



Before STEM (science, technology, engineering and mathematics) and invention education became widely recognized as effective methods of teaching 21st-century skills, the National Inventors Hall of Fame® began crafting education programs that promote creativity.

For more than 30 years, we have collaborated with our Inductees to develop meaningful opportunities for children to engage in hands-on innovation. Informed by lessons and stories from our Inductees' professional lives, we have identified nine essential skills and traits that turn creative potential into tangible results. We call this the I Can Invent® Mindset.

Each year, while developing new curricula, our education team uses the I Can Invent Mindset as a guide to ensure that all participants in our in-person and at-home programs are developing the vital skills they need to succeed. Because many of today's students will likely enter a workforce filled with jobs that do not yet exist,<sup>1</sup> we believe that one of the best ways to prepare them is to teach them how to adapt and innovate when faced with challenges and adversity.

By exploring the stories of our Inductees, children can learn from real-world examples of the I Can Invent Mindset in action.

## Persistence Makes the Impossible Possible

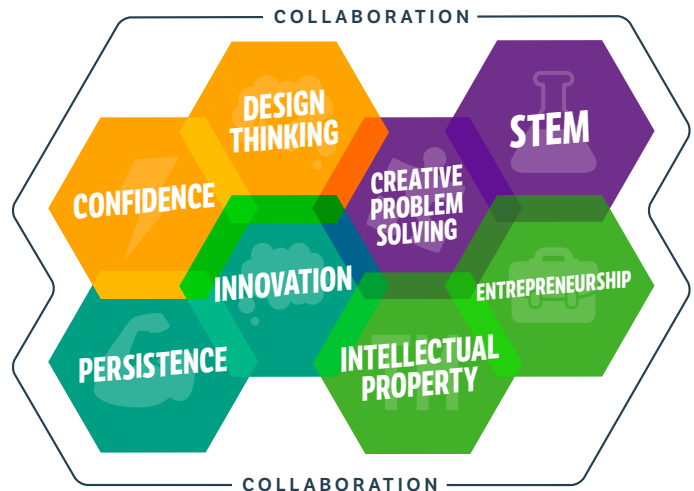
Persistence is the ability to carry on in the face of challenge, hardship and opposition. Because everyone experiences times when things don't go according to plan, being able to not give up but instead work toward a solution is a priceless attribute that can be applied to many aspects of a person's life.

In the context of education, research has shown that a student's levels of persistence not only improve academic outcomes (independent of IQ), but are also predictive of their ability to keep commitments.<sup>2</sup> The sooner we can help children develop their persistence, the faster they can benefit from skill and realize that they can overcome any obstacle they put their mind to.



### The Incredible Persistence of Chieko Asakawa

When Inductee Chieko Asakawa was 11 years old, she was injured in a swimming accident that damaged her optic nerve and caused her to go blind by the time she turned 14. While she was at first scared about what this unexpected accident would mean for the rest of her



life, she made the decision to do whatever it took to lead a productive and active life.

She started learning Braille at age 15 and became so proficient at reading English Braille that she earned a degree in English literature from Otomon Gakuin University in Osaka, Japan, in 1982. As she considered what type of career she wanted to pursue, she came across an article that changed her life.

"I read an article about a blind person who became a computer engineer," Asakawa said in an interview with the National Inventors Hall of Fame. After reading this story, she found a special two-year computer programming course specifically for blind people.

Following the completion of the program, Asakawa was offered a position as a visiting researcher at IBM Research Tokyo. Here, she worked on projects including a Braille editing system and a Braille network system.

With the introduction of the internet in the 1990s, Asakawa was amazed at the amount of information it provided users. She quickly made it her goal to give visually impaired individuals access to these resources.

"The Home Page Reader became available in 1997," Asakawa said. "At that time, graphical user interfaces were not very suitable for blind people, but the Home Page Reader allowed blind people to access the web by just using the number keys and synthesized voice." Her intuitive voice browser became an instant success and was quickly translated into 11 languages.

1. Leopold, Till Alexander, et al. "The Future of Jobs and Skills." World Economic Forum, Retrieved from [reports.weforum.org/future-of-jobs-2016/chapter-1-the-future-of-jobs-and-skills/](https://reports.weforum.org/future-of-jobs-2016/chapter-1-the-future-of-jobs-and-skills/)  
2. Eskreis-Winkler, Lauren, et al. "The Grit Effect: Predicting Retention in the Military, the Workplace, School and Marriage." *Frontiers in Psychology*, 3 Feb. 2014, doi:10.3389/fpsyg.2014.00036.

After graduating with a doctorate in engineering from the University of Tokyo in 2004, Asakawa earned the distinction of becoming an IBM fellow in 2009. Today, she heads the Cognitive Assistance Laboratory at Carnegie Mellon University and is focused on developing a technology called “NavCog,” an indoor navigation system that allows blind people to safely move around complicated indoor locations such as airports, schools and hospitals.

When asked to reflect on her legacy as an inventor, Asakawa described her pride in being able to both innovate and release new technologies for the benefit of others. “Without innovation, we cannot achieve higher goals. But without deployment, we can’t change society,” Asakawa said. “My motto is to make the impossible possible by never giving up.”

**“MY MOTTO IS TO MAKE THE IMPOSSIBLE POSSIBLE BY NEVER GIVING UP.”**

## Asakawa’s Story Inspires Others to Never Give Up

Asakawa did not let a childhood accident prevent her from accomplishing her dreams of becoming a computer engineer. Despite going blind at age 14, she found a way to become one of the leaders in her field by using her abilities to improve computer access for vision-impaired people around the world.

Throughout their lives, students will experience their own obstacles they must overcome, and Asakawa’s story is one that can inspire them to never give up on their goals.

## Intellectual Property Knowledge Protects Creators

Intellectual property (IP) is everywhere – from our favorite brand of sneakers to the songs we listen to on the radio. Referring to creations of the mind including inventions, artistic and literary works, symbols, names and images used in trade,<sup>3</sup> IP gives people an incentive to innovate by providing legal protections over their creations.

While IP is a subject rarely taught in traditional school settings, it’s one that is critically important to helping students understand that their ideas have value.



## Gordon Gould’s Lessons in Intellectual Property

On a cool November night in 1957, inductee Gordon Gould, a physics graduate student at Columbia University, realized that by using a combination of chemicals, electrical currents and mirrors, he could manipulate light into a concentrated beam. He spent

the following weekend compiling nine pages of calculations into his laboratory notebook. These pages contained the first known occurrence of the word “laser” — an acronym for light amplification by stimulated emission of radiation.<sup>4</sup>

Though Gould notarized his laboratory notebook, demonstrating his contributions to laser technology, this was not enough to provide complete IP protection. For this, he needed a utility patent.

Unfortunately, Gould mistakenly believed he needed to build a working prototype before starting a patent application. This misunderstanding would prove costly. For the next 30 years, he fought to win approval of 10 patent applications related to laser technology first submitted in 1959.<sup>5</sup>

Gould finally began to receive royalties in 1988 when the United States Patent and Trademark Office accepted his claim for inventing the optically pumped laser. However, legal expenses forced him to sign away 80% of these earnings to companies who financed his lengthy court battles.<sup>6</sup>

“I was disappointed in myself because I had done this stupid thing of not simply sitting down and writing a patent application,” Gould said. “If I had done that, I would have had that first patent.”<sup>7</sup> Gould’s story is a cautionary one. Had he taken the proper steps to patent laser technology, decades of legal battles would have been avoided. Because he lacked a working knowledge of IP, he lost out on early ownership for his laser.<sup>8</sup>

**“IF I HAD DONE THAT, I WOULD HAVE HAD THAT FIRST PATENT.”**

## Providing Protection to Creator

Gould’s story is a cautionary one and speaks to how important it is for innovators to understand IP. For students interested in starting a business, inventing a new product or even creating a work of art, possessing even a cursory knowledge of IP can help them avoid serious problems and help them ask the right questions when it comes to protecting their creations.

For children interested in the STEM fields, subjects that continue to produce some of the world’s most impactful innovations, being introduced to IP at an early age will give them a sizable advantage over those who are not able to benefit from the same opportunity.

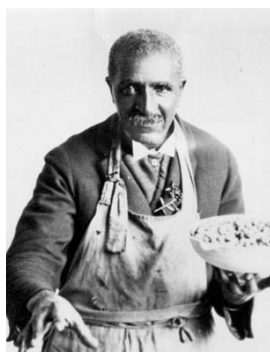
3. The National Inventors Hall of Fame. “Guide to Intellectual Property: IP Is Everywhere.” National Inventors Hall of Fame®, [www.invent.org/blog/intellectual-property/starbucks](http://www.invent.org/blog/intellectual-property/starbucks)
4. Maugh, T. H., II. (2005, September 21). “Gordon Gould, 85: Physicist finally got his due for the laser.” Los Angeles Times. Retrieved from <https://www.latimes.com/archives/la-xpm-2005-sep-21-me-gould21-story.html>
5. Ibid.
6. Chang, K. (2005, September 20). “Gordon Gould, 85, figure in invention of the laser, dies.” The New York Times. Retrieved from <https://www.nytimes.com/2005/09/20/science/gordongould-85-figure-in-invention-of-the-laser-dies.html>
7. Hall, C. (1987, December 17). Inventor beams over laser patents: After 30 years, Gordon Gould gets credit he deserves. Los Angeles Times. Retrieved from [http://articles.latimes.com/1987-12-17/news/vw-29544\\_1\\_patents](http://articles.latimes.com/1987-12-17/news/vw-29544_1_patents)
8. Ibid.

## Creative Problem Solving Can Change the World

As our world becomes increasingly complex, so too will the challenges we will need to overcome. When confronted with problems that do not have a straightforward solution, we must make use of our creativity and imagination.

By combining critical and creative thinking, some of the world's greatest innovators have used a process known as creative problem solving to resolve both incredibly complex problems and to improve existing ways of doing things.

For students who likely will be expected to uncover solutions that do not yet exist when they join the workforce, knowing how to apply creative problem solving is vital.



### George Washington Carver's Revolutionary Creative Problem Solving

Born into slavery, Inductee George Washington Carver overcame enormous hardship to become a world-famous chemist who changed agriculture forever. His contributions to the science of crop rotation, the practice of cultivating different plants

over various growing seasons to maintain soil health, proved life changing for poor farmers whose cotton crops drained the soil of its nutrients.

While farmers were pleased with the results of this new farming method, many now found themselves with a surplus of peanuts and sweet potatoes, and they were unsure of what to do with them.

Carver put his creative problem-solving skills to work by inventing many different uses for these crops. He turned sweet potatoes, for example, into flour, vinegar and even writing ink, dyes and paint.<sup>9</sup>

It was with peanuts, however, that Carver found his greatest success. While he did not invent peanut butter, as is commonly believed, in total he developed 325 different uses for peanuts, including milk, cooking oil, paper, soap and wood stains.<sup>10</sup>

Carver gained prominence in the peanut industry, and in 1921 he even appeared before the Ways and Means Committee of the U.S. House of Representatives, which at the time was requesting tariff protection. During his testimony, he described the many different products that could be produced from peanuts and convinced the committee to approve "a high protected tariff for the common legume."

This achievement earned him the nickname "Peanut Man."

When Carver first arrived at the Tuskegee Institute (now Tuskegee University) in 1896, the peanut was not even recognized as an official U.S. crop. However, by 1940, it ranked among the six leading crops in the country and became the second most

popular cash crop in the South behind cotton.<sup>11</sup> Today, both peanuts and sweet potatoes are consumed regularly by millions of people across the country.

Through his research and discoveries, Carver helped raise the standard of living for poor farmers across the South by improving both their cotton yield and their diet with the growth of peanuts and sweet potatoes.

When Carver passed away on Jan. 5, 1943, he contributed his life savings to establish an institute at Tuskegee. His birthplace was declared a national monument in 1953 — the first ever dedicated to a Black American and non-president.

“CARVER HELPED RAISE THE STANDARD OF LIVING FOR POOR FARMERS ACROSS THE SOUTH”

### Making a Difference

If all Carver did was significantly advance the science of crop rotation, he likely still would have been remembered throughout history. However, he continued innovating, and by using his creative problem-solving skills discovered hundreds of uses for peanuts and sweet potatoes that helped enrich the soil.

Carver's story can help students realize the power of creative problem-solving. Are there other natural materials that could be used in unique ways? Are there common challenges that could be completed faster or more effectively?

By asking questions like these, children begin to understand that growth and improvement are always possible, and that they can make a difference.

## The Power of the I Can Invent Mindset

At the National Inventors Hall of Fame, we believe that when it comes to creativity and invention, there are no predetermined formulas or methods. However, there does exist a collection of common themes that inventors often describe when they discuss what it takes to innovate successfully.

The I Can Invent Mindset represents these collective traits, and when applied to the development of our education programs, provides a way for all students to realize their potential to innovate. Thanks to our close partnership with our Inductees, we are confident that the nine attributes that make up the I Can Invent Mindset are both effective in efforts to innovate and applicable to overcoming obstacles and challenges in any area of life.

9. History.com Editors. (2009, October 27). George Washington Carver. History.com. <https://www.history.com/topics/black-history/george-washington-carver>

10. Ibid.

11. The Science History Institute. (2020, October 15). George Washington Carver. Science History Institute. <https://www.sciencehistory.org/historical-profile/george-washington-carver>

12. Ibid.