

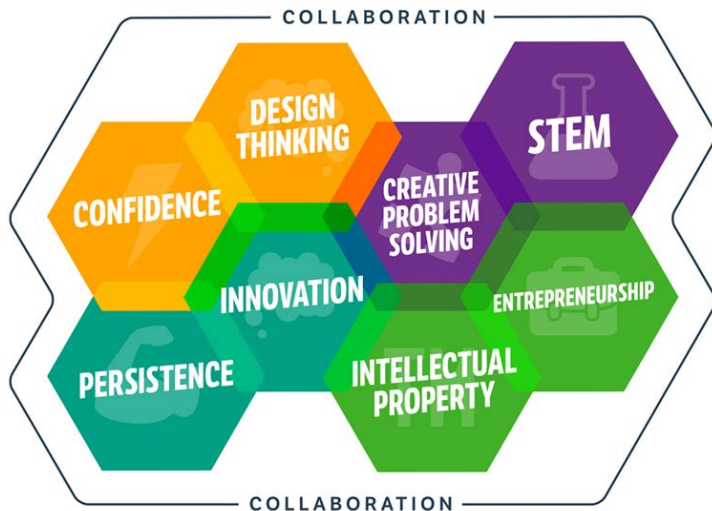


As part of our mission to recognize inventors, promote creativity, and advance the spirit of innovation and entrepreneurship, the National Inventors Hall of Fame® collaborates with our Inductees to develop engaging, hands-on education programs for students across the country.

For more than 30 years, these STEM (science, technology, engineering and mathematics) experiences have inspired millions of students across all 50 states. This is in large part thanks to the integration of the I Can Invent® Mindset — a set of nine skills and attributes that equip children to transform creative ideas into tangible solutions for real-world problems.

Many of today's students likely will enter the workforce with jobs and careers that do not yet exist,<sup>1</sup> and we believe that to best prepare for this inevitable future, we must equip students with the skills to adapt and innovate, especially when faced with complex challenges.

By exploring the stories and lessons of our Inductees, children have the opportunity to learn from real-world examples of the I Can Invent Mindset in action.



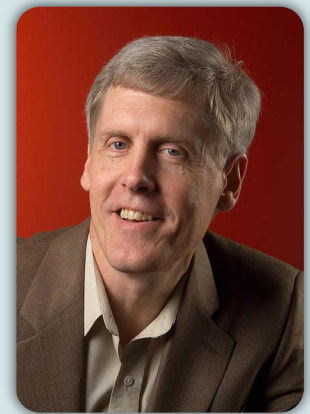
## Entrepreneurship Builds Resilience

Revolutionary ideas are not always appreciated when they are first shared with the world. Sometimes ideas are so new and radical that they are rejected outright by those more comfortable with the status quo. This is not unreasonable, as we are naturally wired to fear the unknown.<sup>2</sup> Entrepreneurs must fight this instinct, and continue to develop and promote their ideas or ventures in the face of resistance.

Teaching students foundational entrepreneurial skills from a young age can help them better identify opportunities<sup>3</sup> and give them the confidence to take risks. By treating failure as an opportunity for improvement, children build confidence and iterate on their ideas over time, allowing them to solve problems in new and creative ways.

## Steve Sasson's Entrepreneurial Mindset

From an early age, National Inventors Hall of Fame Inductee Steve Sasson loved investigating electronics and exploring new technologies and their capabilities. When he was just 13 years old, he built his own amateur radio and accidentally sent out a signal on a banned frequency. In response, the Federal Communications Commission sent him a letter.



“My father simply couldn't understand how this kid could get in trouble with the federal authorities,” Sasson said in an interview with the National Inventors Hall of Fame. “We sent the letter back and it was fine, but I remember that was the first time that I felt my parents didn't know what to do with me.”

This interest in electronics and fondness for creative disruption followed him throughout his education, and after graduating with both a bachelor's and master's degree from Rensselaer Polytechnic Institute, he landed a job working at a research laboratory at the Eastman Kodak Co. There, he was able to do what he loved most: tinker with electronics.

“The most amazing thing about being at Kodak was that they paid me to do what I loved,” Sasson said.

In 1974, Kodak supervisor Gareth Lloyd tasked Sasson with investigating whether the recently created charged-coupled device (CCD) — a mechanism that captures light and transfers it into usable data — could be used to produce an image sensor for a camera.

1. The World Economic Forum. (n.d.). The Future of Jobs. World Economic Forum. <https://www.weforum.org/reports/the-future-of-jobs/>

2. Furr, N., & Furr, S. H. (2022, June 21). How to Overcome Your fear of the Unknown. Harvard Business Review. <https://hbr.org/2022/07/how-to-overcome-your-fear-of-the-unknown>

3. Gillett, A., & Kelterborn, K. B. (2022, February 25). How to Inspire Entrepreneurial Thinking in Your Students. Harvard Business Publishing Education. <https://hbsp.harvard.edu/inspiring-minds/how-to-inspire-entrepreneurial-thinking-in-your-students>

For the next year, Sasson was given complete autonomy to tackle Lloyd's challenge. While each day was filled with excitement for the opportunity to advance the field of photography, Sasson also faced his own share of adversity. No roadmap existed besides the one he actively created.

His persistence paid off in December 1975 when he produced a device that combined a Super 8 movie camera lens, 16 nickel-cadmium batteries, an analog/digital converter, a CCD imaging array, an A/D converter and dozens of digital and analog circuits wired together on half a dozen circuit boards: the world's first digital camera.

Sasson continued to develop digital camera technology, and together with his colleague Robert Hills developed the first self-contained digital single-lens reflex (DSLR) camera in 1989. However, Kodak decided not to market the product in order to protect its lucrative monopoly on film photography within the United States.

This would prove to be a costly decision for Kodak. While its digital camera patent portfolio earned the company billions of dollars,<sup>4</sup> in large part due to its reluctance toward fully embracing digital camera technology, the company filed for bankruptcy in 2012.<sup>5</sup>

As an advocate of invention education, Sasson believes it is essential to empower students to challenge assumptions and take creative risks.

***"I think it's critical for us to make progress with every generation, challenging the assumptions of the previous generation," Sasson said. "I think that's the way you make progress."***

## Thinking Like an Entrepreneur

Entrepreneurship is not easy. Within the United States, 20% of small businesses fail within the first year, and by year five, this number balloons to a staggering 50%.<sup>6</sup>

And yet in the face of these odds, each day people around the country start businesses of their own because they have a steadfast belief in what they're trying to achieve. Sasson applied this same sort of determination while inventing and promoting the digital camera. Despite pushback from Kodak, he believed in his invention and continued moving forward. Helping children realize their ideas have value at an early age can encourage them to pursue their creative ambitions and perhaps one day start a business of their own.

## Overcoming Challenges With Confidence

Within STEM subjects, especially mathematics, students can sometimes feel nervous or anxious about their ability to succeed.<sup>7</sup> While reasons for this range from environmental factors to societal stereotypes or even personal factors,<sup>8</sup> one of the core ways to combat these negative emotions is to help students build their confidence in STEM.

Helping children identify a relatable STEM role model is one way to do just that. As we continue to work toward diversifying STEM fields, we believe students should be exposed to role models who look, sound or learn like them to help them gain confidence in their ideas, abilities and potential.<sup>9</sup>

### Beatrice Hicks' Trailblazing Confidence

National Inventors Hall of Fame Inductee and Society of Women Engineers (SWE) co-founder Beatrice Hicks did not allow gender discrimination to get in the way of her desire to become an engineer and make significant contributions in the field.



Born in 1919 in Orange, New Jersey, from a young age Hicks expressed a deep interest in and gift for mathematics, science and engineering. Surrounded by engineering marvels including the George Washington Bridge and Empire State Building, at 13 she expressed to her father that she would like to follow in his footsteps and become an engineer.

At the time, women were discouraged from studying engineering because it was not socially acceptable for them to follow such a path. As Hicks made her way through school, teachers and classmates alike tried to dissuade her from pursuing her dreams.

Hicks persisted, and in 1939, she was one of only two women from a class of 900 to graduate from the Newark College of Engineering. Her first job out of school was at Western Electric, where she became the first woman engineer in the company's history, and developed technology used in telephone and aircraft communication.

***"We were determined nothing was going to stop us from exploring that potential"***

4. Estrin, J. (2015, August 12). Kodak's First Digital Moment. New York Times. <https://archive.nytimes.com/lens.blogs.nytimes.com/2015/08/12/kodaks-first-digitalmoment/>  
5. Viki, T. (2017, January 23). On the Fifth Anniversary of Kodak's Bankruptcy, How Can Large Companies Sustain Innovation? Forbes. <https://www.forbes.com/sites/tendayiviki/2017/01/19/on-the-fifth-anniversary-of-kodaks-bankruptcy-how-can-large-companies-sustain-innovation/?sh=313cbc146280>  
6. Carter, T. (2021, January 3). The True Failure Rate of Small Businesses. Entrepreneur. <https://www.entrepreneur.com/starting-a-business/the-true-failure-rate-of-smallbusinesses/361350>

7. Picha, G. (2018, May 17). Recognizing and Alleviating Math Anxiety. Edutopia. <https://www.edutopia.org/article/recognizing-and-alleviating-math-anxiety/>  
8. Luttenberger, S., Wimmer, S., & Paechter, M. (2018, August 8). Spotlight on Math Anxiety Psychology Research and Behavior Management. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6087017/>  
9. The National Inventors Hall of Fame. (n.d.). Diverse STEM Role Models Are Important for Everyone. National Inventors Hall of Fame. <https://www.invent.org/blog/diversity-instem/role-models>

After earning a master's degree in physics from Stevens Institute of Technology in 1949, Hicks began working at her father's business, Newark Controls Co., which specialized in manufacturing sensing equipment. It was here that she invented a gas density sensor for devices that used gas-phase materials as fuels or insulators.

In addition to being able to detect dangerous levels of electrical insulation, her invention accurately sensed the amount of gas in a container over a wide range of pressures and temperatures. Because of this, Hicks' technology proved to be essential to the success of the NASA Apollo moon missions.

Throughout her life, Hicks made it a priority to inspire and encourage more women to enter the field of engineering. She co-founded SWE in 1950, and in a speech she delivered at an event early in the organization's history, she explained to those in attendance the importance of SWE's mission.

"We founded SWE to help women regardless of what society says they can or cannot do," Hicks said. "The first women of SWE were fearless. Our minds and our imaginations were activated, and we were determined nothing was going to stop us from exploring that potential. By looking around this room, I can see that determination is alive and well — and I applaud it. I applaud you."

## Giving Students the Confidence to Pursue STEM Careers

While women are no longer actively discouraged from pursuing a STEM career like they were in the early 1900s, even today women make up just 24% of the STEM workforce within the United States.

To help all students feel supported in their STEM education and confident enough to pursue a career in these fields, it is our collective responsibility to help eliminate harmful stereotypes and introduce inspiring, relatable STEM role models and mentors who can help students realize their own potential.

## Innovation Moves the World Forward

When students enter the workforce, they likely will need to solve problems that require a little outside-the-box thinking. In these situations, the ability to innovate and come up with novel ideas and solutions is crucial. Educators who present their students with the opportunity to be innovative and take creative risks in a safe environment not only help cultivate this essential skill in class but also can give students the confidence to innovate in other areas of their lives.

This approach is especially helpful for students interested in working in STEM fields — areas that continue to evolve rapidly thanks to ongoing innovation and the desire for improvement.

## Marian Croak's Drive to Innovate

As a child, National Inventors Hall of Fame Inductee Marian Croak was fascinated with how things worked. Whenever a plumber, electrician or other technician came to her home, she often followed them around, asking them questions about the things they were fixing.

This inquisitiveness was a trait her parents promoted.



"I had an unconventional childhood in that my parents gave me so much freedom to explore," Croak said in an interview with the National Inventors Hall of Fame. "And my father was a person who always encouraged me to ask why."

Croak maintained her curiosity as she grew up. After attending Princeton University, she completed her graduate work at the University of Southern California (USC), where she studied social psychology and statistical analysis. Her time immersed in these two fields helped her develop a passion for discovering ways technology can improve the lives of others.

After graduating from USC in 1982, Croak landed a job at AT&T's Bell Labs as part of its Human Factors research division, later working on network engineering. Here, Croak realized the internet could one day transform the way people communicate with one another.

"It was before the advent of the web browser, which really helped change things, but the internet was starting to be an interesting technology," Croak said in an interview with USC.<sup>10</sup> "And so, we tried experimenting with packetizing voice and treating it just like it was data and running it over an IP connection, and it worked."

However, because this innovation was so new, many at AT&T were skeptical and hesitant to convert the company's existing voice network into a Voice over Internet Protocol (VoIP) system. With passion and perseverance, Croak continued promoting her idea, and she credits the encouragement of an executive at the company for giving her the confidence to keep going.

"I remember one person who was at the executive level who did believe in it, and he said, 'Just keep going. Don't listen to them — just keep going, go as fast as you can.' Then the feeling just left — of being small — and I suddenly grew about 10 feet."<sup>11</sup>

10. Harrison, G. (2020, August 26). Sending Your Voice Over The Internet? Some Called It a Toy. Not Marian Croak. Viterbi Magazine. <https://magazine.viterbi.usc.edu/fall-2020/alumni/sending-your-voice-over-the-internet-some-called-it-a-toy-not-marian-croak/>

11. The National Inventors Hall of Fame. (2022, February 24). Change for the Greater Good: The Marian Croak Story. YouTube. <https://www.youtube.com/watch?v=W4Y898xDiwE>

VoIP has revolutionized the way people communicate by furthering the capabilities of audio and video conferencing. Throughout her 32 years of working at AT&T, Croak earned more than 200 patents, many of which were related to VoIP technology.

Today, Croak works at Google serving as vice president of engineering and leading the Research Center for Responsible AI and Human Centered Technology. While she continues to find herself at the cutting edge of science and technology, she is a strong advocate for connecting people through science and innovation.

“What I’m learning after 40 years in technology is that we can’t really separate science from people. People discover things, people are the ones that are contributing and making science,” Croak said in an interview with the National Inventors Hall of Fame. “I want to see things become better in my lifetime, and fortunately I have seen that, but I want it to keep going in that direction.”<sup>12</sup>

## Encouraging Students to Innovate

Croak’s story shows us that a little encouragement can go a long way. In an educational setting, teachers who give their students the freedom to develop their own solutions to problems not only enhance student engagement but also prepare them to navigate complex real-world challenges.

Students who are urged to take creative risks from a young age have the potential to become the next generation of leaders, entrepreneurs and creative thinkers capable of addressing global challenges and driving progress in STEM fields and beyond.

## The Power of the I Can Invent Mindset

At the National Inventors Hall of Fame, we firmly believe that creativity, entrepreneurship and invention have no fixed formulas or methods. Nevertheless, there are recurring themes that inventors often highlight when discussing successful innovation.

The I Can Invent Mindset encapsulates these shared qualities. As we continue to develop our education programs in close collaboration with our Inductees, we integrate this mindset into each one. Offering a pathway for all students to unlock their innovative potential, educators can be confident that the nine competencies composing the I Can Invent Mindset are not only effective in fostering innovation but also universally applicable in conquering obstacles and challenges across all aspects of life.

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12. The National Inventors Hall of Fame. (n.d.-a). 2022 NIHF inductee Marian Croak: The Problem-Solving Engineer. National Inventors Hall of Fame.  
<https://www.invent.org/blog/inventors/marian-croak-voip>