

April 18, 2014

Dear Mr. Vassiliades:

I thank you and the rest of your organization for giving me the James E. Roberts Award. Last year my sister made it into the science fair and did very well which inspired me to try to do well this year. Your award will inspire me next year. The science fair was a great learning experience for me and there couldn't have been a better end for the science fair than your award.

I am Tai Michaels and I go to Portola Middle School and highly gifted magnet where I am in 7th grade. My favorite subject is science and I even chose an elective which was about science. Outside of school, I go to a programming class, I play on two different soccer teams, and I'm part of a Boy Scout troop.

In our school, all 7th and 8th grade students are required to make a science fair project. I chose to do my project on which bridge was stronger: cable-stayed, cantilever, or suspension. I chose these bridges in particular because they weren't the bridges you usually see in an average bridge strength experiment and they could be affected by wind since they were supported with cables (this idea was aroused by the Tacoma Narrows Bridge collapse).

Unfortunately, one of the sources I'd used had been faulty and I found out that cantilever bridges were most certainly not supported with cables which left me with just two bridges. I didn't think that two bridges were enough to compare with, so I changed my project to just modifying testing one of the bridges and, based on how it was affected, change it in an attempt to improve it. I decided to use the suspension bridge because it was far more commonly used than the cable-stayed bridge.

After doing some research, I had decided on using CA (cyanoacrylate) glue, kite string, and balsa wood, but I soon found out that local stores didn't have balsa wood in all of the needed sizes. So, I changed my plans and got bass wood for the towers and cross pieces. Even changing the wood type, the pieces still weren't exact, so I cut them with a power saw.

With my materials ready, I started on my first bridge. The first bridge I made didn't quite work out because the towers weren't perpendicular to the deck, so I had to change it. With

the now corrected suspension bridge (measuring three feet long), I used an industrial powered fan to blow on the bridge from 14 different distances (which slowly got shorter and shorter) and with three different power settings. I recorded the results and then moved on to the weight test in which I looped a rope over the middle of the main span and tied it to a bucket which I weight down with coins (one at a time).

The next day, I looked at videos of the wind test and the weight test (the weight test was in slow motion) and came up with several ways to improve the results of both tests. Once I had looked over what the pros and cons of each change would be, I decided on tightening the strings, tying the ends of the main cables back to the bases of the towers (instead of to an anchorage like in the first bridge), and running cables underneath the length of the bridge.

Having made the bridge with the modifications, I repeated the tests done on bridge one and found out that the second bridge held about 39.1% more weight and took until the fan was 30.5cm closer to shake the cables on powers 2&3 and 91.5cm for power 1.

I concluded that the lateral cables helped by distributing the weight along the whole bridge, that the tightening of the strings helped by making the cables not shake as much, and that tying the main cables back to the bases of the towers didn't help because it caused the bridge to bow downward to begin with which usually takes a couple kilograms for it to start doing without the modification.

Before going to the LA County Science Fair, I first went to our school science fair. There, I placed 4th in 7th grade and got a judge's special award for best real world application. Of all the students in those two grades, 13 get to go and I was lucky enough to be among them.

I had a great time at the county science fair and it was a great learning experience. Thank you so much for the award.

Sincerely,

A handwritten signature in cursive script that reads "Tai Michaels".

Tai Michaels