My internship at CAMP Dosser was invaluable to say the least. I learned a lot about the engineering design process and the behind-the-scenes process of printing a 3D CAD file. As a student, I was always on the front end of just CADding my design and submitting it to the teacher and then a couple weeks later getting my model. As a lab assistant, I experienced the back-end of getting those design files from the teachers and getting them ready to print at maximum efficiency and least wasted filament. I became experienced with slicing software like Prusa Slicer and Versa Works for the 3D printers and vinyl printers respectively. Slicing a 3D cad file was editing a student design like changing the size and axis it would print on to save the most filament and require the least post processing necessary like removing support material. We also edited student designs on a large scale as we had multiple projects to manage at one time and multiple deadlines to meet. Furthermore, we were receiving new projects every couple days or so. Fortunately, our filing system, all in Excel, was very well formatted by our mentor Mrs. Patil and she taught us how to create new folders and files as well. Without this organization, the other interns and I would have been a lot less efficient with printing designs on time and would have experienced a lot more stress. At the end of my internship, I came out with skills that built upon concepts I had learned in my engineering class that year. I had earned an additive manufacturing certification that year and saw all its applications at CAMP Dosser and really confirmed my learning. It was really the epitome of PBL as I saw all the things I could with that certification I studied for.

Specific equipment I used included the five Dremel 3D FDM printers, four MakerBot 3D FDM printers, two vinyl printers, and the CO2 laser cutter. I became most competent with the printers and vinyl printers as most of my designated projects were to run on them. I learned how to slice g-code (language the 3D printer interprets from the CAD file) of the student designs and slice them to print most quickly, efficiently, or with the least support material depending on the print file all in Prusa Slicer, the editing software for the Dremel 3D printers. I also learned how to use Versa Works, the editing software for the vinyl printers and compiled multiple posters onto one sheet to print the fastest and save the most ink.

A specific project I remember working on was 3D printing battleships and boats for the Laser Lab STEMmersion for their mini tournament. This took several days as it took a while for all the designs to come in to our excel folders we created for them. I spent some time organizing all the files, documenting on a spreadsheet the status of prints, printing multiple boats on a print bed to save time and ink, and taking off support material from finished boats. It was very fulfilling at the end seeing all the young middle schoolers excited to see their boats and test out their buoyancy. The project also taught me how essential management and organization are in a project; something Mrs. Patil instilled in me that I'll definitely remember.

I had one major challenge during my internship that is still clear to me. One of my first tasks was compiling student created wooden keychain designs onto an Adobe Illustrator document to print multiple keychains at a time. These designs were from the middle school Laser Lab STEMmersion and they had just come in the previous day where we gave a tour of CAMP Dosser's 3D printers, vinyl printers, and laser cutter. We also gave them a quick tutorial on Adobe Illustrator as the program was pretty new to a lot of the sixth and seventh graders. We also assisted them with drawing and dimensioning their designs like making all their keyhole dimensions and locations the same, keychain size, and drawing tools to use as a lot of them do not come up (since they're not recognized) on the laser cutter. When I began receiving their print files, they ran smoothly onto the Illustrator file, however one of the documents I made, with about 15 designs, would crash Epilog Cut, the software that runs the

laser cutter, every time I'd send it to cut. Since some of the other documents I'd sent worked, I logically assumed it was one or more of the designs on that specific document responsible. This was very frustrating as I did not know which of the fifteen or so designs were the problem. I had to go through each individual design to check for invisible drawing lines, shapes, points, etc. that would confuse the printer. This took several hours and two days as I had a lot of troubleshooting to do and manage other projects as well. Anyways, on the second day I found the problem; invisible points scattered all over some keychains. A lot of the students did not know how to delete points and since they disappeared when they stopped hovering over them, they continued drawing. After deleting all these points, the prints ran smoothly, and you can see some of the in the slideshow below!