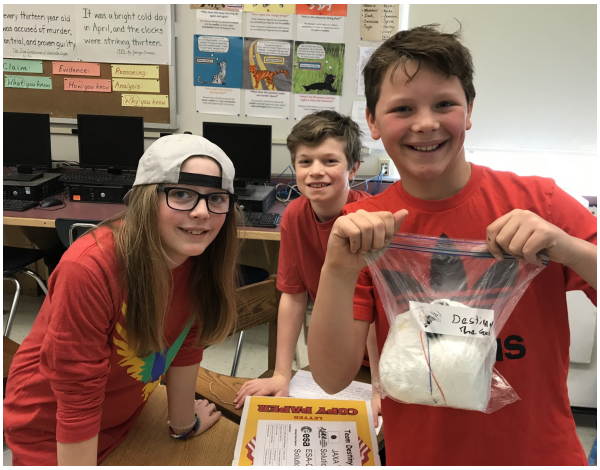


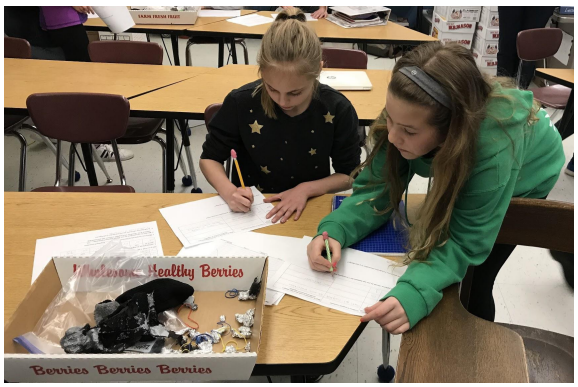
Houston We have a Problem
An ISS Based Project Based Learning Scenario

This project grew from a friendship with Indiana Science teacher Dan Wray, who I met during my first astronaut candidate interviews in Houston in 2003. We both loved space science and really wanted to do some teaching together - the only challenge I was in Alaska and he was in Indiana. So Houston We Have a Problem was born - a hands-on experiment growing from the Apollo 13 mission.

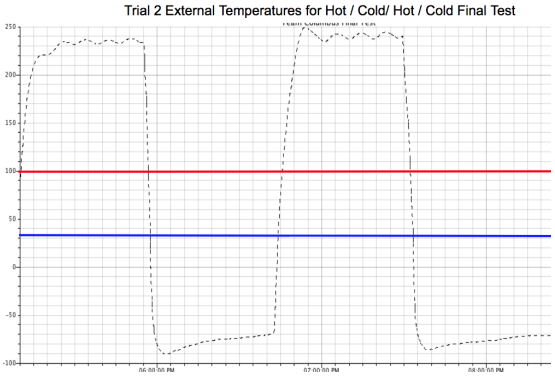
We created a scenario of a battery that needs to be replaced ASAP outside the ISS, however without any insulation it is doomed to either overheat during the sun exposed part of the orbit or freeze during the dark side. So students were challenged to - Apollo 13 style - create an insulation package using materials that could be easily scrounged from inside the ISS - toilet paper, foil, ziplock bags, foil style juice containers, etc. We both got sets of simple Hobo dataloggers that could track the internal temperature of these devices and that became our “battery” that they had to build around.

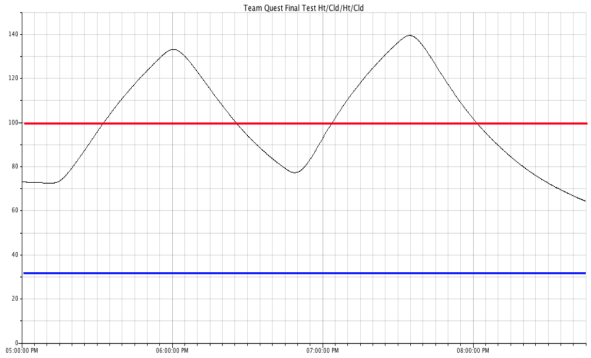
Our real goal was to teach experimentation and data analysis, while also trying to model the collaboration that is so critical to successful project work. My classes - in Alaska - took on the cold challenge, figuring out how to keep a battery close to room operating temperature even when exposed to temps of -150F or more. Indiana went to work tackling the hot - with the goal to be able to survive up to 45 minutes exposed to +250 F.

Our testing model was pretty simple - stick the cold ones in a cooler with dry ice and the hot ones in a conventional oven. When complete the data loggers create some great graphs - so everyone got a practical lesson in graph interpretation.



Once everyone had their data pretty well understood, it was time for our collaboration. After we have all lived and taught virtually through the pandemic it doesn't seem like any big deal to connect classes in Alaska and Indiana - but in 2004 / 2005 this was quite the trick and was by far our biggest challenge. Fortunately we both had great tech staff at our school and we had several successful connections where students share their data and discussed how we could combine the information into a single solution that could tolerate both hot and cold.





Then both sides were tasked with creating their best overall solutions - with success being staying about 32F and below 100F for an entire 2 orbits (3 hours). Several teams succeeded and perhaps our favorite part of the entire experience was listening to the evidence presented during our final videoconference trying to justify which solution was truly the best and should be implemented if this situation ever arises.

It's a great project and we have continued to use it in various forms - have presented it at NSTA and Houston Space Center conferences. If it sounds like something you'd like to try - feel free to reach out and we will gladly share more details to help it come to life in your classroom.