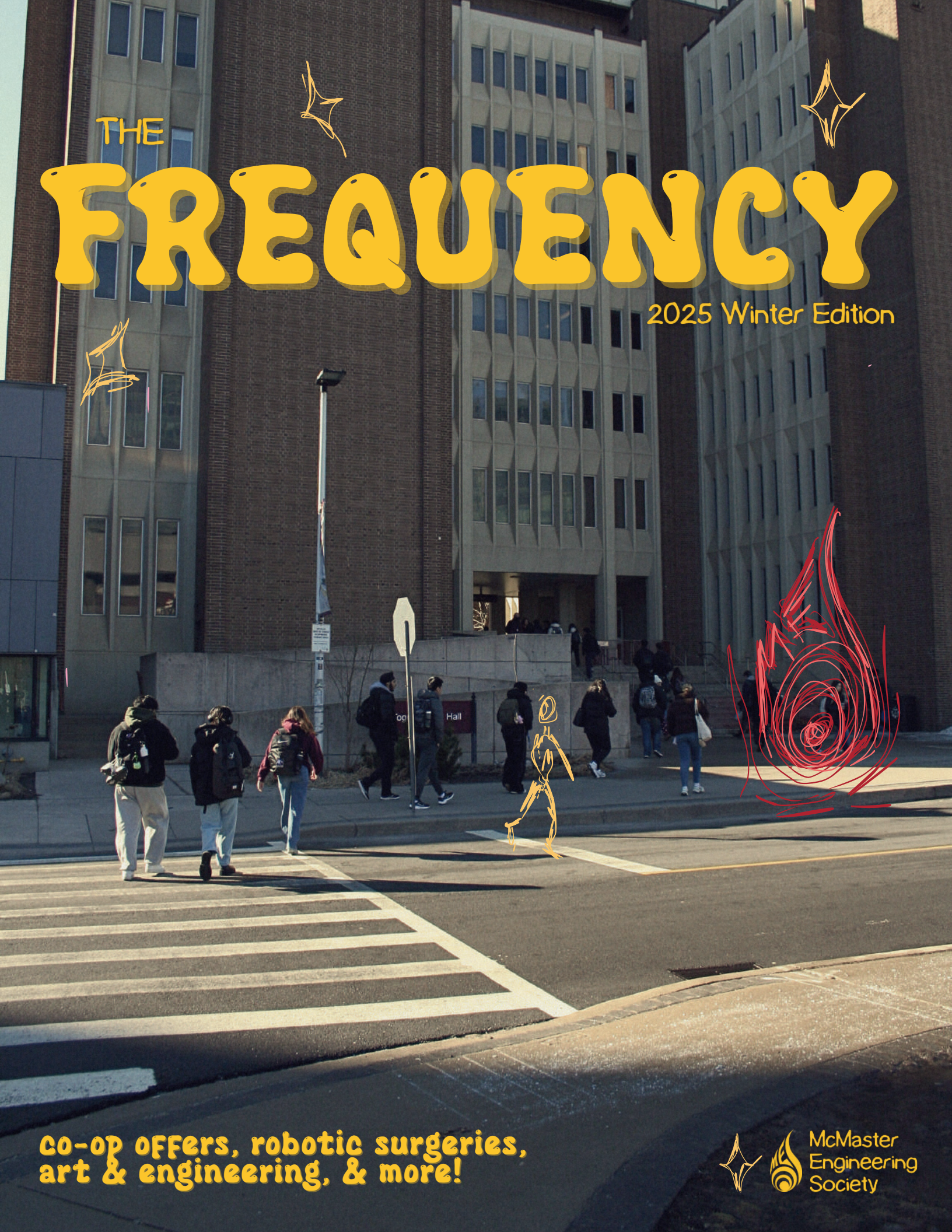
THE
FREQUENCY
2025 Winter Edition
Hall
co-op offers, robotic surgeries,
art & engineering, & more!
McMaster
Engineering
Society

LAND ACKNOWLEDGEMENT

The McMaster Engineering Society recognizes that McMaster University occupies the traditional territory shared between the Haudenosaunee Confederacy and Anishinaabe nations, which is acknowledged in the Dish with One Spoon Wampum Belt.

This wampum uses the dish to represent the territory, and one spoon to represent that people are to share the resources of the land by only taking what they need.

FROM THE EDITORS

Dear Fireball Family,

The 2025 Winter Edition of The Frequency is finally here! Our goal for each issue is to reflect on the shared experiences, challenges, and joys of being part of the McMaster Engineering community—this edition is no exception. Our team has put together 5 engaging articles to hopefully take your mind off your workload and potentially offer new perspectives on engineering and technology.

As summer finally approaches, you might be searching for a co-op, trying to navigate interviews, and taking your first steps toward your professional journey. To help with that, we've included "Co-op Advice for First Years: From Interviews to Offers," packed with tips and insights to guide you through the process. Whether you're searching for your first position or looking to refine your approach, we hope this article offers valuable takeaways. If you're in the mood for something lighter or even just an interesting read, we've got you covered on that too! Our talented writers dive into all different aspects of student life and the ideas that inspire us—from the intersection of engineering and art to the cutting edge of innovation in biomedical engineering.

So no matter what brought you to this edition—whether you're here for information, inspiration, or even just a break from studying—we're glad you're here. So set aside that lab report (just for a little while), kick up your feet, and enjoy! And as always, we welcome your feedback and contribution, because we know that the best ideas are built together.

With love,
Afsheen, Elyssa, and Brenan

MEET THE TEAM

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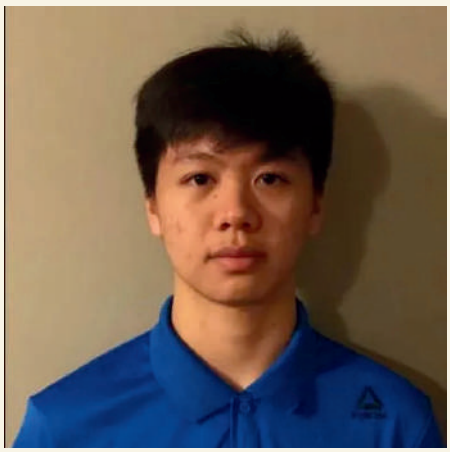

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THE RISE OF ROBOTIC SURGERIES

PRECISION, INNOVATION AND THE FUTURE OF HEALTHCARE

By: Derek Wu

Imagine a surgeon operating with millimeter precision, making movements too delicate for the human hand—all while sitting at a console several feet away from the patient. This isn't science fiction; it's the reality of robotic-assisted surgery, a transformative technology redefining the operating room. Systems such as the **da Vinci Surgical System** are paving the way for a new era in healthcare, where precision meets innovation to improve patient outcomes.

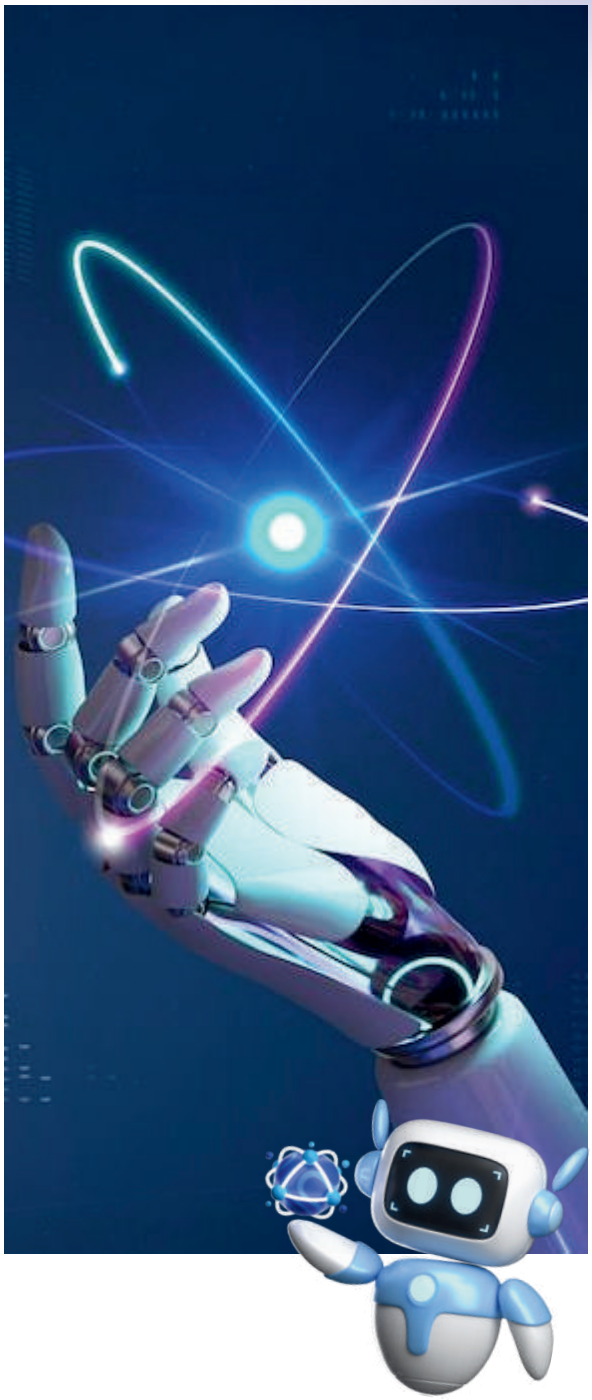
Precision at Its Finest

Robotic surgical systems bring unparalleled precision to the table. Equipped with robotic arms that mimic human motion—but with greater dexterity—these systems enable surgeons to perform minimally invasive procedures with unparalleled control. A high-definition, 3D camera provides a magnified view of the surgical site, ensuring every movement is deliberate and accurate.

Take, for instance, prostate cancer surgeries. Traditionally, these procedures required large incisions and carried significant risks of complications. With robotic systems, surgeons operate through tiny incisions, preserving vital nerves and tissue. The result? Shorter recovery times, less pain, and improved long-term outcomes for patients.

Why Surgeons and Patients Love Robots

Surgeons and patients alike appreciate robotic surgeries for their numerous advantages, which make procedures safer, more precise and more efficient. One of the key benefits is the use of smaller incisions, leading to minimal scarring and a lower risk of infection. Additionally, robotic arms provide unparalleled stability, eliminating even the smallest tremors and ensuring consistency throughout the procedure. Surgeons also benefit from enhanced visualization, with advanced 3D imaging that allows them to see tissues and organs in exceptional detail. For patients, one of the most significant advantages is faster recovery, as many can return home sooner and resume daily activities more quickly than with traditional surgery. However, the impact of robotic surgery extends beyond these immediate benefits. By combining precision with cutting-edge technology, these innovations are shaping a future where healthcare becomes increasingly effective and efficient, offering better outcomes for patients worldwide.



Challenges Worth Overcoming

For all its promise, robotic surgery is not without its hurdles. The cost of these systems can run into millions of dollars, making them accessible only to elite hospitals. Surgeons must also undergo extensive training to master the technology, creating a steep learning curve. Then there's the question of autonomy: while the robots are marvels of engineering, they're entirely reliant on the surgeon's input — at least for now.

Looking Ahead

The next generation of surgical robots is set to revolutionize the field with advancements that will make these systems even more powerful and widely accessible. One major innovation is AI-driven assistance, where robots will not only follow commands but also analyze real-time data to support surgeons in making more precise and informed decisions. Additionally, improvements in connectivity, such as the expansion of 5G networks, could enable remote surgeries, allowing top surgeons to operate on patients from thousands of miles away and significantly increasing access to specialized care. Another crucial development is the push for affordability, with the introduction of compact and cost-effective robotic systems that could extend these life-saving technologies to hospitals in underserved areas. These advancements signal a future where robotic surgery is not just a high-tech luxury but a transformative tool for improving patient outcomes worldwide.

A Call to Future Engineers

Robotic surgery is a field ripe with opportunities for engineering students. From improving haptic feedback and designing smarter AI systems to creating affordable models, the possibilities are endless. If you're looking to make a lasting impact, this is your moment. As healthcare evolves, so does the role of technology—and robotic surgery is leading the charge. With each advancement, we're not just transforming the operating room; we're transforming lives. The next big breakthrough could be yours. Are you ready to innovate?

CO-OP ADVICE FOR FIRST YEARS: FROM INTERVIEWS TO OFFERS

By: Arish Shahab

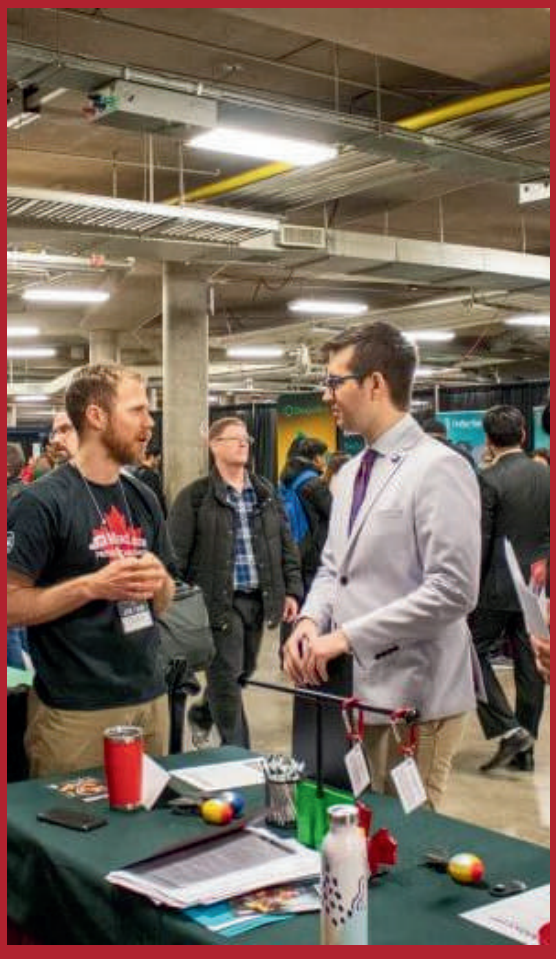
Ah, the first-year co-op hunt. It's a wild ride full of resumes, LinkedIn stalking and questioning every life decision when you see the words "minimum of 2 years of experience" on an entry-level posting. I've been there, and let me tell you, it's not as scary as it seems. In fact, it's manageable, and dare I say, even fun, if you approach it the right way.

As someone who has successfully landed a co-op at Harvard Medical School's Research and Innovation Lab and survived multiple rounds of interviews, I've picked up a few tips that'll help you not just survive, but thrive in this process.

LET'S GET INTO IT.

1. Your Resume: The Highlight Reel of You.
Your resume isn't just a list of what you've done; it's your chance to tell a story that screams, "Hire me!"

Cut the Fluff: Employers don't care that you were "Team Captain in Grade 8 Dodgeball" (unless you're applying to dodgeball co-ops). Highlight skills and projects that relate to the job.
Make Projects Shine: I included Aqua Boost, a hydration tracker I built at a hackathon, emphasizing the bioimpedance sensors I used and the problems I solved. Even class assignments can count, just frame them professionally.
Use Numbers Like a Boss: "Worked on a project" sounds meh. "Developed a wearable device that reduced user errors by 30%" sounds awesome (shoutout DeltaHacks).
Keep It Short: One page is enough. You want to wow them, not bore them.
Pro Tip: Use active verbs like "designed," "engineered," or "optimized." And triple-check for typos, nothing kills credibility faster than "detail-orientd."



2. Networking: Your Secret Superpower.
Networking may feel awkward, but it's one of the most effective ways to secure a co-op.

Be Brave on LinkedIn: I once messaged an upper-year who had interned at a company I admired, and they gave me insider tips that directly helped in my interview. Send messages like, "Hi [Name], I saw you worked at [Company] last summer. I'd love to hear about your experience!" Most people are happy to help.
Show Up: Career fairs, info sessions, and MES events are goldmines for meeting recruiters. I once got free pizza and a recruiter's email at the same event. Win-win.
Build Relationships: Networking isn't just about asking for jobs. Be curious. Ask people about their journey and genuinely listen. It's amazing what you can learn.
Pro Tip: Follow up! A quick "Thank you for your time, I really enjoyed our chat" email can leave a lasting impression.

3. Interviews: Where the Magic Happens.
Interviews can be nerve-wracking, but they're your chance to shine.

Prepare Like a Pro: Research the company and role thoroughly. For behavioral questions, use the STAR method (Situation, Task, Action, Result). For example, I once described how I led a hackathon team, pivoted our project halfway, and still managed to create a functional prototype.
Own Your First-Year Status: Don't apologize for being a first-year. Instead, emphasize your eagerness to learn and adapt. Employers don't expect you to know everything, they're looking for potential.
Ask Questions: My favorite is, "What does success look like for an intern in this role?" It shows you're forward-thinking and serious about contributing.
Pro Tip: If you're nervous, practice with a friend or even in front of a mirror. It's awkward but effective.

4. Use Every Resource Available
You're paying tuition, so make McMaster's resources work for you.

Student Success Centre: They helped me refine my resume and practice mock interviews. Use them.
MES Events: Networking panels and workshops are great for meeting recruiters and gaining insights.
Upper-Years: I've gotten some of my best advice from students who've already been through the process. Ask them about their experiences; they'll likely have tips you won't find online.
Pro Tip: Don't underestimate hackathons and designathons like DeltaHacks. Even if you don't win, the projects you create can be resume gold.

5. Rejections Happen: Don't Panic
Not every application will lead to an offer, and that's okay.

Stay Persistent: Some of my best opportunities came from positions I applied to after the first wave of rejections.
Learn from Feedback: After a rejection, I emailed a recruiter asking for advice. They gave me tips that helped me improve for future applications.
Keep Growing: No co-op? No problem. Work on personal projects, take online courses, or volunteer. I worked on my portfolio website during downtime, which impressed employers in later interviews.
Pro Tip: Treat every rejection as a stepping stone. You're building resilience, and that's a skill every employer values.

My Final Advice:
Landing your first co-op is about more than just getting a job. It's about learning the process, building confidence, and showing the world what you're capable of. When I started, I didn't think I'd end up where I am right now, but persistence, curiosity, and a willingness to learn made it possible. Your first co-op might not be your dream job, but it's a step toward something bigger. So take a deep breath, jump in, and trust the process. You've got this. Good luck, future co-op legends!

All Photos Taken From eng.mcmaster.ca

WHICH GROUP PROJECT Personality ARE YOU?

BY: ARISH SHAHAB

Nothing brings students together like a looming deadline and the shared confusion of figuring out who is actually doing the work. Whether it's in Hatch, Thode, or on a late-night Zoom call fueled by Centro iced coffee and instant ramen, one thing's for sure: group projects are less about the assignment and more about surviving the chaos together.

Let's be honest. You've probably worked with at least a few of these personalities. Heck, maybe you are one of them. No judgment here. Grab your coffee and your problem set, and let's break down the cast of characters that make group projects so special.

1 The Overachiever

The crown jewel of the group. They've already created a Google Drive folder (color-coded, obviously), read the rubric 12 times, and sent an "FYI, let's get started early!" message in the group chat before you even knew you were in a group.

Their life motto? "If you want it done right, you have to do it yourself." They're equal parts lifesaver and slightly terrifying, but hey, they get the job done.

Pro Tip: Let them lead. You'll get an A. Just make sure to nod enthusiastically during meetings and say, "That's such a great idea!" often. Trust me, it works.

2 The Ghost

Did they even know they were assigned to this group? The Ghost shows up to the first meeting, mumbles "Sounds good!" when roles are assigned, and then vanishes into the void. No texts, no emails, and no deliverables.

They'll reappear last minute (maybe), claiming they "had midterms" or "didn't get the notifications." You'll consider adding them to your Thode Missing Persons Report.

Pro Tip: Just do their part. It's faster than waiting for them to re-materialize.

3 The Ideas (TM)

This person is a visionary. During brainstorming sessions, they'll throw out wild ideas like, "What if we made a robotic arm that can also serve coffee?" (It's a report on circuit diagrams.) They're big on innovation, and low on practicality.

Execution? Not their department. But hey, they're great for the "creative solutions" section of the rubric.

Pro Tip: Keep them focused with phrases like, "That's awesome, but let's keep it simple for now."

4 The Last-Minute Hero

The deadline is tomorrow, and you're starting to panic. Suddenly, the Last-Minute Hero swoops in, armed with caffeine and adrenaline, sending a "Sorry for the delay, here's my section!" message at 4 a.m.

Their work? Surprisingly solid, considering the time frame. You'll be equally annoyed and impressed.

Pro Tip: Just say thank you and move on. Don't ask questions.

5 The Social Butterfly

They treat group meetings like a social event. Every session starts with "So, how's everyone doing?" and ends with, "Let's grab boba sometime!" They'll crack jokes, share memes, and keep the vibes immaculate. Contribution to the actual project? … Debatable.

Pro Tip: Let them manage the group chat. If nothing else, they'll keep spirits high when everything starts falling apart.

6 The Bare Minimum

The Picasso of mediocrity. Their work is just enough to count but nowhere near what was needed. Expect two bullet points, a screenshot from Wikipedia, and a "Hope this helps!" in the group chat.

Pro Tip: Give them the easiest task possible, like proofreading. Or just let the Overachiever handle it.

7 The Tech Guru

Your saviour in all things tech-related. They'll take over the slides, add animations, and make your report look like a pro designed it. They probably spent an hour debating fonts ("Times New Roman or Arial?!") and have strong opinions about Canva templates.

Pro Tip: Praise them relentlessly. They're the reason why your final submission doesn't look like it was made in MS Paint.

8 The Nervous Newbie

They're a first-year Eng student who just transferred from Life Sci, and it shows. They triple-check their work, ask if they're "doing it right" every 10 minutes, and apologize for everything. Their effort is unmatched, and they're genuinely trying their best.

Pro Tip: Be nice. They'll probably grow up to be the Overachiever someday.

9 The Group Therapist

When the group chat devolves into chaos ("Who said they'd do the intro??"), this person steps in and says, "Guys, let's all calm down and focus on the task." They're the glue holding the team together and will 100 percent send, "You're doing great, guys!" motivational texts at 3 a.m.

Pro Tip: Appreciate their emotional labour. Without them, this project would be a Hunger Games simulation.

10 You (Hopefully Not the Ghost)

So, where do you fit in? Are you the Overachiever drowning in tasks? The Social Butterfly keeping everyone entertained? Or maybe you're The Ghost (in which case, we need to talk... if you can even be reached, that is).

Here's the thing. Every group project needs its quirks. The mix of personalities, chaos, and sheer willpower is what makes it memorable. And let's be honest, no one ever forgets their first Thode all-nighter or that one group Zoom call where someone forgot to mute while eating chips.

The Verdict

Love them or hate them, group projects are a rite of passage. They're as iconic to McMaster Eng as Thode Library and coffee-fueled Fireball Gala planning. At the end of the day, the real question isn't who you are, it's how you survived.

So, which one are you? Be honest. Better yet, share this with your group chat and let the chaos begin. Just don't blame me if it starts a fight!

BY: AGRATA PATHAK

MYTH OR FACT: A SECOND-YEAR PERSPECTIVE

First year is always an exciting yet nerve-wracking experience for everyone, mine was no different! I was determined to make the most of the university experience, and dove straight into a sea-load of guides and information. Starting off with the classics in 'University Basics', I most likely watched hundreds of videos on university advice, tips, tricks, and the do's and don'ts of university. Like a sponge, I absorbed every tidbit of information and eagerly listened to the upper years recalling their first year experience during Welcome Week. It was all super thrilling and I couldn't wait for it to start.

Now, after a year full of academic and friendship milestones and a couple of twists and tumbles along the way, I want to take the time to look back; a "blast to the past" if I may, I will be revisiting the advice and some stereotypes I gathered and separating myth from the facts with my new-found experiences and very own perspective.

Let's call it...

MYTH OR FACT: ENGINEERING EDITION!

"THERE IS ONE BEST AND EFFECTIVE WAY OF NOTE-TAKING." (MYTH)

The first series of videos I watched were on note-taking skills. Initially, I viewed them as a source of information and advice, but as I continued, I spiraled down a rabbit hole, unable to take my eyes off the hypnotizing notes. The content creators had incredible note-taking skills with beautiful handwriting and meticulously organized notes, not to mention the cute stationery. Moreover, phrases such as "Effective", "Try This!", "Efficient!", "Aesthetic", and "This is how I got an A+" immediately caught my attention, and by the end, I had learned the Cornell Method and the Mapping Method, and had familiarized myself with Notability, Goodnotes, CollaNote, and OneNote. Yes, four apps and two different methods, even though I only really ended up using OneNote.

During my first year, I was constantly stumped on how to take notes, and the question, "What is the best note-taking method for organization and efficient learning?" popped up numerous times in my head. Well, the truth is that there is no "best" note-taking method. Everyone is different and learns differently. Besides, I discovered that it depends on the course and what type of content is being taught. For example, I found it easier to type up my notes for my programming classes, while for my physics classes, I preferred writing on the lecture slides. For Calculus, I learned best while taking notes along with the professor. I use OneNote for everything because it works for me, but I have friends who use Goodnotes, Notability, and even handwrite their notes. It is important to remember that the best way to approach your study style is by thinking *"What works best for ME?"*. Try experimenting—the YouTube videos may help by exposing you to a range of methods and apps. Of course, even now, I experiment and switch between note-taking methods, thinking, "Is it better to type or write? Should I write on lecture slides or make my own?". It's a continuous process and I am learning to grow comfortable with my own note-taking methods. One thing I do know:

I absolutely love colorizing EVERYTHING!!

"DO NOT SIGN UP FOR 8 AM CLASSES." (FACT)

I have heard phrases like *"8 AM classes are not worth it"*, and "don't do that to yourself" more times than I can count over the course of the summer before first year. In fact, it was starting to become hilarious because surely it could not be that bad! When I learned we were assigned our schedules for the first year, I nervously wondered to myself, what if I ended up with one of those dreadful 8 AM classes? How would I survive?! Thankfully, I didn't have any, and all my days started peacefully at 9:30 AM, but I have heard stories that could very well be classified as horror stories.

Well, that is until the start of the second semester. I had my labs at 8:30 AM every other week and dear Lord, was it a pain to get up and start my 1-hour commute! Not to mention it was in the middle of winter, so it was dark, cold, and definitely not the most motivating atmosphere. In retrospect, every other week was not bad, but at the moment, I vowed to never choose an 8:30 AM class... that is, until Semester Two of2025. I thought I was a morning person—until 8 AM classes made leaving my cozy bed a daily battle. If you can avoid 8 am classes, do it. If you are a morning person and believe you can do it, well, good luck! Looking back, the idea of getting up for an 8:30 class really isn't as funny as I used to think, and experiencing it firsthand was a shock. Still, I'm hopeful that maybe I will come out of this semester as an early bird, ready to start the day at 5 AM (I doubt it).

"SKIPPING CLASSES IS FINE." (MYTH)

Skipping classes is very tempting, I will admit, and I am guilty of it, especially when the class is scheduled for 8:30 on a Monday morning. However, I can say with confidence that the amount of work that piles up is quicker than quicksand. Once you start, you might be tempted to think "Oh, one more missed lecture won't hurt," Let me say it gently: *yes, it will hurt badly, both academically and mentally.*

I remember in my first year, I had skipped one class, feeling overwhelmed with the shock of first year responsibilities, but the following week I skipped it *again, and again, and again*. That first class I had skipped was added to my to-do list. It didn't decrease the weight I had, but rather built upon in such a way that the progress I did make seemed insignificant. By the end, it worsened my procrastination and led to the inevitable cramming session before midterms.

Like me, if you feel overwhelmed, talk to someone. I had talked to my friends or on-campus resources that support students through university life, and it helped. Yes, the course load in university can be overwhelming, but remember you have support and time. This year I dropped one of my courses to better focus on my other ones, and I felt so much better because I knew I had done what was best for me. In the end, if you feel tempted to skip a class, think about how much harder it might actually make your semester down the line! Don't be like me... attend your classes!

"ENGINEERING STUDENTS ARE ALWAYS DROWNING IN WORK AND DON'T HAVE TIME." (FACT... .KIND OF?)

"A Day in the Life of an Engineering Student" was a constant recommendation on my feed, and the memes about the life of an Eng student followed me everywhere. Yes, they were drowning in work half the time, but at the same time, they were pursuing their hobbies, going out with friends, working out, and seemingly having time. It was not until Welcome Week that this statement officially became a myth in my head. The upper years had cool and awesome stories about their time at co-op, in their respective clubs, events, and hobbies outside of extra-curriculars. Me and my starry-eyed self were fascinated and found another reason to be excited about university life.

At the beginning of my first year, I felt like I was always drowning in work and in fear of being behind in my courses. I barely went out to the events, big or small. I eventually gave in and decided to check out the fascinating events hosted by the clubs. From that moment, I have many cherished memories of going out with friends, gaining motivation to pursue my hobbies out of school, and overall, just having a clearer mind. Yes, I am still drowning in work, but now I don't hesitate to take the time that I need to slow down, whether it's catching up with a friend or even committing to an extracurricular that I am passionate about. I discovered that even though it feels like I don't have the time for anything, if I make the time, I can still do the things I like while still succeeding academically (hopefully).

"ENGINEERING STUDENTS HAVE NO COMMUNICATION SKILLS." (MYTH.... REALLY?)

Truth be told, I find this statement funny because this is probably one of the longest-running stereotypes of Engineering students and I have witnessed quite the opposite. Throughout my year and a half as an Engineering student and the various projects I have completed for my classes, everyone has been very vocal about their ideas. My peers have great ideas, and while brainstorming in projects or even participating in class, everyone seems to communicate their designs perfectly. They are innovative, brilliant ideas, and the result of these engineering visions have led to interesting projects. However, the challenge arises when students are expected to put their thoughts and ideas into writing. I will admit that when I talk about my thought process with my group mates, everything makes sense. However, the challenge arises when students are expected to put their thoughts and ideas into writing. I will admit that when I talk about my thought process with my group mates, everything makes sense.

Regardless, as soon as my fingers hit the keyboard to record my thoughts, everything goes blank. On top of that, when describing something technical, there are only so many words to describe an idea or design without seeming repetitive. By the end of writing a report, I question my own intelligence and contribution to the project. "Did I seriously write the same idea three times in a row?" or "What is my groupmate talking about, is this the same project?" or even better, "Guys, I think we have to improve our justification...". I guess, in a sense, our communication skills are limited to speech, we really do love to ramble! Let's increase the 0% communication skills to 90%?

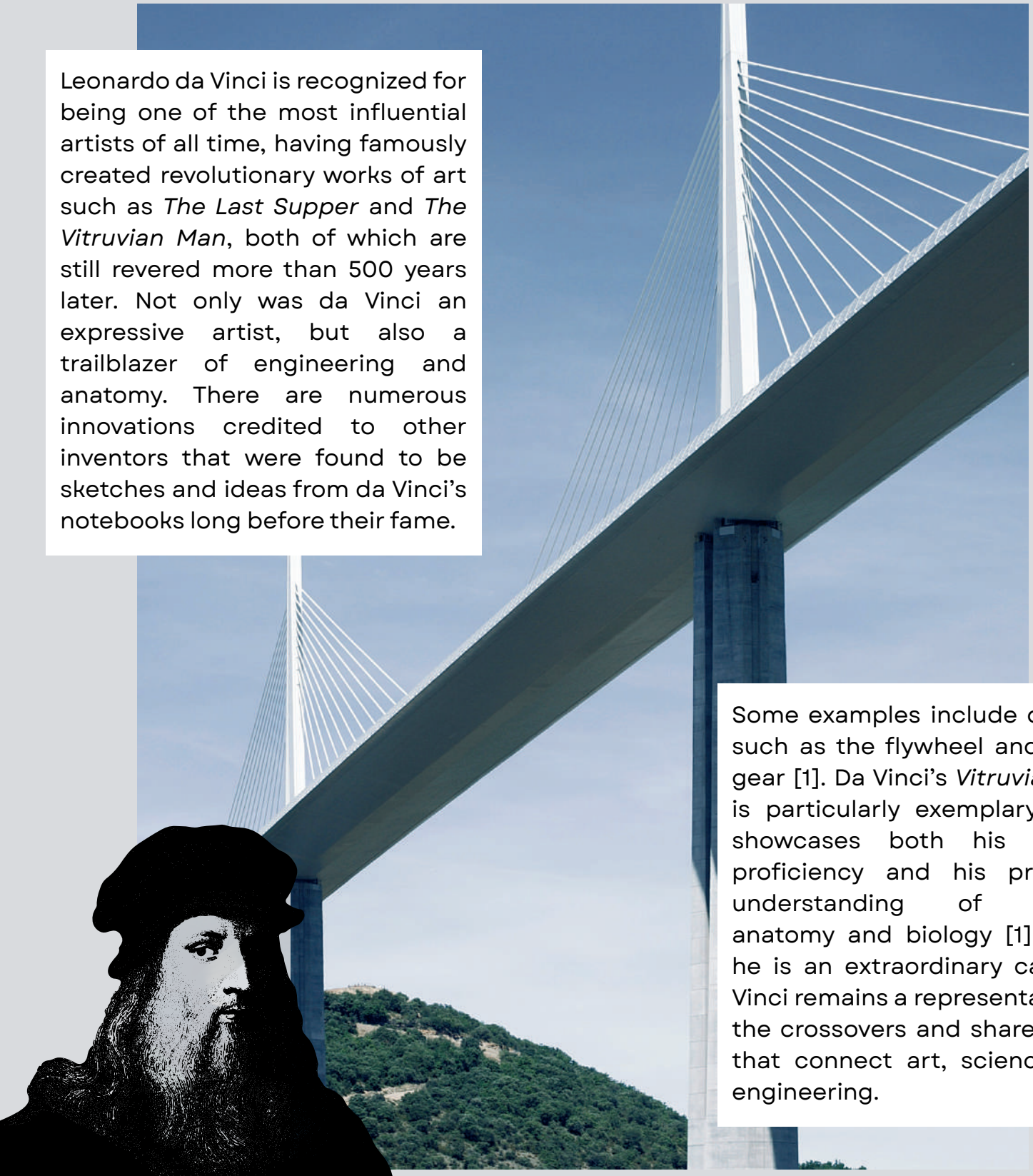
Well, there you have it! 'Myth or Fact: Engineering edition' summed up within 5 statements.

As a reader, do you agree? Have you also felt the same way? Personally, it's been a rough year and a half, and there are still many more to go, but I always seem to learn something along this journey. Who knows, maybe next year I'll have more myths or facts to add, or, better yet, a new perspective on the current ones. I sign off with what I hope to be the takeaway of this article: stereotypes exist for a reason, but it doesn't have to limit your experience! Do what's best for you, and if it means skipping your 8 am class to catch up on the work you're drowning in... so be it...

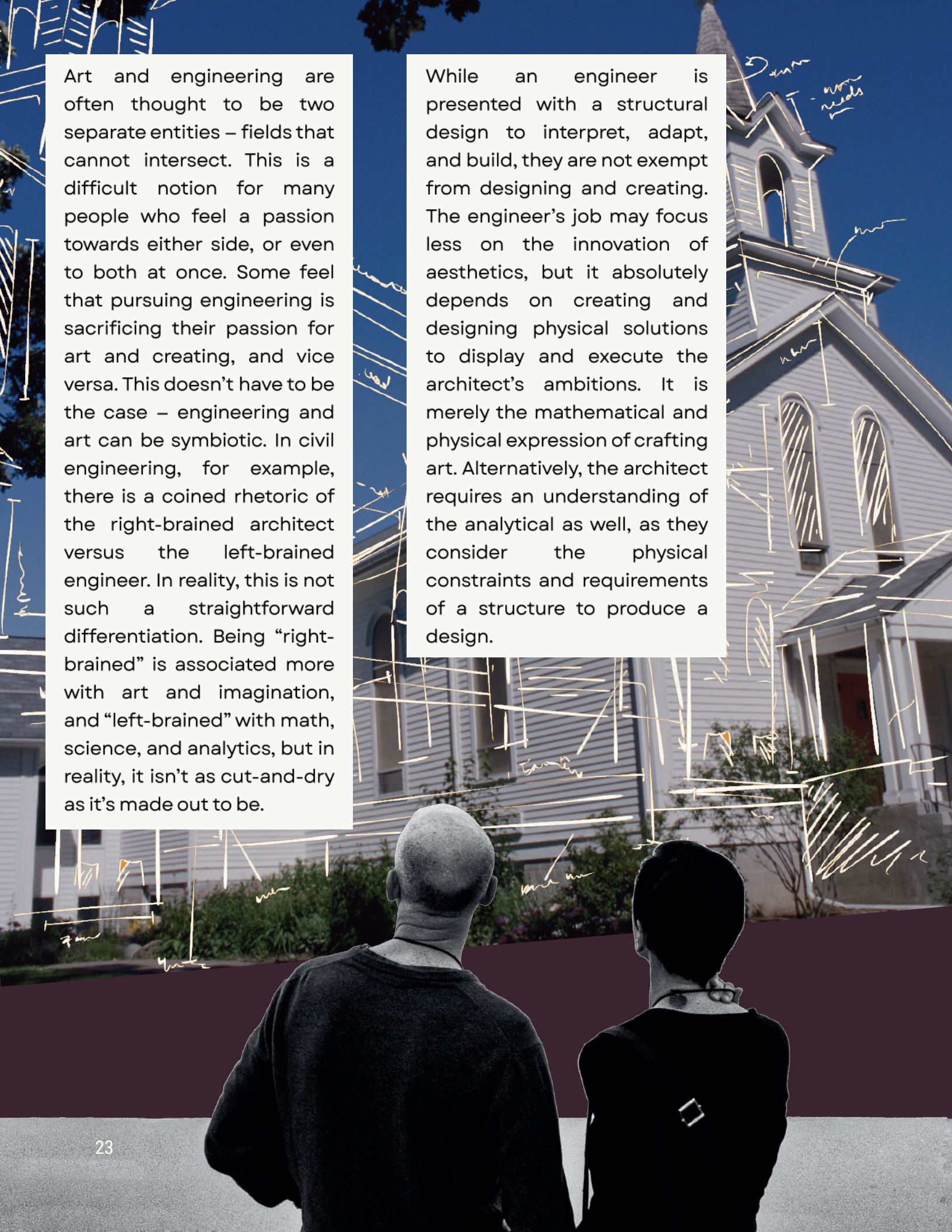
Art and Engineering

by: Mia Rodgers

Leonardo da Vinci is recognized for being one of the most influential artists of all time, having famously created revolutionary works of art such as *The Last Supper* and *The Vitruvian Man*, both of which are still revered more than 500 years later. Not only was da Vinci an expressive artist, but also a trailblazer of engineering and anatomy. There are numerous innovations credited to other inventors that were found to be sketches and ideas from da Vinci's notebooks long before their fame.



Some examples include devices such as the flywheel and worm gear [1]. Da Vinci's *Vitruvian Man* is particularly exemplary, as it showcases both his artistic proficiency and his profound understanding of human anatomy and biology [1]. While he is an extraordinary case, da Vinci remains a representation of the crossovers and shared skills that connect art, science, and engineering.

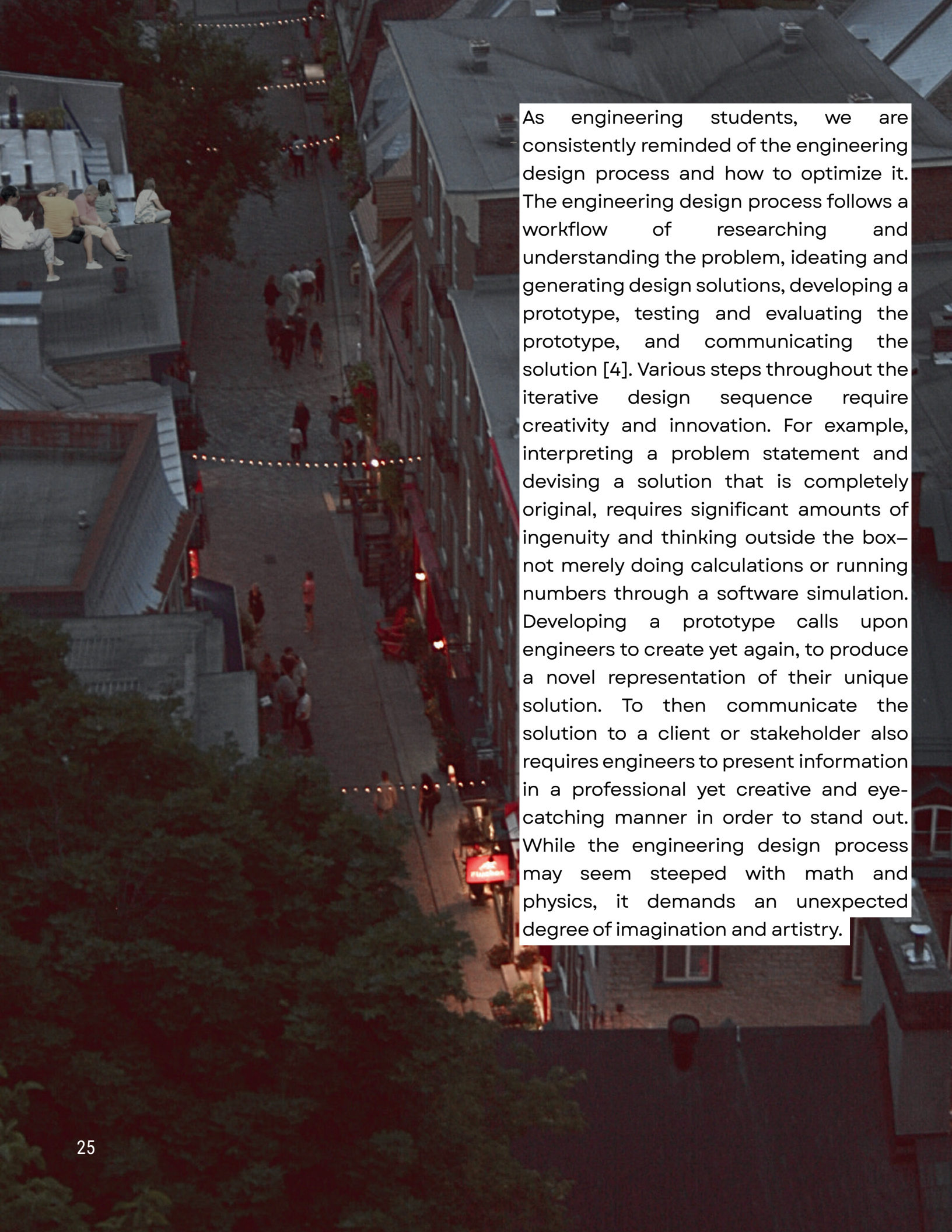


Art and engineering are often thought to be two separate entities – fields that cannot intersect. This is a difficult notion for many people who feel a passion towards either side, or even to both at once. Some feel that pursuing engineering is sacrificing their passion for art and creating, and vice versa. This doesn't have to be the case – engineering and art can be symbiotic. In civil engineering, for example, there is a coined rhetoric of the right-brained architect versus the left-brained engineer. In reality, this is not such a straightforward differentiation. Being "right-brained" is associated more with art and imagination, and "left-brained" with math, science, and analytics, but in reality, it isn't as cut-and-dry as it's made out to be.

While an engineer is presented with a structural design to interpret, adapt, and build, they are not exempt from designing and creating. The engineer's job may focus less on the innovation of aesthetics, but it absolutely depends on creating and designing physical solutions to display and execute the architect's ambitions. It is merely the mathematical and physical expression of crafting art. Alternatively, the architect requires an understanding of the analytical as well, as they consider the physical constraints and requirements of a structure to produce a design.

An individual is not limited to being simply “right-brained” or “left-brained”. Further, certain disciplines are neither fully left or right-brained. A study was done by Drexel University’s Creativity Research Lab that investigated the brain activity of varying skill levels of jazz musicians when asked to improvise a piece of music. The study found that after being asked to perform the same task, some musicians displayed more right-brain activity, while others showed more left-brain. The researchers established a connection between the observed brain activity and the musician’s skill and level of experience [2]. Less experienced artists showed primarily right-brain function during the improvisation, while the more experienced musicians used their left brain [2].

This could indicate that the more knowledge and experience the artists had, the more analytical and pattern-oriented their improvisation became. Music is still widely considered to be art regardless of which side of the brain was used to create it. This study leads us to better understand the idea that creativity, as well as math and patterns, find themselves ingrained into the practices of art and engineering. Many would even argue that music and mathematics have a relationship that spans centuries. For example, John Coltrane, a famous jazz saxophonist, created his own Circle of Tones, using the geometrical drawing that connects music notes called the Circle of Fifths [3]. In addition, Western music today is organized numerically, with tunings of each note being mathematically determined—each note in an octave has a frequency 5.9% higher than the preceding one [3]. Adequate knowledge and understanding of the math behind music allows musicians to better create harmonious pieces of art.



As engineering students, we are consistently reminded of the engineering design process and how to optimize it. The engineering design process follows a workflow of researching and understanding the problem, ideating and generating design solutions, developing a prototype, testing and evaluating the prototype, and communicating the solution [4]. Various steps throughout the iterative design sequence require creativity and innovation. For example, interpreting a problem statement and devising a solution that is completely original, requires significant amounts of ingenuity and thinking outside the box– not merely doing calculations or running numbers through a software simulation. Developing a prototype calls upon engineers to create yet again, to produce a novel representation of their unique solution. To then communicate the solution to a client or stakeholder also requires engineers to present information in a professional yet creative and eye-catching manner in order to stand out. While the engineering design process may seem steeped with math and physics, it demands an unexpected degree of imagination and artistry.

It is believed by some that practicing art can actually make a more well-rounded and effective engineer. The idea is based on the prevalence of our vision and the role that it has in brain connection over the other senses. It is argued that taking part in visual arts will improve one's ability to see. This will then improve their ability to observe and visualize, making it easier to innovate and solve problems [5]. Wendy Crone is an engineering physics professor at the University of Wisconsin who specializes in nanotechnology and biotechnology, and is also a painter. She has said that her art has helped in her engineering research to be able to easily detect changes in images due to her visual attention to detail [5]. Others have noted how creating art has bettered their engineering communication skills in representing clear ideas visually. As aspiring engineers and potential artists, we can use skills from art, math, and science to optimize the capabilities of the human brain. We are not limited to being an engineer or an artist, we can be both.

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[3] M. Liu, "Musical numbers: Math and music nurture a deep and complex relationship," News and Events, https://dornsife.usc.edu/news/stories/relationship-between-music-and-math/#:~:text=Mathematic s%20and%20music%20may%20seem,that%20dictates%20an%20instrument's%20sou nd (accessed Jan. 2025).
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