# Community College Partnership for student-led Undergraduate Suborbital Research

Barbra Sobhani[1], Jennifer Jones[2]

[1]Red Rocks Community College, Science Department, Lakewood, Colorado, USA
[2]Arapahoe Community College, Physical Science Department, Littleton, Colorado, USA

## Abstract

Undergraduate research is a high-impact practice to engage STEM students and increase retention, especially in underrepresented populations. With a wide range of student diversity, community colleges are a vital part of the STEM pipeline. Historically, it has been difficult for community colleges to provide undergraduate research opportunities due to lack of funding for projects and little support or opportunity for faculty to pursue research. Colorado Space Grant has allowed our students and faculty access to excellent research opportunities at an affordable price. However, the cost of doing research on suborbital rockets, even through Colorado Space Grant, can be prohibitive. In order to allow the students the opportunity to get their own research flown on a sounding rocket, Red Rocks Community College (RRCC) and Arapahoe Community College (ACC) are partners, combining resources both financial and advisory. These collaborations have led to active space science projects, including biological survivability experiments, designs for removal of space junk in orbit, and 360 degree video of a rocket launch and retrieval. The students present their research at an undergraduate symposium at the end of the semester, giving them professional presentation experience. Being engaged in cutting-edge projects and research helps student retention in college, increases transfer success and career engagement in the space sciences.

## Making rocket payload development affordable

Space research involving rocket launches is immensely rewarding for undergraduate students, but costly. To bring sub-orbital access to our community college students, we developed an interdisciplinary, cross-campus collaboration to launch a rocket payload through the NASA Space Grant RockSat program. RRCC and ACC share the launch and materials costs. Each school has a student team and advisor. The student team designs the experiment, builds the payload and participates in integration and launch. The first collaborative project tested viability of unprotected DNA, radiation shielding and detection during the flight. The next project, the team is developing a system to trap small space debris to protect payloads form micro-scale impacts. Last year, students developed a payload to test the deflection of space debris and the survivability of 3-D printed plastics upon re-entry. This year the students are creating a system that will record 360 video for the rocket launch, de-spin, and reentry as well as a biological payload.

## Managing partnerships for project success

Community colleges do not generally have the internal processes and structure set up for cross college collaboration on research projects. Our team has developed and revised a structure for successful project completion. Team selection is through an application process and students of all levels are encouraged to apply. This year, a team manager position was developed and filled by a business student to better reflect the structure a design team would experience in the workplace. Students are encouraged to develop external partnerships with other institutions and companies that can provide resources and testing capabilities that are not available on the community college campus. Students complete a series of design reviews and are given the opportunity to do professional presentations each semester. Final reports and publications are also a part of the process, giving students valuable publishing experience.

## Conclusions

Affordable access to sub-orbital platforms provides an outstanding opportunity to engage high-achieving undergraduates and leads to successful transfer and completion in engineering and space science degree programs. Collaborating with Colorado Space Grant has provided the necessary resources to develop an undergraduate suborbital research opportunities at RRCC and ACC.