

Space Center Houston
STEM Innovation in Schools Challenge 01
presented by



1.0 REVISION TRACKING LOG

Section	Revision #	Description	Date
	0	Original Document	1/5/2021

2.0 ACRONYMS

- SCH – Space Center Houston
- NASA – National Aeronautics and Space Administration
- STEM – Science Technology Engineering and Mathematics

3.0 INTRODUCTION

Chevron has partnered with The Manned Space Flight Education Foundation, Inc. (henceforth referred to as Space Center Houston or SCH) to develop and execute an Innovation Challenge for Houston area schools to support STEM learning and creativity in students.

As NASA moves forward to missions to the moon and Mars, a critical need to arises to be able to diagnose and treat medical needs in an isolated, distant environment with minimal tools and personnel. As humans venture farther from Earth and for greater periods of time, it becomes imperative to develop technologies that support human health effectively, efficiently, and with minimal resources.

Space Center Houston’s vision of this challenge is seeking to foster the creation of advancement of technologies that can support human health during long duration space flight. Within the next decade, NASA will be conducting crewed missions to the moon and will likely be preparing for missions to Mars. Missions to Mars would require crews to be away from the Earth for nearly two years at a time. Early missions will likely have a medical officer on board, but the goal is to be able to send scientists and engineers to distant worlds with all of the tools needed to perform and receive fairly complex medical care with minimal training. These systems would also be usable on Earth in isolated communities or as an alternative to existing emergency medical kits.

The challenge will consist of a single Competition Round, which consists of the design of a system that addresses medical needs in space. The focus should be on one or several of the Hazards of Spaceflight as

well as common medical procedures performed on Earth that are likely over a two-year space mission. The five Hazards of Spaceflight are as follows:

1. Radiation
2. Isolation and confinement
3. Distance from Earth
4. Gravity (or lack thereof)
5. Hostile/closed environments

For more information about the five Hazards of Spaceflight, follow this link:

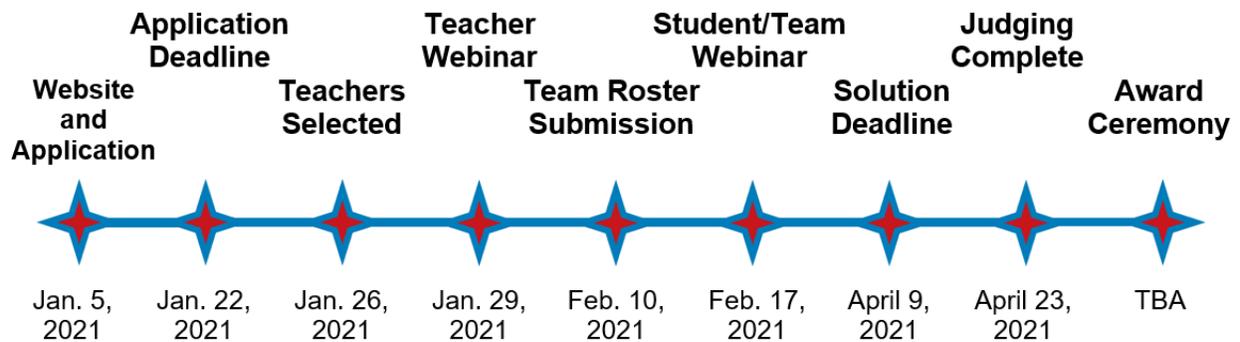
<https://www.nasa.gov/hrp/5-hazards-of-human-spaceflight>

Whatever the system designed, it should address the distance from Earth by default, so another of the five hazards must be addressed at minimum.

4.0 PRIZES

Each participant from selected classrooms will be granted a ticket to Space Center Houston for the day of the awards ceremony. (This does not include transportation to or from SCH.) Space Center Houston will also grant up to 20 Family Memberships to the winning participants.

5.0 SCHEDULE



6.0 ELIBILITY FOR PARTICIPATION AND PRIZES

In order to participate in this innovation challenge, teams and schools must fit the following criteria:

- The school must be in the Greater Houston area. This will be judged on a school by school basis, but does include Galveston and Texas City schools.
- Teachers must plan on having their entire class(es) participate in the challenge.
- The total number of students participating under one teacher must be at least 20 students.
- Teams must consist of 1-6 members.
- All team members must attend the same school.
- All team members must be in the same school "level"
 - I.e., a team may not have a middle schooler and a high schooler

- Family members may be on the same team as long as all other requirements are met.

Priority will be given to Title 1 schools and schools that have multiple classes and teachers participating, but all schools in the Greater Houston area are encouraged to apply.

6.1 ELIGIBILITY FOR PRIZES

The primary identifier of eligibility is location. Teachers will not be selected if their school is outside of the Greater Houston area, but this will be determined on a case-by-case basis. All students under a selected teacher will be eligible for the Family Membership to Space Center Houston. Further, all selected schools are eligible for the Most Participation Award.

7.0 REGISTRATION

All interested teachers must apply for the challenge and meet the eligibility requirements in order to be selected. The application process for this challenge takes place through the Space Center Houston website ([Link here](#)). Section 5.0 documents the challenge schedule which includes the application deadline.

8.0 THE COMPETITION

This competition will test competitors' ability to identify the future medical needs of NASA missions to the moon and Mars and design a system for how to address these needs. As there is no easy way to quantify the ability of any given design, determinations by judges will be more qualitative. This means that research, experimentation, and documentation are essential to scoring well. Competitors are encouraged to track all information associated with the final design and submit that as well.

8.1 JUDGING CRITERIA

Here are the categories through which points will be awarded:

- Feasibility
 - Maximum 30 points
 - It is important to know that the proposed design is capable of functioning in space. The system will be judged based on how well the proposed design would work provided what we know about the environment in which it would be deployed.
- Originality
 - Maximum 30 points
 - NASA is also working on creating solutions to medical problems that may occur in space. Teams are encouraged to learn from what NASA has done and is doing, but as we are seeking to innovate with this challenge, originality and new ideas are essential.
- Size and Weight
 - Maximum 20 points

- Large, heavy objects are harder to get to space because it takes more fuel, which in turn adds more weight. The smaller and lighter the object design, the more points will be awarded in this category.
- Prototype Design
 - Maximum 20 points
 - Participants are not required to build a prototype to compete in this challenge, but it is encouraged. The prototype should be a rough build of the concept and is not required to be functional. It is more important that the size, weight, and aesthetics are similar to the intended design.

Our final judging criteria may change if necessary. If updated, all participating teachers will be notified as soon as possible.

9.0 FINAL SCORING

Three neutral judges will be selected to review and score all submissions. The judges scores will be averaged to create a single score in each category for each team. The scores will be announced on during the ceremony at Space Center Houston. Scores will not be announced, but any team can request their score after the competition has ended.

There will be a maximum of 20 individual prizes given. The final number of prizes will be determined by the number of members in high scoring teams (e.g., if the three highest scoring teams have six members each, then the next highest scoring team must have one or two members to receive prizes).

As the judges' rulings are qualitative, there will be no opportunity to rebut scores.

10.0 MODIFICATIONS

Competitors are invited to communicate directly with Space Center Houston using the challenge email address (innovation@spacecenter.org) regarding any rule that restricts their ability to demonstrate technical achievement and innovative solutions in medical solutions for future space missions.

Requests for rules clarifications should be sent to innovation@spacecenter.org, and all questions and responses will be made public and shared with all competitors on the Space Center website. SCH and Chevron reserve the right to alter the rules if deemed necessary. In addition, circumstances may arise that require adjustments to the challenge timeline. Such adjustments of the challenge timeline is within the full discretion of SCH and Chevron. Competitor Teams will be notified of any changes to the rules and/or timeline, and given the opportunity to voice concerns and/or request modifications. Final authority for all changes will rest with SCH.