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CISC 480 – Dr. Sawin

Final Portfolio Essay

There are three core values that have guided my choices in what I want to learn and do with my time and resources. The first is it must be useful. This means that people can benefit from my efforts in a way that is not superficial or on paper. The second is it must be challenging. I enjoy the process of learning for the sake of learning. Over my years in academics, I found that researching new topics, finding resources, and having success is a stimulating process that brings me fulfilment. Because of this, I want to spend most of my time getting better, learning, and getting faster at whatever my craft is. The final thing that I value is change. This value overlaps much with learning since change can force one to need to learn new skills. But I value change and flexibility because I do not know what I will want to do in the future so I want the flexibility to change my career to focus upon whatever I care about at the time. The projects I completed at my time at the University of St. Thomas demonstrate the values that have guided my career and academic choices. From starting in Biochemistry to finding a passion in Computer Science then studying and working through a pandemic to finally graduate has been a journey to reflect upon.

I entered the University of St. Thomas as a Biochemistry major and I thought I had it all figured out. I was certain that I would study Biochemistry and go to grad school to get a PhD and make it big time. Biochemistry would definitely be a fulfilling journey because of how my values align with it. Biochemistry is useful since its research advances medication, how we deal with disease, nutrition, and several topics. Biochemistry is challenging. I can remember the difficulty of the course, but also how fulfilling it was to understand more about how the physical

world functions. Why materials feel the way they do, move the way they do, and degrade the way they do. Biochemistry is changing as technology becomes stronger in the field, DNA sequences can be analyzed and compared so that new discoveries can be made faster than before. I applied to do summer research with the university's biochemistry department. The department ultimately decided not to have me on for the summer. I was disappointed to hear this news, but my efforts wouldn't stop to join the summer research cohort. At the time, I was taking the computer science course "Intro to Programming & Problem Solving." I thought that being able to code would make me stand out as a biochemistry student and give me a second chance. I talked with the professors in the department and expressed that I could offer much more value to a research group that needed programming. I learned of some projects that could use technical skills. The one that stood out to me the most was the project Dr. Donato was working on which involved comparing the DNA of bacteria to find genes that caused antibiotic resistance. I thought that was an important project to help prevent the rise of antibiotic resistance to save lives that depend on antibiotic treatment. I expressed my interest, but no promises were made by the faculty. I had heard nothing for weeks after I asked for a second chance. I began looking for alternative jobs for the summer, even considered working at Cub Foods again like I did in high school. I was leaving class one day when I got into the elevator with one of the Chemistry faculty. She smiled at me and said "Congratulations."

"For what?" I asked. I remember being visibly confused as the elevator doors closed.

"For joining research this summer." She responded. Now she shared a bit of my confusion. I thought she had made a mistake and I could clear things up.

"Oh, I actually didn't get put on a research team."

“No, you’re on Donato’s team. You should be receiving an email soon.” She could tell that the news made my day. I thought this opportunity would be great for when I would apply to graduate school, but it would change my life.

With only one programming class, I had to research a lot over the summer to figure out how to work with the tools they were using. They had a tool to compare DNA sequences of antibiotic resistant bacteria and antibiotic susceptible bacteria. Finding what was unique in the resistant bacteria would be candidate genes to test for causing antibiotic resistance. Running the comparisons was done manually using the command line. The workload was far too large to run each command. I wrote python code that automated the process for all the data that we had. It reformatted files, compared them, and stored the results in a structured way. Then with a short list of DNA sequences to test in the lab, the rest of the team discovered a gene that caused antibiotic resistance. This work was submitted and published in Antimicrobial agents and chemotherapy (2020) <https://doi.org/10.1128/AAC.00867-20>. I really enjoyed this project because it would be helpful in the fight against antibiotic resistance, it challenged me with a new skill set, and it led me to change my major to computer science.

After I had a few more computer science classes under my belt, I took computer architecture in Spring 2020. I learned the history of developing processors and how people wrote instructions at a level very close to the hardware. I reflected on the project where I worked with a partner to write a program that reads in assembly code and converts it into the binary instructions that the processor would use. This project was useful in teaching us students how to think about problems at a very granular level so that we can be effective problem solvers in the world. I chose to reflect on this project because halfway through the class is when we got the news that St. Thomas would be going fully remote during the pandemic. We had to change how we worked

on code together, attended class, and everything else in our personal lives. When the world was depressing, small projects like these gave me something to focus on. It gave me something to be grateful for. Computer science was a field that transitioned very easily into remote work. I had an internship at the time that also was fully remote and I was able to make money, take classes, and take care of myself when others had crucial resources disappear during the pandemic.

Another programming project that I worked on during the pandemic was a world distance calculator. It uses a publicly available API to show the distance between two points that the user enters in. In a time where everyone was distant from each other, it was cool to know that I could make a tool that someone else could use. I would enter my apartment and my parent's house and see a number of miles that I couldn't cross without testing negative first. I would enter my apartment and the office where my internship was supposed to be. While it is a simple calculator, it made me consider how the user experience would be with this tool which is something that St. Thomas graduates should consider when creating software. We should consider how we can make useful and unbiased software.

The pandemic separated me from family, work, and school. I learned to cherish the time I have here. We were fortunate to have the technology to remain connected by having video calls, games, and entertainment to get through the isolation. While I started in biochemistry for the good of the world, a challenge, and a changing environment, I found the exact same things in computer science. Technology can serve to connect us with our loved ones and provide much needed resources to people. It is a challenging field that will require me to be constantly learning and exercising my brain. It can change priorities and mediums of work like it did in the pandemic when technology had to be used to keep people connected and many jobs intact.

Graduating from St. Thomas means that I should use my work to be morally responsible. This means considering how the software I create will affect several groups of people and getting input and feedback from different communities. If I continue to challenge myself, I'll be able to work skillfully and think critically about my place in the world and contribute to society. Wherever my passion lies in ten years from now, I can be sure I will be doing good for the world, learning, and changing for the better.