Cumulative Reflection on my Education

Ryan Pals

Computer Engineering

Iowa State University

In my three years at Iowa State I have transitioned from a high-school graduate with a simple understanding of computers and coding into a professional ready to build a career in computer engineering. I have learned about many different topics, written countless lines of code, and greatly expanded my professional network, not to mention all the cool projects I made along the way. Now that my undergraduate education is drawing to an end, I am going to take some time to reflect on what I've learned, how I went about it, and where I plan on going in the future.

Throughout my education at Iowa State, I have designed many different systems, from simple circuits to complete MIPS processors, and from web software systems all the way down to embedded code. In addition to the benefit I've obtained from completing many separate projects, I have also benefited from the way that the ISU curriculum builds on itself, with each class using concepts from another class. As an example, in EE 230 we used MOSFETs to create a basic NAND logic gate. In CPRE 281 we used these gates to create more powerful logical systems: ALU's, timers, multiplexers, etc. In CPRE 381, we combined these logical units to create a MIPS microprocessor, which we learned to program using C & Assembly. In CPRE 308 we learned how the operating system creates an abstraction layer that allows users to do more complicated things with our MIPS CPU. When you combine this course progression with the many coding classes we take, it provides a great understanding of how an entire computing system works together.

Unfortunately, we engineers do not live in a bubble. This means that engineers must be proficient in more than just technical skill sets; we also need to be effective team players who understand the societal and ethical implications of our work. To encourage growth in these areas, the ISU curriculum has a lot of group-work and ethical discussion.

A lot of the group work is designed in such a way that teamwork is highly encouraged. Some classes I have taken even require high cooperation in groups: COM S 309 Software Development Practices and CPR E 329 Software Project Management are examples of classes where the entire semester is focused on applying methodologies and tools to make group work more effective.

In order to ensure that we keep ethical considerations in mind, our professors create discussions on current events that are particularly relevant to the topic at hand. Additionally, we do many seminar courses where we reflect on our degree process, what we've learned, how it applies to the rest of the world, and the ethics involved.

Needless to say, I did not complete my degree without a little help. One could even argue that the process of learning how to utilize available resources to accomplish a given task is more important than the technical knowledge obtained from an undergraduate education. In my case, I would usually use either official datasheets & documentation or online forums as my first resource when learning something new or troubleshooting a problem. Should that fail, I would resort to the most effective resource of my undergraduate career: my peers. In my opinion, a reliable and helpful peer network is the single most powerful thing you can have in the engineering world.

Outside of class, I've enjoyed the opportunity of participating in many student organizations on campus. I've participated in a variety of technical clubs including Mobile Development Club, Game Development Club, CSE Club, IEEE, Audio Club, Arduino Club, ISEAGE Cyber Defense Competition and HackISU. I enjoy participating in these clubs because they allow me to creatively apply what I've learned in the classroom. This process also strengthens the design skills in ways that can't be achieved in a traditional class. Additionally, I have learned that you really have to look around to find the most exciting technology and the most interesting people.

I have spent a lot of time outside of class learning things that I think will make me a better engineer and business person, including different technologies, programming paradigms, and design methodologies. As an example, I have been working towards learning functional programming, as it is highly regarded by many engineers that I respect. Also, I have been working towards my goal of developing a working understanding of machine learning by the end of this semester so that I can get a running start on my internship this summer.

Additionally, I am working on taking more risks that could advance my career outside of the classroom. As an example, I am currently working creating a website for myself. This can be difficult, because, like many engineers, I am a natural introvert; I don't like the idea of putting all of my achievements and pet projects up for the entire world to see and critique. I am also working on moving all of my side projects to GitHub so that I can work on building a portfolio and establishing myself as a professional. This, of course, has the risk that potential employers could see my code and decide that they don't think I produce work of a high enough quality. That being said, these are important risks to take in this profession, and I am confident that they will pay off.

If I could repeat my undergraduate education again, I would do a few things differently. First of all, I would get involved with clubs sooner. I would stay super involved, find one club I'm particularly passionate about, and work to obtain a leadership position in that club. With this, I could learn more about being an engineering leader, and I could contribute to creating a better environment for my fellow students. In addition to this, I would get involved with a wider variety of clubs. I have done many technical clubs, but I certainly wish I had the opportunity to expand my network further beyond the ECE department. Finally, I would either study abroad, do an eight-month co-op, or pick up a couple minors. At this point in my education, it's too late to do

any of these without major sacrifices. Although I am happy to graduate a semester early and get a head start professionally, I feel like I could have used a full four years more effectively.