2018

MATC Summer Internship Program

MID-AMERICA TRANSPORTATION CENTER

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Since my first day at The University of Nebraska-Lincoln, The College of Engineering's faculty has always stressed how beneficial it is to have an out of classroom experience in the engineering field, whether it's through research, an internship, or a co-op. I have been lucky enough to have two of these experiences through the MATC internship program. Before my first internship through the MATC internship program, I had no idea how much knowledge one could gain from just a few short months as an intern. An internship provided me with an experience that the classroom never could. That's why, after my first internship, I was eager to apply for another through the MATC Internship Program. Throughout my time at the University of Nebraska-Lincoln, the Departments of Civil Engineering professors talk about the Civil Engineering profession regarding three different fields: the public sector, the private sector, and research. My first internship experience was in the private sector at Olsson Associates. This time around, I had a whole different experience. I was given the opportunity to help conduct research under Dr. Yong Rack-Kim in UNL's Department of Civil Engineering. This research was focused on a new greener alternative construction material, Geopolymer Concrete. Though I learned a great deal about Geopolymer Concrete, the knowledge I gained from this experience goes far beyond that.

My first week on the job, I was assigned to read some research article pertaining to Geopolymer Concrete. Though reading academic journals all day doesn't sound like much fun, I found myself eager to read and learn more. After reading for a few days, I still had many questions unanswered about Geopolymer concrete. After Googling and discussing with graduate students and Professor Yong Rack-Kim, I soon realized that there has been very little research done on Geopolymer Concrete, and that many of the

questions I had couldn't be answered because it hasn't been researched extensively. Learning that I am one of the few to research this construction material made me all the more excited to start the research.

After reading about the limited information and research there is about Geopolymer Concrete, I began to make concrete samples for research testing. Throughout three weeks I created more than 40 different samples using both Ordinary Portland Cement Concrete and a Geopolymer concrete. While creating the samples I used equipment and techniques that I learned in many of my classes. It was an eye-opening experience to see how these equipment and techniques are used daily when studying construction materials.

During the several weeks I spent preparing samples, Professor Kim, Graduate students, and I were also preparing for The University of Nebraska-Lincoln's Big Red Summer Camp. As part of our National Science Foundation outreach project, we took part of the Discover Engineering session of the camp. We conducted a concrete bridge activity allowing high school students to design and test the strength of concrete bridges using conventional and alternative construction materials (OPC concrete and Geopolymer concrete). This hands-on activity demonstrated how alternative construction materials may replace conventional materials and bring greener and more sustainable infrastructure for the future and that fundamental research in construction materials can improve all fields of civil engineering. During this activity, students were giving a presentation about the basics of concrete mixtures and the differences between Ordinary Portland Cement Concrete and Geopolymer Concrete. This presentation also highlighted the benefits of Geopolymer Concrete and why we are interested in studying

this alternative construction material. Students were then able create their own concrete mix designs for both OPC Concrete and Geopolymer Concrete. The students choose the weight of Portland cement/fly ash, Water-Cement ratio/Alkaline Solution-Fly ash ratio, and Aggregate-cement ratio/Aggregate-Fly Ash ratio based off the information in the presentation and their own intuition. The students then mixed their concrete by hand and filled their bridge molds. The students then came back four days later to test the strength of their bridges using a Universal Testing Machine. For this activity I was responsible for creating and presenting a 20-minute presentation to the students, deigning the bridge molds, and creating a post presentation quiz for the students.

In connection to this activity, pre-activity and post-activity surveys were given to the students before and after the event. The surveys were aimed to measure the interest and knowledge of the students pertaining to engineering and alternative construction materials. I had the opportunity to do some statistical analysis to obtain a better understanding of how our activity increased their knowledge about geopolymer concrete. The high school students were asked six questions where they indicate how strongly they agreed or disagreed using 0-10 scale (with 0 being strongly disagree and 10 being strongly agree) with statements before the activity. The same 6 questions were given after the activity. After statistically analyzing the surveys using a t-test, one question had a significant change in the pre-survey and post-survey averages. This question was “I have heard/known alternative/supplementary cementitious binding materials that can replace Portland cement”. The average pre-survey answer was a 3.8, and the average post-survey score was 8. From this statistical data it can be observed

that the students have a much better understanding of geopolymer concrete because of this activity.

After the Big Red Summer Camp ended, I started to test my concrete samples that I prepared earlier. I was able to use destructive and non-destructive testing methods to obtain the mechanical properties of the concrete samples. Some of the testing devices I had already used under supervision in laboratory settings for classes; however, there were several devices new to me. This experience was different than a normal laboratory setting from a class, because I alone operated the equipment after receiving training. It was a valuable experience not only to learn how to operate test equipment I was familiar with, but also to learn about new testing techniques that can be used.

Another very valuable experience I had through this internship was helping writing research papers. I had the opportunity to help the graduate students that I worked with write research papers. This hands-on experience in academic writing proved to be more exhausting than I thought. Academic writing takes a lot of patience and thought. With the opportunity to get a paper published as a peered reviewed research article, you want the paper to be perfect. The paper that I helped worked on will be submitted for publication, and if published I will be listed as a co-author.

Overall, this internship through the MATC program has been a very valuable experience. Everything I learned throughout this internship goes far beyond just the research aspect and could be applied to any other job I may find myself in the future. This experience is one that a classroom could not recreate. This internship will be great to add on my resume as well as provide great conversation during an interview. From

this internship I believe that I now have a head start for careers after college. Thanks to the MATC Internship program I can say with confidence that I have chosen the right career to pursue and I am excited to see what the future has in store for me as a engineer.