

DESTINATION IMAGINATION AND THE REAL WORLD: My Parallel Experiences as a DI Team Manager and a NASA Engineering Project Manager (Part 1 of 3)

By Scott Dalglish



I would never have guessed that these two facts would lead me on an exceptionally fascinating and rewarding journey this year.

- It costs \$40,000 to send a 2-liter bottle of water to the Space Station.
- Colorado Destination Imagination faced a challenge in the Boulder Valley School District which could have ended the district support of the Destination Imagination program.

At the start of the last school year, the Boulder Valley School District sent a memo to Boulder Destination Imagination (DI) Team Managers that said, 'no DI activities of any sort may take place unless a district employee is directly supervising the activity.' Since I managed a Technical Challenge team and our creations took form in my garage on the weekends, I saw this as a real problem for Boulder District sponsorship of DI. This ruling also had the potential to cascade to other districts, so I was highly motivated to address this new policy.

I scheduled a meeting with the district officials to discuss the new policy and to look for solutions that met everyone's needs. To prepare for the meeting, I kept asking myself, "How can I convince the district that DI provides extremely valuable skills that the schools don't have time to teach?"

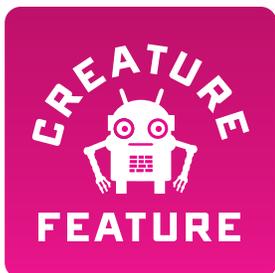
When I met with the District decision makers, I first made the case that the true engine of our economy is innovation—and that Boulder/Denver region was recognized worldwide as an innovation center. I backed this up with some great quotes from an Inc. Magazine article that talked about Boulder as an innovation hub (see [How Boulder Became America's Startup Capital](#)). I explained that as a volunteer in the classroom, I could see that teachers don't have the time to teach the 21st century skills that DI teaches. However, these skills are the core to our economy. I asked, "Does the Boulder School District want to be part of making Boulder an innovation hub, or do they want to disconnect from that?"

I decided to emphasize how the DI program teaches highly valuable, real-world skills. I asked the District representatives,

“ How many of you were taught project management in elementary school – none, right? How often do you use project management skills in your job – every day, right? DI develops many practical real-world skills, like project management, at an early age.”

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To illustrate how effective DI is at building real-world innovation skills, I set a printout of the DI Creature Feature Technical Challenge on the table and did a quick review of all the Central Challenge requirements.

TECHNICAL CHALLENGE REQUIREMENTS

- Build a creature that uses technical methods to perform team-chosen actions.
- Present a story of adventure with the creature as a character.
- Use technical methods to demonstrate features of a world where the story is set.
- Create and present two Team Choice Elements that show off the team's interests, skills, areas of strength, and talents.

I then pulled a [Request for Quote \(RFQ\) from NASA](#) that I was working on at my job and did a quick review of the NASA RFQ. Here is what the RFQ said:

- It costs \$40,000 to send a 2-liter bottle of water to the space station.
- Challenge: We want to improve the efficiency of converting space station astronaut urine back to water by adding more temperature sensors to the Space Station Urine Processing Unit (UPA).

COMPANIES WILL BE SCORED ON THEIR ABILITY TO PROVIDE TEMPERATURE SENSORS THAT:

1. Are wireless
2. Do not have a battery
3. Withstand high temperature and caustic chemicals
4. Spin at 200 RPM
5. Operate in a vacuum environment
6. Are small and low-profile so they do not disturb the liquid flow.
7. Are inside several layers of titanium and other metal

enclosures

8. Provide 4 sensor readings from inside the spinning drum and 4 from the outside of the spinning drum.
9. The Urine Processing Unit may not have additional holes drilled in it to accommodate the sensors.

And similar to a Destination Imagination Challenge, it required companies to explain their solution (Team Challenge Elements and Tournament Data Forms), abide by time and budget restrictions, ask questions (similar to DI-ers asking for Clarifications), and give a presentation on the solution:

- Companies applying to solve this problem must explain any special technology they have that they feel may solve this problem.
- You have 6 months to solve the problem and you must provide a fixed-price budget to complete the solution.
- You may ask questions before you bid this project.
- You must present your proposed solution to be considered for this project – then will be given a short window of time to install and demonstrate your final solution at the Marshall Space Flight Center.

I said to the District team, "These technical challenges look pretty similar, don't they?" I then explained that I truly understood (from volunteering in the classroom) that teachers can only cover a finite amount of material. DI teaches additional important skills—skills that send people to the moon, cure cancer, and fuel strong economies, like Boulder's.

Our meetings with the District were successful. I was impressed by our creative and open-minded district officials. The solution was to make DI Team Managers "extra duty" district employees for \$100 per year (which I donate back to my team). I had to get fingerprinted and watch some training videos, but now I'm an extra duty district employee and I comply with the new district policy. Boulder District DI was saved!



DESTINATION IMAGINATION AND THE REAL WORLD: NASA Space Station and Destination Imagination Projects are Parallel Journeys of Thrilling Innovation (Part 2 of 3)

By Scott Dalgleish

About the time of our first DI team meeting (with a new team I'm managing), my proposal to NASA was accepted and my company was selected to take on the challenge of putting sensors in the International Space Station Urine Processing Unit.

I told NASA that I was confident that we could solve the problem, but in truth I was pretty overwhelmed & nervous about what we had signed up to do. As it turns out, I was feeling exactly the same as my DI team members as they committed to tackling the Creature Feature Challenge, but they were willing to give it a shot.

A few weeks later, my engineering team made a crude prototype of the Urine Processing Unit from some extra sheet metal that my DI team picked up at a scrap yard. We tested our prototype design and some things didn't work, but it looked like it had the potential to work if we invested more effort. That Sunday, my DI team was trying to get Styrofoam simulated cheese balls to erupt out of a "cheese volcano" to meet the "Technical Environment" requirement of the DI challenge. The small fan that they first tried didn't work but the leaf blower proved to create a very dramatic effect! Screams of excitement as simulated cheese balls rained down on my driveway made my week.

As work on the NASA project progressed, some team dynamics issues arose. NASA said they would do some of the testing for us if we agreed to lower our bid. We agreed, but then NASA

team members that needed to do the test were not available. In the end, to keep things on schedule, we did the testing at our own expense even though it was not our job to do it. Guess what happened in the DI meeting that Sunday? Some of the DI team members were starting to wear out and the only way things were going to get done was if a few kids did more than what they committed to do. A few kids stepped up and did extra tasks which allowed us to stay close to our project schedule.

Our ideas and persistence on the NASA project were starting to pay off. We were reading all the sensors and meeting all the challenging requirements. It was thrilling that we found a way to make it work. At that week's DI meeting, much to my amazement, the Creature was talking, moving, and had smoke coming out of his ears, just as planned. As the creature lumbered across our kitchen while smoking and talking, more screams of excitement from seven fourth-graders made my week (again).

The next week at work, we were getting ready to travel to the NASA Marshall Space Flight Center to install our sensor solution. We had a very short period of time to get the job done, so we built our own simulated Urine Processing Unit and practiced the process of molding the sensors to the titanium drum to assure that when the time came to do it at NASA, we could get it done in the short timeframe they gave us. That Sunday at the DI meeting, we set up a simulated performance area and started to rehearse the performance, while coordinating the robotic cheese creature, treadmill cheese waterfall, and leaf-blower-driven cheese ball volcano. Both projects were starting to look good.



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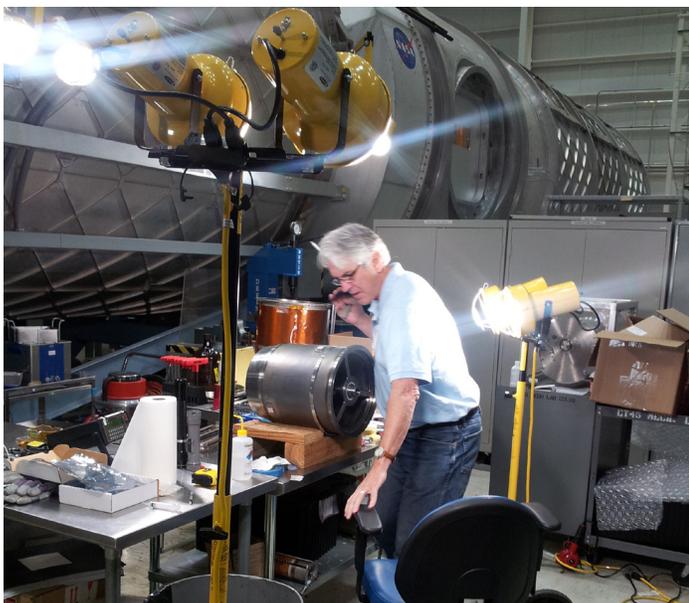
Photo 1) Bill Simms, Phase IV Mechanical Engineer, experiments and perfects a technique to install the sensors in a simulated UPA in the Phase IV Engineering lab. Practice paid off.



Photo 2) Bill successfully installs the sensors in the actual titanium UPA drum at the NASA Marshall Space Flight Center – within the allotted time and budget.

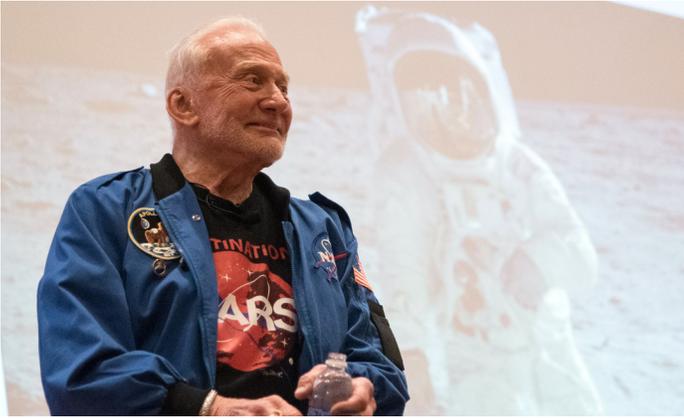
THE INSTALLATION AT NASA WAS ON TIME AND MET ALL THE CHALLENGING REQUIREMENTS – AND NASA WAS THRILLED WITH THE SOLUTION.

The DI team placed first at the Boulder Tournament. They wanted to go to Global Finals, so they worked hard and reworked and improved everything for the State Tournament and won a slot to Global Finals. But that’s still not the end of the story.



DESTINATION IMAGINATION AND THE REAL WORLD: How NASA Engineers and Destination Imagination Kids Learn from Painful Failures (Part 3 of 3)

By Scott Dalglish



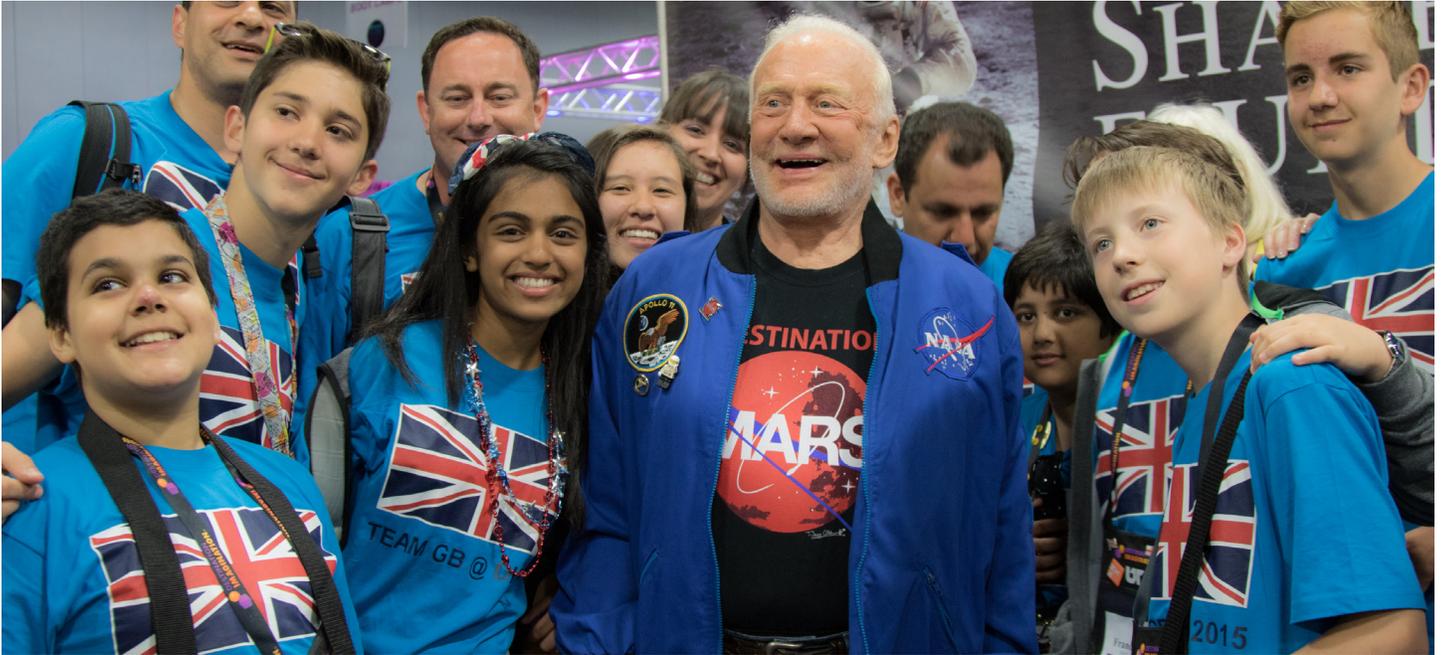
Unfortunately, our Global Finals performance didn't go well at all. The Creature had a failure at the start line, which caused a chain reaction of performance problems. Despite the painful showing, the experience provided an excellent learning opportunity. Immediately following the really rough Central Challenge performance at Global Finals, we rushed over to see a special Q&A session with Buzz Aldrin (the second man to walk on the moon). Buzz said many great things to the DI kids about how NASA relates to DI. He talked about:

- The extensive use of checklists that were used on the moon mission.
- Practicing over and over again to work out the bugs and to get to a point where the critical performance was natural – and you were ready to react to unexpected problems.
- Working hard in school and gaining knowledge, which can prepare you to address unexpected problems.
- Learning how to quickly think on your feet as a team.

Buzz Aldrin shows the kids at Global Finals, "I wasn't the first to walk on the moon, but I was the first to take a selfie in space!" The next day (after some of the pain from the rough central challenge wore off), we went back to the prop room and visited the Creature that failed during the Central Challenge. We sat down and I told my DI kids the NASA Apollo story. The kids knew the part about Neil and Buzz walking on the moon, but they didn't know the whole story that started with Apollo 1 – where 3 brave astronauts lost their lives. Terrible mistakes were made on Apollo 1 that resulted in an extremely painful outcome. We talked about how there was a lot of finger pointing after the Apollo 1 tragedy, but the NASA team realized they needed to work together and learn from the failures and make sure they never happened again. Buzz Aldrin bravely got into the same capsule that killed 3 of his best friends because he trusted the technical problem solvers to learn from their mistakes, brush themselves off, and march forward. After the talk, the kids decided that they wanted to learn what went wrong with the creature and fix him – even though he would never perform again.

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In the process of doing the failure analysis on the Creature, they discovered that most of the problems were not technical problems, but preparation problems that good “pre-flight” checklists would have solved – just like Buzz described. I’m very sure the list issues they found during this process will have a long-lasting and positive effect on them in the future. I’m pretty confident that for the rest of their lives, they will be applying what they learned from the Creature Failure Analysis. As for the NASA Space Station Urine Processing Unit Project – NASA is still using it very successfully. The sensor system recently won “Most Innovative Use of RFID” at a trade show in May and was a featured article in the RFID Journal. (See the article, Solving NASA’s Water Problem.) Pretty cool for a challenge I doubted we could solve, but had the confidence to try just like DI. We are now using the new designs from this project to improve our product offerings. We are using the NASA magazine article to fuel our marketing efforts. All of this results in hiring more employees and paying more Boulder taxes that support our schools.

As for the DI team, the performance at Global Finals hurt pretty bad. As a Team Manager, you want all the learning experiences to be from successes – but not all valuable lessons are learned that way. I think NASA’s involvement at Global Finals helped make the experience one of the most valuable in these seven kids’ lives.

Looking back 9 months to the start of the DI season, I would have never guessed how right I was about DI being uniquely effective at developing real-world, NASA-like innovation skills in our kids.