My hands were trembling as I held the piece of paper in front of me. I stuck them behind my back and clasped my sweaty palms together, effectively hiding the paper. It didn't matter; I had everything memorized. Trying to steady myself, I breathed deeply, getting as close to the microphone as I dared.

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The more the words spilled out, the more comfortable I became. My hands unclasped, and soon I was gesturing as passionately as I would in any normal conversation. By the end, I was still trembling, but for a different reason: the room had erupted into thunderous applause. At the poetry open mic, your first round of applause was free, but you had to earn the rest. This one, I had earned, and I stepped down from the stage beaming. That evening, I knew I had inspired people, as so many other poets had inspired me in the past.

Art has always been my strongest link to the rest of the world. I've made all of my best friends through a shared love of music, theater, literature, and anything that is creative. While most of my friends have gone on to singing, writing, and filmmaking, I found a different use for my creative drive: chemical engineering. The leap might not be obvious, but for me it made perfect sense. High school freshman year biology had revealed to me the harsh realities of disease. I read about how cancer started and spread, learned about the immune system attacking myelin sheaths, and saw that one mutation in someone's DNA could bring complete devastation. It seemed impossible to me that, with all the technology at our disposal, there were still diseases that had no treatments. Since then, I had a firm mission: do something about it. So that was how I found myself seeking out research opportunities before I'd even set foot on campus.

At the time, I had only the vaguest idea of what "research" actually meant. My first four months of college involved a crash course in literature review, forming a hypothesis, and actually testing it. I ran innumerable MATLAB simulations, testing configurations of microwave point sources to try to detect holes in trees caused by pests. Months of toiling away at the computer resulted in three great things: a Research Experience for Undergraduates (REU) to continue my work, strong evidence to support the feasibility and usefulness of my project, and the opportunity to present it all to the greater scientific community at a conference. By the end of freshman year, I was exhausted, overwhelmed, but also quite hooked. I had discovered a new kind of art: the art of "What If?"

Research had united my drive to help others with my creativity. Where I was once stringing words together to create something beautiful, I was now lining up experiments to create an elegant solution. The lab I joined at the beginning of my third year of school was working on genetically transforming a plant, , for more affordable and abundant cancer drugs. I have performed many roles in this lab, everything from planting seeds to plating bacteria, but my most significant one happened when I did an independent study in the lab. My project was to try to grow photosynthetic roots in order to activate more biosynthetic pathways in our hairy root cultures. It had been done before, in a different plant species, and I was spending hours every week applying similar principles to my crop of roots. A hundred different "what ifs" were running through my mind, and methodically I was testing each possibility, sequentially adjusting parameters according to what theory suggested would work. There were multiple variables to work with—sugar concentration, light exposure, carbon dioxide partial pressure—and the root growth cycle was 28 days, so every experiment required careful planning and forethought.

Creates a catchy, emotional introduction to the applicant and the statement that sets the stage for motivation, goals, and broader impacts.

Clearly states goals at end of introduction.

Describes experience 1 and its tangible outcomes. Ties back into story line and motivation.

Describes experience 2 with many concrete examples.

If something failed, I redrew my plans and moved on to the next idea in my arsenal, keeping the thought of all the people this project could eventually help as my motivation. Though this project has since been taken over by a full-time graduate student, it helped me realize how much I love working in the lab and that I wanted to continue on as a graduate student myself.

My passion for research did not end at the campus labs. During my time at , I have completed three co-ops exploring different aspects of research in biotech. At , , I learned to test and validate equipment that would eventually be used for commercial manufacturing. This was my first real exposure to the art of saving a failed experiment, and I found that the ability to "think on your feet" was one of the most valuable qualities of an engineer. At , a startup focused on , I learned the ins and outs of getting a product from the lab into the clinic while working with some neat polymers. In particular, I saw first-hand just how much characterization and testing of a product is necessary before it can be brought into the clinic, let alone onto the market. Lastly, at , another startup with a focus on biologics, I learned how to coax CHO cells into making more drugs in the same growth cycle by doing small-scale studies that would later be scaled up. I also had the opportunity to work with single-use systems, an exciting trend in the biotech world that seems to be leading to a cleaner, safer industry. These experiences have shown me how the different roles across the industry connect to create something new, and have enabled me to develop a diverse skill set and a broad idea of what can be done.

Describes experiences 3, 4, and 5 in just enough detail and discusses what the applicant gained from them.

Finally, I have been able to solidify the vague mission I've had since high school into a concrete vision for what must be done. I am ready to take my creative energy and passion for research on to a PhD project. Recently, I attended a bioengineering conference that exposed me to a major unmet need in biomedical research: . Research is desperately needed to improve the treatment options available, and I am excited to focus my energies on this under-explored clinical problem to improve the lives of patients.

Ties the wrap up/ look ahead in with the braoder impacts for a strong conclusion.

Eventually, I plan to become a professor. Not only would I be able to use my creativity to direct my own research initiatives, but I would also be able to inspire other students, much like I have used poetry to inspire people in the past. I hope to foster a community of engaged researchers who are as concerned with the meaning and impact of their work as I am. From the beginning, the important thing to me has been connecting to other people, regardless of whether my tool was a pen or a pipette. In particular, I want to mentor other women engineers to help them reach their full potential. I have been lucky; I have been surrounded by brilliant, dedicated female scientists and engineers who have encouraged me to keep pursuing a career in engineering and higher education. Initially, I was afraid that I had made a mistake in pursuing engineering. Looking around my classes, women were seriously outnumbered by men, and it was daunting to think that I would need to fight the stereotype that women are inherently worse at engineering. But during my first research experience freshman year, I saw how successful the female upperclassmen were, and they used to tell me not to be scared off and not to give up. Later, as I started seriously thinking about graduate school, the female graduate students with whom I worked assured me that I had the ability to thrive and succeed in a PhD program, allaying my fears. This support helped me to become the confident engineer that I am today. Someday, I hope to be the inspiration that helps other young women persevere in this industry and overcome any discouragement they might encounter.

Discusses goals for broader impacts and motivaiton based on applicant's own experience.

Back on campus, one hundred engineering freshmen blinked back at me as I stood at the front of the lecture hall. My hands were steady as I started speaking. “Who here thinks they might be interested in undergraduate research?”

About half of the room tentatively raised their hands. With an encouraging smile, I launched into my presentation about the benefits of research, how to get involved, and how it had helped me along the way. I co-founded the Committee two years ago to help other students find their own passion through research, and so far we have sponsored events ranging from REU application workshops to a college-wide lab fair to seminars on giving effective presentations. My passion for words found a new outlet: getting students involved across . There is this persistent stereotype that engineers are not good communicators, and I am actively working to contradict it by sharing my experiences with others. Though I have now graduated and left , the committee has continued running the events that I helped get off the ground; this legacy of research engagement is something that I am very proud to leave at my undergraduate institution, and something that I hope persists for many years to come.

Describes past broader impact experiences with concrete examples and outcomes.

I plan to extend my outreach efforts to the K-12 level to not only help kids see the value in pursuing a STEM-related field, but also show them how creativity and artistic drive merges with those disciplines. In fact, this summer I had the opportunity to mentor 24 high school students through the . The program allows students to complete research projects in science and engineering labs at , while exposing them to diverse range of STEM disciplines through speakers, activities, and field trips. My role as program coordinator involved everything from helping students troubleshoot their projects to answering their questions about college to challenging them to form connections between their extracurricular activities and their academic pursuits. Through their eyes, I got to relive the frustration and excitement over tackling a new problem and learning for the first time what research entails. Through their success, I got to experience an incredible sense of pride as each student gave a polished and impressive final presentation detailing all they had accomplished. Many of these students had told me that they had never considered majoring in engineering before beginning the program, particularly the girls; one student shared with me that at one point he had never even thought he would go to college; yet another confided that he had never before believed that he would be able to be successful in a tech field. The enthusiasm for science and engineering these high-schoolers gained over the course of a six-week program has completely inspired me to continue working to bring these transformative STEM experiences to other students. By mentoring the next generation of STEM students and showing them how to merge creativity and science, I hope to continue making a positive impact on not just their lives, but on the engineering research community as a whole.

Concludes with future broader impact goals and relates back to introduction.