

A Reflective Journey: Navigating My Cumulative Experience

My journey at ISU (Iowa State University) has been characterized by incredible diversity, and growth. I've spent my days studying a range of computer and security related topics, participating in Army ROTC, and engaging with numerous friends in activities like broomball, dancing, the Cyber defense competition, and game nights. It has been amazing, educating, and often challenging, but completely worth it.

This short reflection will cover my experiences in communications, ethics and professionalism, continuous learning, diversity of engineering experience, and hands-on experiences. Each of these areas of learning have been contexts in which I've been able to apply my knowledge and gain competence as an engineer.

I believe an appropriate place to start is communication. Communication is incredibly important in the domain of cyber engineering. Often cyber engineers find themselves dealing with sensitive topics, data, and equipment. There is little room for error when handling systems and information that could easily be used for harm; and so, the knowledge of good communications practice is something in which I have seen value, and in which I have excelled.

Most of the communication I've engaged in over my time here has been verbal. Whether in person or virtually, verbal communication has been critical to my success. I am often required to coordinate between peers, mentors, professors, and students with different focuses. I've been on many team projects with students from other majors, usually design students when they are not under the ECprE umbrella. My first team project here was in a Design class, it was a wakeup call to me. I spent many hours discussing the details of our team's design with my partners, we set up voice calls, met multiple times a week, and had to coordinate with other people to source our resources. It was an incredibly preparative experience for me, all my other classes and team projects have built on the communication skills I learned from that class.

Despite verbal communication being the largest mode I have used, written communication is not negligible. It has been thoroughly integrated into every element of the Cyber Security curriculum. Except the pure math courses, it is no exaggeration for me to say that every single course I have taken involved extensive writing. My writing has been in the context of writing lab reports, detailing the findings of a survey into research surrounding spam emails, and explaining and reflecting on concepts like ethics and professionalism. In each of these, I demonstrated and improved my capability to understand and communicate abstract and material information into a clear written form.

It's clear that there is a symbiotic relationship between engineering and communication. The number of instances where effective communication was critical for my success has shown me its importance, and dramatically improved my proficiency. It has prepared me for future

interdisciplinary collaborations. I know the refined communication skills that I've gained will be instrumental in presenting complex engineering concepts in comprehensible ways.

When my professors first started asking me questions about ethics, I found them to be monotonous. The study of ethics was challenging to me because it seemed too obvious to really need to be considered. This was a huge oversight, and it cost me some serious headway in my understanding.

Although I consider myself blessed because I have not yet had the misfortune of really facing an ethical dilemma, this really cost me. My lack of perspective contributed to me not immediately seeing the value of considering an ethical approach to engineering. At first, I really thought the questions I was asked were too obvious to need a time investment. It was in considering the implication of how technology was used, how it affects people, and the ways it can be abused that really got me interested.

Once I started really thinking about it, I quickly branched into really being engaged in considering how people deal with their multiple conflicting agendas, relationships, and priorities. I was fortunate enough to have had my mind changed by the time I started my cyber ethics class, in which I took a deep dive into the theories and process of ethics and ethical decision making.

Through this, I learned to see the serious thought and study of ethics as incredibly valuable because it prepares one to face dilemmas and challenges. Study and reflection on ethics provides the tools and knowledge needed to fairly make decisions with thorough considerations of impact to stakeholders.

ISU emphasizes a balanced engineering perspective. I think nowhere else is this more evident than in cybersecurity engineering. I've found that my engineering experience at ISU has been vastly varied. I've taken basic classes in chemistry, physics, and mathematics. I've taken advanced classes in discrete mathematics, digital algebra, and mathematical proofs. I've taken many classes in computer science, computer engineering, software engineering, and cybersecurity engineering.

This has been incredibly valuable to me. I've been able to see myself becoming equipped with the tools and knowledge that I know I'll need to be successful in my career. I have a broad perspective on the applications of the principles of engineering, I know how to apply myself to any domain of learning. This has been incredible in building my confidence and my capability to contribute to an engineering workforce.

It is incredibly important for a student to have access to hands on learning, rather than developing in a strictly theoretical environment. Thankfully, ISU has a great practice of incorporating a hands-on learning element to every class.

In CybE 331 we used python to program many different cryptographic cyphers which we used to encrypt and decrypt documents and files. In CybSc 538 I learned how to use software

reverse engineering tools such as Ghidra, IDA, and x64dbg to dissect the functionality of various kinds of malware and other programs. In CybSc 536 I used computer forensics toolkits like EnCase and FTK to apply our forensics knowledge to search disc images in search of evidence.

In ComS 309 I was able to apply my knowledge in java and application development methodologies like Apache to build a calendar scheduling application in SpringBoot Java which interfaced between our servers and our Androids. In CprE 308 we did a weekly lab in which we would program an element of an operating system, for example a file structure or a process scheduler.

In CprE 185 I programmed C code to read the real time data from a Dualshock 3 controller to measure its acceleration and pitch while dropping it from a height of 2 stories. in CprE 288 I programmed an ARM Cortex M4 based Microcontroller with various I/O to control a Roomba which used infra-red and pressure sensors to navigate a maze.

Finally, in my ROTC classes MS150, MS101 – MS402 and lab component, I participated in numerous in person and hands on activities to hone my leadership capabilities, my interpersonal tact, and my ability to handle navigating complex tasks under high pressure. I taught labs, participated in semesterly field training exercises', lead a fund-raising effort which resulted in \$5000 being raised, which all culminated in a 31-day summer training exercise in Fort Knox Kentucky where I demonstrated my ability to lead a team of 40+ individuals in complex tasks under high pressure and strict time constraints.

The hands-on experiences I have been afforded have complimented the theoretical knowledge that I have become an expert in. Most of my engineering and military science classes have had a hands-on component.

My time at ISU has grown me tremendously, I have been prepared to take on higher responsibilities in academic, professional, and personal pursuits. I have learned the engineering, cybersecurity, leadership, and ethical frameworks that will propel me into a diverse and active career in the Iowa National Guard. My experiences in cyber engineering, computer engineering, computer science, software engineering, military science and Spanish have readied me to take on all my future engineering challenges with a level head and a sharp mind.