

The Importance of Art in Engineering
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Engineering is an important discipline in the development of society. It spans across many different concentrations but each hold one critical component in common: they are driven by a creative design process. Creative design holds a critical role in the success of engineers. Unfortunately, engineers tend to overlook the importance of artistic, right-brained thinking in their studies. Not only does this type of thinking benefit the engineer, one could consider it essential. Artistic and creative thinking can offer more well-rounded approaches to studies in engineering. It can offer the inspiration and fuel behind the ideas for engineering based thinking. Also, art offers a cultural and societal approach to the world and it is the engineer's responsibility to be able to use this knowledge to positively impact the world.

When most people hear the word "engineer" they do not think of art. They think of left-brained skills such as math, science, and technical skills. However, right-brained, artistic thinking offers an important role to more well-rounded approaches in engineering. "Building a Better Engineer: The importance of Humanities in Engineering Curriculum" supports this idea by stating that, "Engineering educators need to emphasize the importance of humanities and arts courses in the engineering curricula so the engineering education is complete and the graduates are diverse well rounded, socially conscious individuals that can work effectively with others in teams" (Khalid, Chin, Atiqullah, Sweigart, & Stutzmann, 2013).

One of the most beautiful opportunities an engineer has is to balance their right and left brained skills. Welsh (2016) discusses this "whole-brain approach" in his blog "Art for Engineers: Encouraging More Whole-Brain Thinking." Welsh states that, "If engineers are to be effective players on the world stage, they must complement their traditional left-brain orientation with right-brain characteristics; they must take a whole-brain approach." Although engineers are thought of predominantly as left-brained, technical thinkers, they should understand the importance of right-brained approaches. Unfortunately, many engineers limit themselves to purely left-brained thinking because it is what comes most naturally. Khalid, Chin, Atiqullah, Sweigart, & Stutzmann state that, "A number of engineering students take humanities courses thinking that they are wasting their time." However, Welsh goes on to give a personal example of how his interest in learning freehand drawing later contributed to his engineering skills. He states, "Improved seeing, whether literally as described here or possibly, by extension, figuratively, further enables an engineering student or practitioner." Drawing could give an engineer the ability to express their ideas visually and be able to better communicate them to other engineers and the community. However, freehand drawing is just one example of how the arts can positively aid an engineer in their work. Welsh points out that engineers have the potential to use any of the visual arts to further express their ideas.

Not only must an engineer be able to express their ideas but they also must be able to create the ideas. Welsh states that, "This whole-brain approach may enable aspiring engineers to be more creative and innovative during their formal studies and later in professional practice, to their, their employer's, and society's benefits." Right-brained artistic thinking can offer the inspiration and fuel behind engineering based innovations. It is important to have an "outside of the box" approach in order to think of new and exciting ideas to later be able to design and implement. In the article "Why the best engineers should study humanities," Yakov Ben-Haim offers inspiration on this saying, "... the subtle and intellectually sophisticated interplay between science, technology, and man's understanding of nature and of himself draws the student to the highest levels of abstract thought" (1998). In "The Eternal Relationship between Art and Engineering," Sa'd agrees on the importance of art and engineering synergy stating, "You may

come up with brilliant ideas, but they could never be materialized without the help of tools that technology provides” (2014). Art is the fuel, the inspiration, and the reason behind technological projects and innovation. S’ad goes on to say that, “...art is an idea and engineering is the implementation of that idea...” S’ad uses the famous Leonardo da Vinci as an example supporting the art and engineering relationship. He says, “An important question to ask would be whether his works would have come into existence without his engineering expertise or vice versa?” Henry Fountain in “Putting Art in Stem,” also uses the the famous Leonardo da Vinci as an example in the relationship between art and engineering. He says, “Engineering and art were not always completely separate disciplines. Take Leonardo da Vinci, who seamlessly combined the two” (2014.) Engineering is all about innovation and the implementation of new ideas, all fueled by artistic thinking. Therefore it is important for engineers to study art to help them in their success. Khalid, Chin, Atiqullah, Sweigart, & Stutzmann say “Education in arts is a key to creativity, and creativity is an essential component of, and spurs innovation.”

But why is thinking of new ideas so important for the engineer? The engineer has the ability to impact the world through new technological innovations. Take the famous invention of Thomas Edison's light bulb for example. This invention enabled a newer, safer way for people to light a room as opposed to a candle. Ben-Haim states, “Technology influences individuals, society, and the course of history.” Societal needs are constantly driving the need for more engineering. It is the engineer’s responsibility to able to positively impact the societal and cultural needs of our world. Ben-Haim goes on to say, “It is the responsibility of the engineering community to collaborate in a broad and penetrating attempt to understand where our innovations are taking us.” Engineers have shaped the world as we know it today due to the demands of our society. They are able to positively do so through their knowledge of culture learned through art and right-brained thinking. Ben-Haim suggests a prominent example of how engineers shaped the world through the industrial revolution. He says, “...the [industrial revolution] was rooted in an intimate interaction between new technologies, new social concepts, and mores.”

It is clear that there holds a special relationship between the arts and engineering. They are two halves of one whole, yin and yang. Henry Fountain discusses John Maeda, a professional in the field of electrical engineering and computer science, who stated that, “Both are dedicated to asking the big questions placed before us: ‘What is true? Why does it matter? How can we move society forward?’ Both search deeply, and often wanderingly, for these answers.”

Although often overlooked, creative right-brained thinking is an essential component to the success of an engineer. A right-brained approach to engineering can offer a more well-rounded structure to ideas. Without the art and creativity can inspire the engineer and provide fuel for their thought. Without the arts and humanities supported by right-brained thinking, engineering has no purpose or reason to grow. The importance of art should not be overlooked in the engineer's studies because it is ultimately the engineers who are responsible for the way our world evolves socially and culturally.

Ben-Haim, Y. (1998). Why the best engineers should study humanities. *International Journal of Mechanical Engineering*, 28(3), 195-200. Retrieved September 10, 2017, from <http://journals.sagepub.com/doi/pdf/10.7227/IJMEE.28.3.2>

This journal entry discusses how time and time again, culture induces the process of engineering and in turn sculpts our world history. It reflects how many opportunities for engineers arise due to current cultural and societal events. These ideas directly support my thesis statement. More specifically, they support my third point that art can offer the inspiration and fuel behind engineering based thinking. Ben-Haim offers a great example about the reason for the development of clocks as a societal need and in turn arose opportunities for engineers to design them. Specific examples such as this from his text will be used to support my thesis.

Fountain, H. (2014, October 31). Putting Art in STEM. *The New York Times*. Retrieved September 10, 2017, from <https://www.nytimes.com/2014/11/02/education/edlife/putting-art-in-stem.html?mcubz=3>

This article stresses the importance of finding new ways to think like an engineer. It discusses incorporating art into the STEM curriculum and suggesting turning the word into STEAM. This article is supportive in my topic in that it quotes multiple professionals in STEM fields. The quotes pulled into this article are very powerful statements in finding a link between art and engineering. I plan to use these direct quotes from professionals in my writing as they can serve as a strong sense of credibility.

Khalid, A., Chin, C. A., Atiqullah, M. M., Sweigart, J., & Stutzmann, B. (2013, June). *Building a Better Engineer: The Importance of Humanities in Engineering Curriculum* (Rep. No. 6052).

The authors of this report argue that engineers should increase their interpersonal and communication skills. They explore how humanities can increase creativity in engineering studies. This report is loaded with evidence that supports my claim that art is important to the success of engineers. The authors offer a plan for incorporating art and humanities throughout the entirety of a student's educational career. I plan to use this article to support all points of my argument by quoting many of the strong statements the authors suggest. This report is also a good source of statistical data to back my claim.

S. G. (2016, January). Art for Engineers: Encouraging More Whole-Brain Thinking [Web log post]. Retrieved from <http://bigbeacon.org/2016/01/2643/>

Walesh describes in his blog how picking up drawing as a hobby started influencing his work as an engineer. He begins this in response to Betty Edwards book *Drawing on the Right Side of the Brain*. He offers a personal account to my argument and backs up his opinion through the use of this book. The personal accounts add a real-life example to my argument. Specifically I plan to cite some of his ideas on what he refers to as a

“whole-brained approach” which directly supports my argument that artistic thinking can offer more well-rounded approaches to studies in engineering.

S'ad, N. (2014, December 7). The Eternal Relationship between Art and Engineering [Web log post]. Retrieved September 10, 2017, from <https://www.linkedin.com/pulse/20141207232402-65458978-the-eternal-relationship-between-art-and-engineering>

This article discusses the synergy between art and engineering. S'ad offers many prime examples and concepts that could be beneficial to all points of my thesis. He specifically gives examples such as architects and civil engineers. I plan to use these examples and his supporting points behind them. At the beginning of the article, S'ad gives the example of Leonardo Da Vinci as both an artist and engineer. A part of this portion of the article will be cited as a supporting point.