

Final Reflection on My 2017 Summer Enrichment Experience in Engineering at Stanford University

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This summer, I spent three weeks at Stanford University's Pre-Collegiate Institutes taking the structural engineering course. This class focused on building bridges and towers to address specific scenarios and to utilize the physics principles of moment and equilibrium

A Day at the Institutes

Each day, I would wake up between 6:00 and 8:30 a.m. to get ready for the day and run over to the dining hall for breakfast. From 9:00 to 11:30 a.m., I would be engaged in activities and classroom instruction provided by the course instructor. Then, after an hour-long lunch, my class and I would return to our dorm to complete worksheets, research designs, and build structures under the guidance of our counselors. At 3:30 p.m., there would be a half-hour snack break followed by an hour-and-a-half activity period. At 5:30 p.m., the counselors would release us for dinner, and we would have free time until the 9:30 p.m. house meeting. Lights out followed at 11:00 p.m. On weekends, we would have free time to work on class projects, socialize, or explore the campus until required activities or field trips. These days would end later, with the house meeting at 10:30 p.m. and lights out at midnight.

The Course

In my course, we began by reviewing the physics principles of vectors, scalars, moment, and equilibrium. We practiced these concepts through worksheets and demonstrations. Sometimes, we would experiment with these concepts in building towers out of various materials, including gummy bears and toothpicks, paper and string, and forks and paper plates. I saw how different groups had different ways of thinking through the construction and design of their towers.

After my instructor, felt that we fully understood the physics behind structural engineering, we began to build prototype bridges to see which basic designs could hold the most weight while using the fewest materials. We learned that girder bridges, though inefficient, can hold a lot of weight, while suspension bridges are the most efficient and effective, but cannot span great distances. This led to our first major project. Our instructor had us design and build a bridge to cross a set distance and hold a 12-pound weight. She divided us into groups of three, and we began to design our bridges. We were instructed to design the bridge to be as efficient as possible without breaking. My group designed a supported girder bridge with a series of arches for reinforcement. It was the second most inefficient design, but it was very strong and quite aesthetically pleasing. We ended up winning first place for our design, beating out the runner-up by just a single point.

Our next and final project was to design towers that would survive a powerful earthquake. After learning how the force of the earthquake was distributed along a building and how to calculate it, we began to design and construct our towers from balsa wood and glue. My group's tower design was a series of stacked hexagons, each rotated 90 degrees from the one beneath it.

Unfortunately, somewhere in the construction process, it began to lean at a steep angle. During testing, this proved to be the tower's downfall, as the weight of the tower combined with the earthquake caused the entire structure to fall over. Despite this, the HexTower still won second place and was rated the most exceptional tower by the class. This was our final project, and the last day of our class, so our instructor allowed us to hook together the surviving towers into a single skyscraper and shake it to pieces with the earthquake simulator. That was a lot of fun!

Outside of Class

Outside of class, I was very busy. Our activities included board games, sports, movies, and trips to museums. I alternated among the activities. Sometimes, I would watch a movie, and, other times, I would want to do something physical. During my free time, I would frequently work on the assigned homework from class, whether it was a worksheet, a presentation, or finishing the construction of our tower. Other times, I would read a book in the lounge, get a gelato, or play card games with friends. There were always enough things to do, so that you could never get bored. On the first Saturday, Stanford hosted a small carnival, which featured a petting zoo, lawn games, and free food. I think I had the most fun rolling around in the giant inflatable hamster balls, chasing my friends around the quad. We also went to Capitola Beach, where I explored the town, waded in the water, and read. The following Sunday featured a field trip, as well, and I chose to visit the De Young Art Museum. I wandered the museum for several hours, looking at many great works of art. My favorite part of the enrichment program, though, might have been the talent show. On the last Tuesday, students shared their singing, playing, and hula-hooping abilities on stage. There were many students with a lot of talent!

Personal Impact

Upon completing the Stanford enrichment program, I realized that there are many great career possibilities and many interesting people engaged in these professions. I don't think I will ever look at a building the same way again. Each time I see a building going forward, I will unconsciously analyze its structure. While I don't know if I will become a structural engineer, this program made the field of engineering very appealing to me, and I believe that it is where my future career lies.

This program also showed me how working as a team is necessary to doing a task well. In working together on all the parts of bridge and tower projects—from design to construction to presentation—my group had more fun, addressed problems more easily, and learned more about structural engineering than any group I saw that divided up its tasks. This experience and reflection taught me that it is necessary to balance working independently and working collaboratively, as both are necessary for a successful team to accomplish its goals.

In The End

I feel that this program was one of the best academic experiences of my life. I learned a lot, and I had fun doing it. Thank you, Garwin Family Foundation, for this wonderful, life-changing experience!