Example 3

Fake It Until You Love It

When I learned that I was required to take Engineering 101, intro to programming, I was upset, to say the least. Furious would be a more accurate description. I hadn't wanted anything to do with computer science; I'm a mechanical engineer - why is U of M doing this to me? Is this some new form of experimental torture? I have been telling myself for quite some time now that I will never be involved in the EECS department. I refused to go in the building, except just passing through, and I would never, ever consider an EECS major or even befriend a professor or GSI. It was just something I hated and never wanted to associate with. Spending hours at the computer staring at the terminal window, unsure of how to proceed, made me despise every assignment we received. But, as I continued to struggle with the projects, I forced myself to go to office hours. And that, surprisingly, is how this paper came into existence.

I sauntered in to my GSI's office, having prepared myself for the long hours of programming and saw this guy, surrounded by bulbous pine cones, staring at a chunky computer screen in the corner. My GSI said, "Madison, this is Leland Pierce, my advisor." I talked with Dr. Pierce many times after that initial meeting, not only for programming help but also about EECS in general. His enthusiasm and sense of humor made me want to learn more about his field. So, when I got this assignment, I knew exactly who I would interview.

In our previous conversations Dr. Pierce had mentioned that he had two undergraduate degrees, one in electrical, and one in aerospace engineering. When I asked him why, I was expecting a philosophical answer, like how he saw the potential for

breakthrough technological advancements by combining Aerospace and Electrical knowledge. Instead, he responded by saying that one of his freshman year roommates was studying electrical and the other was studying aerospace, and he felt that he would be missing out on something by only studying one. However, he didn't stop delving into completely new material at that point. He also spent the summer between his undergraduate and graduate careers learning biology solely because it interested him. Dr. Pierce decided that he would go to graduate school at U of M after he worked at NASA for a Co-op. There he worked on electrical circuitry and simulations for a telescope that was going to be launched into space. He also had taken advanced math classes dealing with vector fields in space during his undergraduate years, which is how he decided to study electromagnetics. At the time he graduated from school, almost all of the jobs in Electrical Engineering were in defense. He interviewed for several different positions having to do with tracking enemy combatants and directing ballistic missiles. But, Dr. Pierce blatantly told all of them he didn't want to kill for a living. So, he ended up back at Michigan working in the Radiation Laboratory (Radlab).

I asked Dr. Pierce to elaborate on his research and he expanded on his work in remote sensing. Dr. Pierce works with two other researchers to detect the distribution of vegetation in forests by means of remote sensing. Using the difference in wavelength between visible light and microwaves, a Lidar (light radar), reflective images from satellites, and several computer programs, they are able to render a relatively clear 3d image of the vegetation on the ground. I found it fascinating how the different aspects of data, like canopy height and diameter of the trunk, could be obtained from several different collection methods. The problem is, the images have very low resolution and

his group in the Radlab have worked to combat this problem. The way the images are obtained produces a lot of noise and still gives a very low resolution. So, the group did something creative by drawing on ideas from biology. The human eye resolves these issues in a way that can be replicated in a simple manner. The neurons average over many receptors in the eye, which eliminates noise, creating a low-resolution image. The eye then does something very smart- it takes portions of the image and averages the parts of those portions that overlap. This method produces low noise, high-resolution images. I had taken a neurobiology class in high school, so when he explained this biological concept, I understood it (if only on a basic level). This multidisciplinary idea is an excellent example of why Dr. Pierce thinks it is valuable to have even basic experience in other fields besides one's major; somehow, I was beginning to agree with him.

I was confused by his answer from before, however, and wondered why he couldn't have just taken an aerospace engineering class if it interested him. I thought about this response a lot after the interview, and I realized that, no, you don't have to go as far as double majoring if you're interested in a topic. However, learning about fields outside of your chosen major is important. I would be missing out on a lot if I never had to take even a few classes that weren't mechanical engineering classes even though individual classes don't connect things like another degree does.

With all of this complicated work, I figured there must have been a major setback the group had faced thus far that he felt could not be overcome. He responded with a long pause. Finally, he said that the complexity of nature was, and still is, a major roadblock to getting any of their programs to work globally. The processes are so generalized because

of this complexity that it is difficult to obtain an accurate view of more than 1% of the world.

When Dr. Pierce finally managed to get these words out I was feeling rather unsettled. I had never once thought their programs didn't, and might never, work accurately for large samples of the Earth's surface even after twenty years of research. Their perseverance really struck me, as I get discouraged when my seemingly insignificant Engineering 101 projects don't always work. The variety of vegetation and complexity of reality, however, *is* the reason that they do this research in the first place, and this talented and dedicated group of scientists will continue to modify their protocols and programs so that they predict and reflect variety from an ecological standpoint.

I think this shows how important knowledge in other fields is, especially for engineers. However, because we are so focused on powering through the difficult classes to get our degrees, we tend to just ask what the easy humanities classes or required Electrical Engineering classes are so we don't have to study for them or do a lot of extra work. This now seems like a huge mistake. I contemplated my attitude toward computer science and electrical engineering. The more I thought about it, I realized that I didn't know enough to be making such a harsh judgement about them. Maybe, just maybe it would turn out that I was even slightly interested in them.

Lastly, I asked Dr. Pierce if he had any thoughts on the absence of female professors, researchers, and students in EECS. He acknowledges the fact that there are a great deal fewer female faculty and staff and that often times they are not treated as equals, but treated according to their job title and gender. He thinks male faculty often are so focused on their research and obtaining money that they make degrading comments

that they don't actually mean. This bias, as well as job stereotyping are things that need to be actively combated, one must try to understand another's situation through everyday interactions. As for the lack of female students, the way most intro engineering classes are taught may be the culprit, he says. He has observed that Engineering 101 (Intro to Programming) has become a "weeding out" class for those in the CoE, and can be rather discouraging, particularly for women since we tend to doubt our abilities. As Sheryl Sandberg stresses in her book Lean In, women tend to feel like they will eventually be found out for not being intelligent, even if they actually are. Since seeing this trend, he has decided to experiment by teaching several female staff members the content of Engineering 101 for one hour a week for 33 weeks. Through this trial, he hopes to garner support for his new lecture methods that will include an interactive coding and lecture session along with a lab-like portion.

I wholeheartedly agree with the observation that Engineering 101 is a weeding out class, and I feel that the lecture is exactly the sort of thing that makes me feel like I could never be a programmer. However, the way our labs are taught encourages us to think, to make mistakes and learn from them, and realize that we can program (with a little help of course). As I have progressed through the semester in Engineering 101, I have tried to adopt a more positive attitude, and as it turns out, I actually enjoy Matlab, a programming interface. And while I still don't want to devote my life to programming, Dr. Pierce has given me good reason to think of this new subject as an exploration into the unknown instead of a form of torture.