the demonstration, both groups of children were given the toy to play with. Not surprisingly, all of the children pulled on the first tube and laughed at the squeak. But then something interesting happened: While the children from the second group quickly got bored with the toy, those in the first group kept on playing with it. Instead of being satisfied with the squeaks, they explored the other tubes and discovered all sorts of hidden surprises. According to the psychologists, the different reactions were caused by the act of instruction. When students are given explicit instructions, when they are told what they need to know, they become less likely to explore on their own. Curiosity is a fragile thing.
- A few schools have adopted an approach that allows students to learn through experimentation. An example is the Tinkering School, run by Gever Tully. It offers a program where kids ages eight to seventeen learn how to build things by “fooling around.”
- Finally, at the emotional-risk booth they had to create a postcard with a secret. This was inspired by the Post Secret web site, which anonymously shares secrets on postcards that people around the world send in. Almost everyone participates, despite the sensitivity of this exercise
- You can practice performing small experiments every day until doing so becomes quite natural. These experiments need not be earth-shattering, just interesting. When I was a girl, my father turned almost everything we did into an experiment. When we went out to dinner, for example, he would blindfold all three kids and feed us black and green olives to see if we could tell the difference. He would keep a tally and give us the results at the end. Or, when one of us left the cap off the toothpaste tube. He would line us up, ask us questions, and take our pulses, similar to a lie detector test. He would start with easy questions such as “What is your name?” or “What is your birthday?” while he took our pulse. Then he would ask the key question, “Did you leave the cap off the toothpaste tube?” He would see if our pulses increased while we answered this question as an indication that we might not be telling the truth. This was a playful way to add experimentation to our everyday lives. Soon it became a natural way to approach the world.

TEN: If anything can go wrong, fix it.

- **This story is a reminder** that you see what you want to see. If you view yourself as a creative person, you are much more likely to come up with innovative ideas. But if you define yourself as a worker bee who merely implements the ideas of others, that is the role you will play.
- When they’re finished, she compares the two approaches and end products. Putting puzzles together requires a fixed goal, and if a single piece of the puzzle is missing, you aren’t able to succeed. On the other hand, making a quilt is an open ended process in which you can quickly change direction based upon the pieces you have on hand. And no matter what materials you are given, you are able to complete the quilt. Heidi shows her students that innovators and entrepreneurs are much more like quilt makers than puzzle builders. They have a mind-set that allows them to respond to the unexpected and to leverage the resources that are available in order to create something of value rather than waiting for all the expected pieces to show up.

- Some people are driven by their strong fear of failure and therefore are unwilling to take on challenges that have a chance of not turning out well. Others are driven by their strong fear of missing an opportunity. The latter group is willing to take on projects that might not turn out as expected, because they don't want to miss the chance that it will succeed.
- Even more remarkable, the United States put a man on the moon in less than nine years after President John F. Kennedy set forth that challenge in 1961. The prize in this case was global recognition, motivated by intense international competition. Everything that was needed to take on that audacious goal had to be invented in order to succeed. And it was all done by a team of engineers with an average age of 27, with less computing power than a modern cell phone. In addition, according to author Catherine Thimmesh, approximately four hundred thousand people were directly involved in accomplishing this amazing feat including seventeen thousand workers at Kennedy Space Center, seventy-five hundred Grumman employees who built the lunar module, and five hundred designers and seamstresses who constructed the space suits.

ELEVEN inside out and outside in

- On the inside, your creativity is influenced by your knowledge, imagination, and attitude.
- Your attitude is the spark that jump-starts your creativity, and without the attitude that you can come up with breakthrough ideas, your Innovation Engine comes to a standstill
- Individuals who think intelligence is malleable say things such as “When the going gets tough, I put in more effort” or “If I make a mistake I try to learn and figure it out.” However, those who think that their intelligence is fixed don't take opportunities to learn from their mistakes.
- It is important to note that our mind-sets are malleable. Carol Dweck of the Stanford School of Education has done a tremendous amount of work on this topic and has shown how the messages that others tell us and that we tell ourselves dramatically influence how we see our place in the world. Compelling proof comes from a study by Dweck and Lisa Sorich Blackwell on low-achieving seventh graders. All of the students had a study skills workshop. Half of the group attended a general session on memory, while the other half learned that the brain, like a muscle, grows stronger through exercise. The group that was told that the brain is like a muscle showed much more motivation and had significantly improved grades in math, while the control group showed no improvement. This study is supported by extensive research and demonstrates that your mind-set and attitude are within your own control.