

2016 CU Boulder Outreach Paper



School:

Colorado University at Boulder

Team members:

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Faculty Advisor:

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Mission Statement:

As a team and a student organization we strive to give back to the community in a way that will provide as many students as possible with the opportunities and knowledge to pursue what they want to in life. We believe that all k-12 students should be exposed to the STEM fields and encouraged to engage with them, regardless of race or gender.

We believe that, as a new NASA RMC team, the best way to make an impact is to first reach as many students as possible. We've elected to do that by teaching engaging lessons at a local highschool and forming a partnership with one of our university's STEM organizations to help them reach more k-12 students. We have also established relationships with a local FIRST robotics team so that we can further our impact as time goes on by providing mentors next school year and possibly over the summer.

Although our impact is not as large as we want it to be this year, the connections and partnerships we've formed this year essentially guarantee that our outreach initiative will only grow in size as time goes on. We hope that the framework we lay today will allow us to impact enough children's lives to make a meaningful difference and be in the running for the outreach award next year.

Outreach Projects:

One of our outreach projects for the competition was to go to a local high school using a program designed to interact base knowledge of physics with basic engineering in a fun and engaging way. The group of students we reached out to was a group of highschool sophomores and juniors of mixed race and gender, predominantly of Hispanic descent as well as Asian and Caucasian, with roughly 30-40% being female. We had 3 classes of students with roughly 30-35 students per class (around 70 total) participated in the outreach event. For each session we had 4-5 volunteers from the robotics club.

The outreach project we participated in involved a Lego drop. The students are given a bucket of Legos and a light bulb with the goal of making a carrier for the light bulb that could be dropped 15ft and not only have the light bulb survive but have it light up at the end of the drop. The team with the lightest structure, where the light bulb lights up at the end wins the competition. The students are broken into teams of 3 and are given 20 minutes to design the carrier, while our outreach volunteers go around and give advice and answers question about the design and potential design problems. Then after the 20 minutes are up we take their carriers and weigh them as well as verify the light bulbs we gave them are working. We then have them select a dropper as well as two people for the ground team and have the students who are the

droppers head up to the balcony where we would drop from. After verifying that the landing zone was clear we have the students drop the carriers one group at a time. The students then pick up the Lego pieces and retrieve their hopefully undamaged light bulb. After all teams have gone we go back to the weighing station where we would plug the light bulb back and make sure the filament is still intact and the light bulb can still light up. The winner is then declared from the pool of light bulbs that still illuminate with the first place prize receiving a candy bar for having the lightest possible successful craft.

This project involves base level physics laws such as Newton's second and third laws, $F=ma$ and for every reaction there is an equal and opposite reaction respectively. Some basic engineering principles such as; failure points and wind resistance. The combination of the two allows student to see how what they are currently learning in their science class can eventually lead to building more complex systems. We also like to compare it to the Mars entry and landing vehicles for the Mars rovers by making the comparison between the dropping of their carrier to the landing vehicles NASA uses, in hopes of sparking the student's interest and helping them to realize that most of these amazing vehicles developed by various corporations in conjunction with NASA all have their base in relatively basic ideas.

Furthermore, we've formed the beginnings of a partnership with CU's ITLL in outreach with local schools. The [ITLL](#) or Integrated Teaching and Learning Program and Laboratory is a program at the University of Colorado, Boulder which supports hands on engineering education for all ages. At the collegiate level this entails offering hands on engineering projects courses; while at the K-12 level this includes a fellowship program (for college fellows to work with K-12 students) , a digital library of engineering education resources, and TEAMS. TEAMS is a partnership between pre-collegiate schools in the Denver metro area and CU Boulder. Individuals from CU Boulder go to these schools and lead hands on workshops on engineering. An example of such a workshop might be an egg drop. The CU Boulder Robotics Club hopes to partner with the ITLL in TEAMS in the coming weeks. We would like to integrate our lego drop as one of their workshops and lead this workshop at local schools In addition to working closely with the ITLL to provide enthusiastic volunteers to their program to allow it to reach more students across the state.

Recently an opportunity opened up to mentor a [FIRST](#) robotics team. Our final planned component of outreach is to pursue this potential opportunity. Next year the CU Robotics Club will mentoring a FIRST robotics team at a local high school which will hopefully help spread interest and break down barriers in the STEM fields.

Conclusion:

Although we will have only reached about 100 students by the time of the competition, the framework we've laid out during our first year as a NASA RMC team will help us reach more than double that figure in the 2016-17 school year and possibly more in the coming years.

Outreach is important to us and we did what we could this year, but because of our relatively late start as a fully fledged team we were unable to contact schools in time to engage in more outreach programs. We believe that our presence as a source of FIRST mentors, our partnership with CU's ITLL and our continued work at local schools will be enough to start making a real impact in Colorado and hopefully raise the bar in the coming years for other RMC teams to do the same.