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E in STEM  
Major Project: Reflection

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## Reflection

The engineering design challenge was fun for the students to do, but there were some issues. Time was one of my obstacles. The current unit of study was another issue. We are on a hybrid schedule so my students are only in school 2 days a week, 3 days every other week. I would have liked to have spent more time on the engineering design process with them. Ideally, students should be able to do some of the process on their at-home learning days, but participation is minimum. Therefore I covered most of the assignments having to do with engineering, at school. The current unit I am doing with my students is not related to any of the design challenges in the *On the Moon Educator's Guide*, so I had to veer off topic a bit. I was okay with that, however, because of the nature of the way this year is going (global pandemic). I'm sticking with teaching the basics in terms of content, and focusing on science inquiry skills and the engineering design process, whenever possible. Any engagement I can get from my students is a positive for me.

For the most part, all of my students love the "STEM Challenges" I give them. They were very excited to do the "Touchdown" challenge. We had just talked about the Space-X Crew Dragon *Resilience* launch to the ISS earlier that week, and my students are always excited to talk about anything related to space and astronomy. Naturally, they were eager to get to the building part, so getting them to create a plan and follow the design process was challenging. I talked about the criteria and constraints of the challenge and had them record that in their lab notebooks. I encouraged them to sketch diagrams or write down their ideas as I was passing out materials. A few students did.

Building the moon landers went well. Students had fun trying different things and sharing ideas. They did a good job using the materials and were excited to see if their moon lander worked. One of the most frustrating parts for the students was the constraint of not having a lid or "seatbelt" for the "astronauts." Of course several students argued that that wasn't realistic, which is true, but I didn't have an easy answer for that argument. For interest off time, I just told them to go with it and have fun. It was a learning process for me as well. I was unsure of the size of cups to use, as

the *leader notes* did not specify the size. My first class used relatively large paper cups. I noticed that made it too easy. The marshmallows could easily stay in the cups, and not bounce out. I quickly found smaller cups before I had my second class and I had enough for all the rest of my classes to use the small, plastic cups. However, it was easy to just squish the marshmallows into the cup to hold them in. Many students did this and argued that “it’s not one of the constraints.” Again, true, so I pushed them along. This resulted in several students not making much of a lander at all. They just taped the cup, with the 2 “astronauts” stuffed in, to the cardboard and dropped it, and they didn’t bounce out.

One of the hardest parts of doing this engineering design challenge with my students was getting them to reflect on the process. I asked them to sketch a labeled diagram of their final lander and to write how they used the materials and what modifications they made along the way. Many did not do this part. I intended to have them work on this the next day they were in school, but circumstances did not allow that to happen. Therefore, I had them fill in a blank design process flow chart. I used the Design Process from PBS Design Squad. I taught the design process earlier in the year and all my students have the flow chart in their lab notebooks, so they were familiar with it.

I have done several engineering design challenges with my 6<sup>th</sup> graders over the years but this was the first time I did the “Touchdown” challenge. I have ideas for how I would do it differently in the future. First of all, I would change the constraints a little. I would say that the marshmallow “astronauts” need to be loosely in the cup so that if you turn the cup upside down, they fall out. I would also limit the use of tape and use only masking tape. I found that the clear tape was not useful. Finally, I would use cereal boxes for the platform instead of stiff cardboard. I think the stiff cardboard made the challenge too easy and it was hard to gather and cut all that cardboard. It would be easier to collect and cut cereal boxes.

The next time I do any STEM challenge with my students I will plan for it to last more than one class period. I will also require my students to come up with a plan before I give the materials. After the challenge is done, I would make it a required class assignment to reflect on the process, including drawing a detailed diagram of their final product. I would need to model this for them as well.