Carbon Capture Challenge Quick Start Guide

Background Information

The Challenge Before You

An issue that is facing both the future of space travel and life on planet Earth is the accumulation of greenhouse gases in closed systems. As human beings, any environment we occupy will eventually show an increase in Carbon Dioxide. If unchecked, this can lead to a myriad of problems from carbon dioxide poisoning in a space-faring vehicle to climate change here at home.

During the Apollo 13 mission, astronauts were faced with the dangers of having too much carbon dioxide in the air. While carbon dioxide can cause an environment to retain heat more than usual, it can also become toxic to humans after the concentration reaches a certain point. Astronauts had to improvise a way to connect carbon dioxide scrubbers in the lunar module to survive. If you'd like to see how they solved the problem, take a look at this Apollo 13 YouTube playlist: https://youtube.com/playlist?list=PLoyH_K0dJ2bPIcUAUW4PjgYJQ1DCX-t2F

NASA has experimented with different solutions for capturing carbon from the air in the past. As they look ahead to longer duration missions, many of these solutions will need to be improved or new, scalable solutions implemented. The STEM Innovation in Schools program will support your students as they attempt to solve this problem in unique ways.

The STEM Innovation in Schools challenge will consist of a single competition round in which participants develop a carbon capture system that can be housed in a space-faring vehicle or a lunar or Mars habitat. Additional consideration will be given to projects that also incorporate the storage and/or utilization of the captured carbon.

Vocabulary

Carbon Capture: the process of removing carbon dioxide or similar carbon molecules from an environment.
Prototype: a first attempt or model of what will be the final product.
Space-faring vehicle: a shuttle or capsule designed to transport crew or cargo through space
Lunar habitat: a temporary or long-term housing for people on the surface of the moon
Mars habitat: a temporary or long-term housing for people on the surface of Mars

The submission deadline is May 17, 2024.

Prizes

Every scholar who submits an entry for the STEM Innovation in Schools Challenge will receive a free ticket to Space Center Houston and a free invitation to our Awards Ceremony (TBD). Additional prizes include 15 Family Memberships and 10 free registrations to our Space Center U program.

Space Center Houston also provides webinars, guidebooks, and individual support for teachers to make the implementation of this challenge as easy as possible in your classroom. Teachers with the highest participation levels will be invited to participate in professional development with our incredible instructors to gain skills that will help you further develop your classroom into an engaging, exploratory experience for your students.

Quick Start Guide

Objective:

Develop a carbon capture system that can be housed in a spacefaring vehicle or a Lunar or Martian habitat.

Deliverables:

Each team must design a prototype of a carbon capture system. Additionally, teams will submit a presentation explaining the design and how the system works. If a physical prototype is made, teams should also provide data that shows the effectiveness of the system.

Acceptable presentation formats include:

- Microsoft PowerPoint
- Google Slides
- PDF (Word or Google Document)
- Nearpod Presentation
- Google Site
- Microsoft Sway

Acceptable video formats include (video can be included in your presentation):

- MP4
- MOV
- AVI

Requirements:

The carbon capture system should address three key components:

- Effectiveness: The system should reliably remove a significant amount of carbon dioxide from the environment.
- Size: The system should be compact enough to be easily stored and used inside of a spacefaring vehicle. For reference, the Orion capsule that will be used in the NASA Artemis missions to the Moon can house four astronauts and has an interior roughly the size of an SUV.
- Scalability: The system should be expandable in such a way that using multiple devices in tandem will increase the efficacy. Additional consideration will be given to systems that can have potential applications on Earth.

Submission:

Submissions will be collected through a Microsoft Form. You can access the submission form with the following web address: https://bit.ly/CCSUBMISSIONS ***(link is case sensitive)***

You can also use the QR code to access the Microsoft Form.