National Inventors Hall of Fame®

WHY INTELLECTUAL PROPERTY IS ESSENTIAL TO STEM EDUCATION

THE COST OF NOT PROTECTING AN INVENTION

On a cool November night in 1957, National Inventors Hall of Fame® (NIHF) 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 in his laboratory notebook. These pages contained the first known occurrence of the word "laser" – an acronym for light amplification by stimulated emission of radiation.[1]

Though Gould notarized his laboratory notebook, demonstrating his contributions to laser technology, this was not enough to provide complete 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 decision 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.[2]

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 that financed his lengthy court battles.[3]

"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."[4]

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 intellectual property (IP), he lost out on early ownership for his laser, and a potential Nobel Prize.[5]

While Gould should have double-checked the patent application procedures, it's curious that the fundamentals of IP were not taught to the inventor in school.

THE SURPRISING LACK OF INTELLECTUAL PROPERTY EDUCATION IN SCHOOLS

Unfortunately, little progress has been made since the 1950s to inject IP into the classroom. Despite the push to promote STEM (science, technology, engineering and mathematics) education at the national level,[6] IP – which includes utility, provisional and design patents, as well as trademarks, copyrights and trade secrets – is a topic largely absent from K-12, college and even graduate school curricula.[7]

Short of attending a law program, there are few reliable ways to learn about IP within the confines of our traditional education system.

According to Michael J. Oister, CEO of NIHF, one of the reasons IP is rarely taught in schools is that the subject is complex.

"Intellectual property, and particularly the protection of inventions, is a complex subject. It is full of legal jargon, and even though intellectual property is literally all around us, it isn't in mainstream conversation or pop culture. It should be taught in any art, creative writing, music or STEM-based course so that people will have a basic awareness about when they should seek protection."

- Michael J. Oister, CEO of NIHF

A Camp Invention® program participant shows off her new invention

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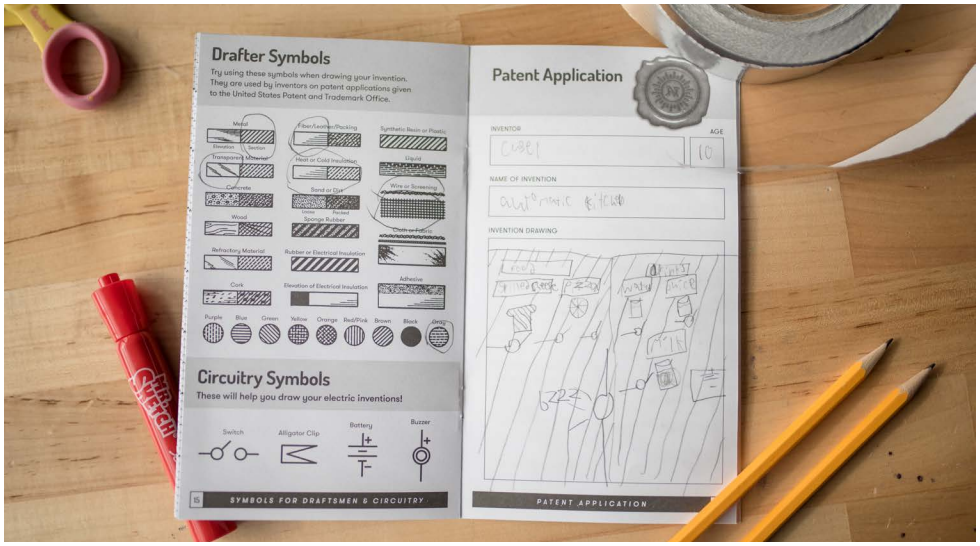
6. U.S. Department of Education. (n.d.). Science, technology, engineering and math: Education for global leadership. Retrieved from https://www.ed.gov/Stem



The inside of a Camp Invention Inventor Log

Beyond the complexities of the subject matter is the fact that often, teachers simply have not been introduced to IP in their own education.

A recent study from The Center of Intellectual Property Understanding found "a lack of compulsory education related to intellectual property," and for teachers specifically, "there is little or no formal IP education and the level of awareness and understanding appears to remain low."[8]

Given the scarce amount of resources available to educators when it comes to both learning about and teaching IP, the subject's absence in the classroom is unsurprising.

However, with IP becoming ever more essential in the contemporary workplace, sending students into the world without an understanding of how ideas are protected places them at a great disadvantage and leaves them unprepared for potential opportunities.

A NATION OF INVENTORS

From the bottled water we drink to our favorite song on the radio to the car we're driving, IP and legal protections are all around us. These protections give individuals the incentive to transform their ideas into inventions, companies and sometimes even entirely new industries. **In fact, America can attribute much of its economic growth to our founding fathers' steadfast belief that every citizen owns the products of their physical and mental labor.[9]**

This stance was as philosophical as it was pragmatic. Though America possessed vast natural resources, if our fledgling nation was to sustain itself economically, its citizens needed the freedom to both create and have guaranteed protections for their creations.

So important were these protections that they were written into the U.S. Constitution, where in Article 1, Section 8, Clause 8, Congress is granted authority to **"promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."[10]**

Though we take such protections for granted today, it is important to note that in 1787, America's IP policy was revolutionary. By drastically lowering the cost of filing a patent to a mere 5% of what Great Britain charged its citizens at the time, in America, many more people had the potential to become an inventor.[11]

This policy allowed people such as Matthias Baldwin (locomotive), George Eastman (roll film), Elias Howe (sewing machine) and Thomas Edison (electric light and phonograph) – all of whom possessed very little formal education and came from humble beginnings – to invent technologies and industries unique to the United States.[12]

By drastically simplifying the patent application process, and publicizing successful patent applications to inspire innovation and the evolution of ideas, by 1865, "the U.S. per capita patenting rate was more than triple Great Britain's." By 1885, America was patenting at a per capita rate over quadruple Great Britain's output.[13] Never before had a nation tied its very sense of national identity so closely with IP.

Even George Washington in his first annual Address to Congress in 1790 highlighted the importance of inventions to the growth of America.

"The advancement of agriculture, commerce and manufactures by all proper means will not, I trust, need recommendation. But I cannot forbear intimating to you the expediency of giving effectual encouragement to the introduction of new and useful inventions."[14]

It was this entrepreneurial spirit that drove Americans from all walks of life to invent tools, such as the spinning jenny, power loom, steam engine, cotton gin and internal combustion engine – technology that transformed the nation's economy during the Industrial Revolution and helped establish the United States as a global economic leader and eventual world power.

7. Villasenor, J. (2014, August 4). Intellectual property: Valuable to every discipline. Retrieved from https://www.chronicle.com/article/Intellectual-Property-/147985
8. The Center for Intellectual Property Understanding. (2018, March). The state of IP education worldwide: Seven leading nations. Retrieved from http://www.understandingip.org/wp-content/uploads/2016/05/CIPU-State-of-IP-Education-Worldwide.pdf
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10. Madison, J. (1787, September 7). The Constitution of the United States: A transcription. Retrieved from https://www.archives.gov/founding-docs/constitution-transcript#toc-section-8-
11. Kline et al. (2016), 12.
12. Ibid.
13. Ibid., 17.
14. Washington, G. (1790, January 8). First annual address to Congress. Retrieved from https://www.presidency.ucsb.edu/documents/first-annual-address-congress-0

THE VALUE OF INTELLECTUAL PROPERTY IN STEM INDUSTRIES

Today, similar transformations are occurring in California, where companies like Intel, Google and Apple are inventing new ways for people to work and communicate. This pocket of innovation is so concentrated that eight of the top 50 patent-producing companies worldwide are headquartered in California and accounted for a staggering 13,570 new patents in 2017.[15]

Simply put, the more a company innovates, the more valuable it becomes. It is no coincidence that these eight companies are some of the most successful in the world. According to research from Ocean Tomo, an increasing amount of a company's value is composed of its intangible assets, which include brand recognition, IP, patents, trademarks and copyrights. In 2015, the estimated market value of intangible assets for companies listed on the S&P 500 was an incredible 87% of their total value.[16] Pairing this information with a 2017 study from the MIT Sloan School of Management, which found a direct correlation between a company's willingness to innovate and its net profit over a two-year span, it becomes clear that IP is an essential component of contemporary business.[17]

On Sept. 26, 2016, the U.S. Department of Commerce released a report which found that "IP-intensive industries support at least 45 million U.S. jobs and contribute more than $6 trillion dollars to, or 38.2% of U.S. gross domestic product (GDP)."[18]

This financial impact exists at the individual level as well, and Opportunity Insights found that the average patent holder earns approximately $256,000 per year beginning in their mid-forties. For patent holders who produce the most highly cited patents and have made discoveries that have the largest scientific influence, the market compensates their contributions, and these inventors earn more than $1 million on average per year.[19]

PREPARING STUDENTS FOR THE FUTURE

Given IP's continued importance to the economy and world around us, how can we ensure that the children of today will be prepared for the jobs of tomorrow? While current STEM education techniques continue to improve by incorporating hands-on activities and lessons in entrepreneurship, the lack of IP instruction is a glaring oversight that must be addressed. **It is not enough to simply teach students how to code, design and invent; they must also learn how to protect what they create.**

Without this knowledge, their work is susceptible to theft, misappropriation and potential legal attacks. Equipping students with even a basic knowledge of IP can go a long way in avoiding much larger problems.

One way parents can supplement a child's IP knowledge is to enroll them in interactive programs that prioritize the subject in their curricula. This type of learning can even begin at the PreK level, as research from the National Institute for Early Education Research has found that a young child's natural curiosity makes them uniquely suited to explore STEM topics.[20] Programs such as Camp Invention® and Invention Project® demonstrate the power of IP to students at a young age and ensure that children remain engaged in what they're learning as they grow.

Early exposure to innovation is critical, and according to recent research from Opportunity Insights, this early introduction increases the likelihood that children will become inventors in the future.[21] Just as important, however, is that IP education is similarly introduced at a young age to ensure students understand how to protect what they make, while combatting the rise of internet piracy.

For educators to provide the best possible STEM instruction for their students, the integration of IP fundamentals is a must. Programs that show teachers how to best incorporate IP in their day-to-day lesson plans are valuable and can benefit the instructor throughout their entire career.

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