

2022 Design and Prototype Semi-Finalists

Fermentation NanoLab

Students: Braydon Schramm, Elias Saad

Teacher: Robin Merritt

School: Clear Creek, Texas

Students: Joseph Pilienci, Kyle Ducote, Adrian Magelitz, Takyia Wallace

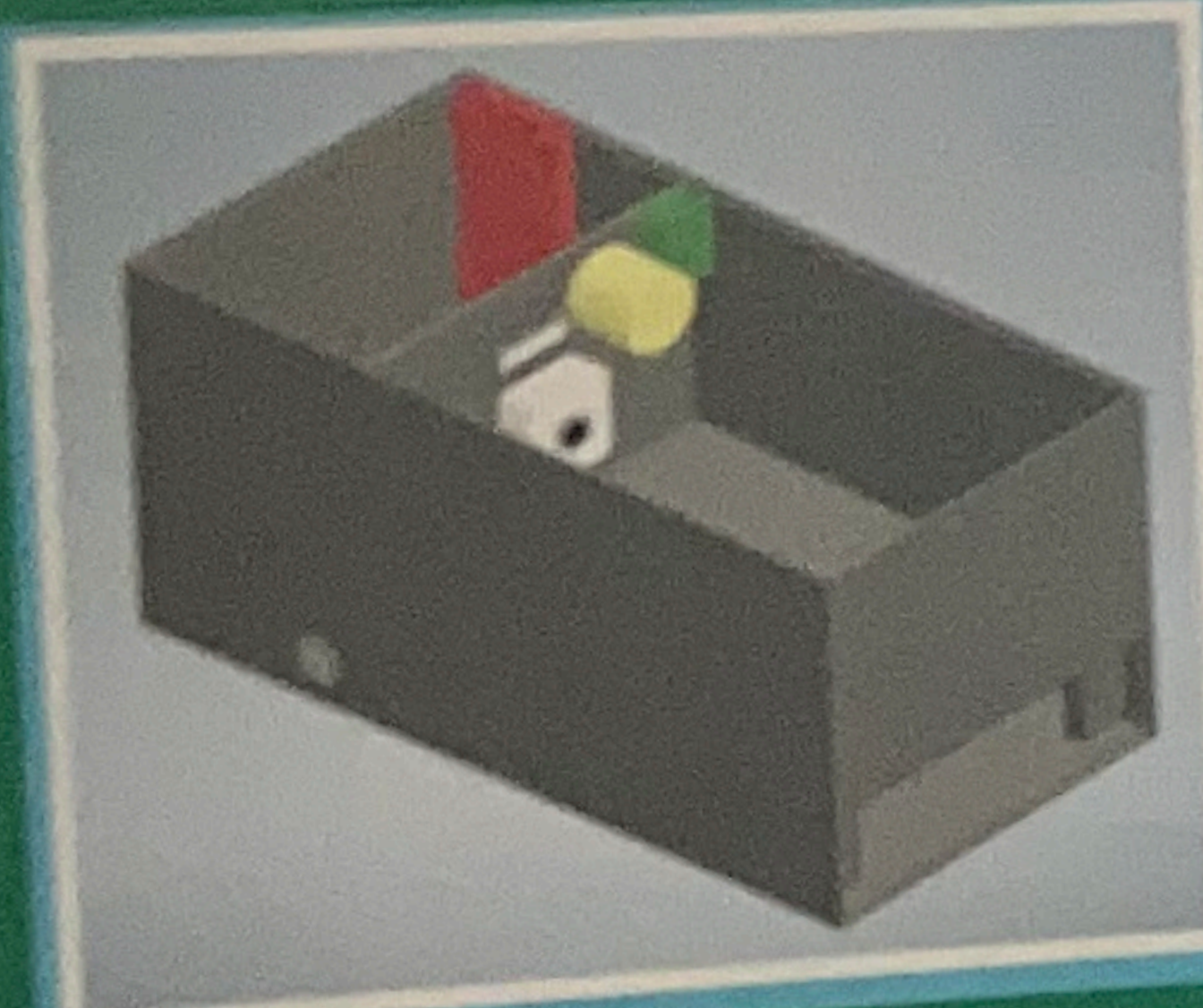
Teacher: Rebecca Allen

School: Palm Bay Magnet, Florida



FERMENTATION NANOLAB

Final Solution

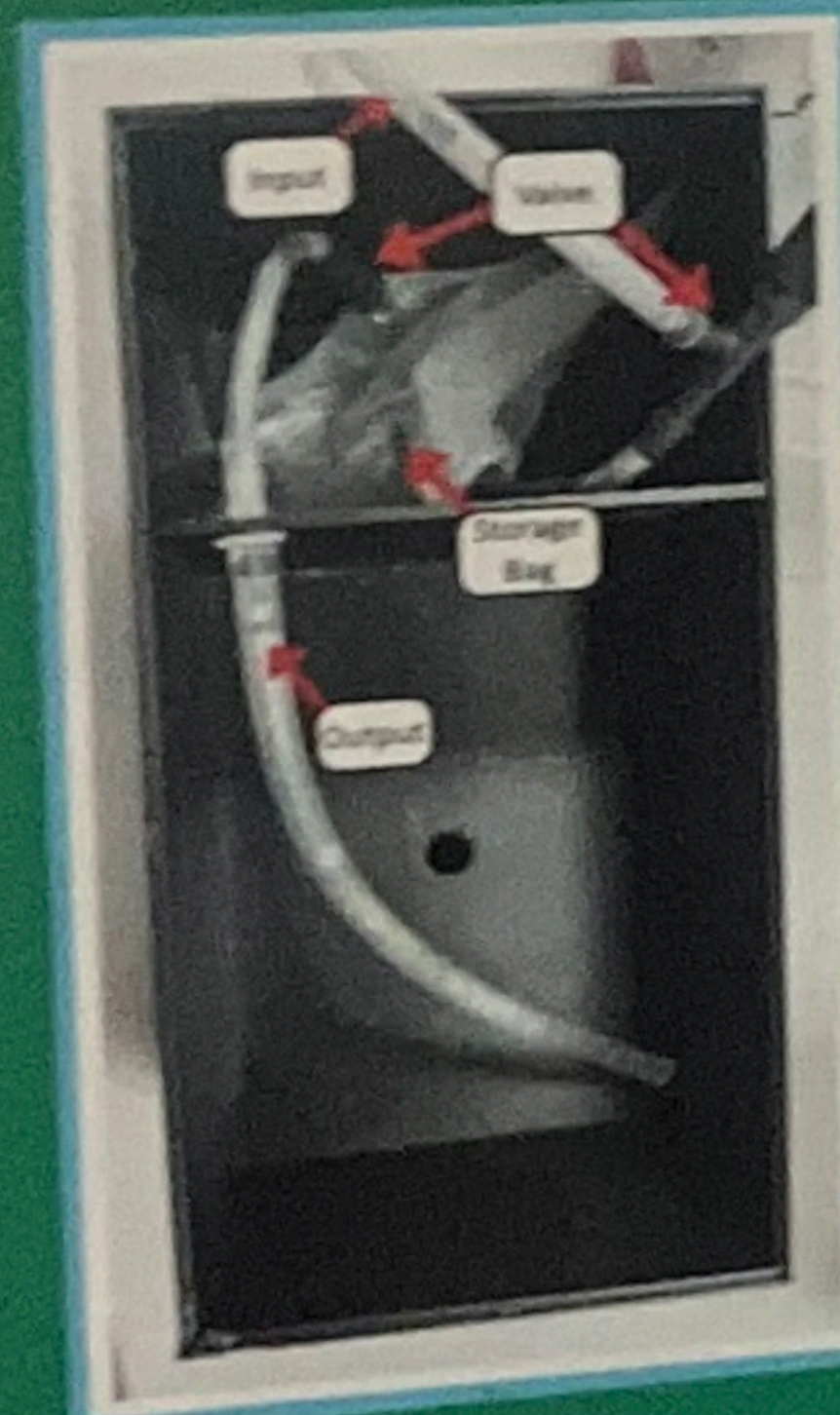


Explanation

Our final fermentation lab was designed to have water stored in a plastic bag, and be passed through the water distribution system (comprised of pipes and valves) after being passed through this system, it will be piped into our main fermentation chamber. Within this chamber, oxygen sensors, carbon dioxide sensors, a chamber, lights, and other sensors are present to make sure the fermentation process runs smoothly. To control these sensors, a Raspberry Pi is present so that we can control, monitor, and view information from our sensors. The Raspberry Pi is placed inside our smaller chamber, as well as the water distribution system. Water is piped into the smaller chamber, and then distributed into the larger fermentation chamber. In the fermentation chamber, a motor is placed under a raised platform under the chamber to stir and provide agitation to the fermentation process.

Justification

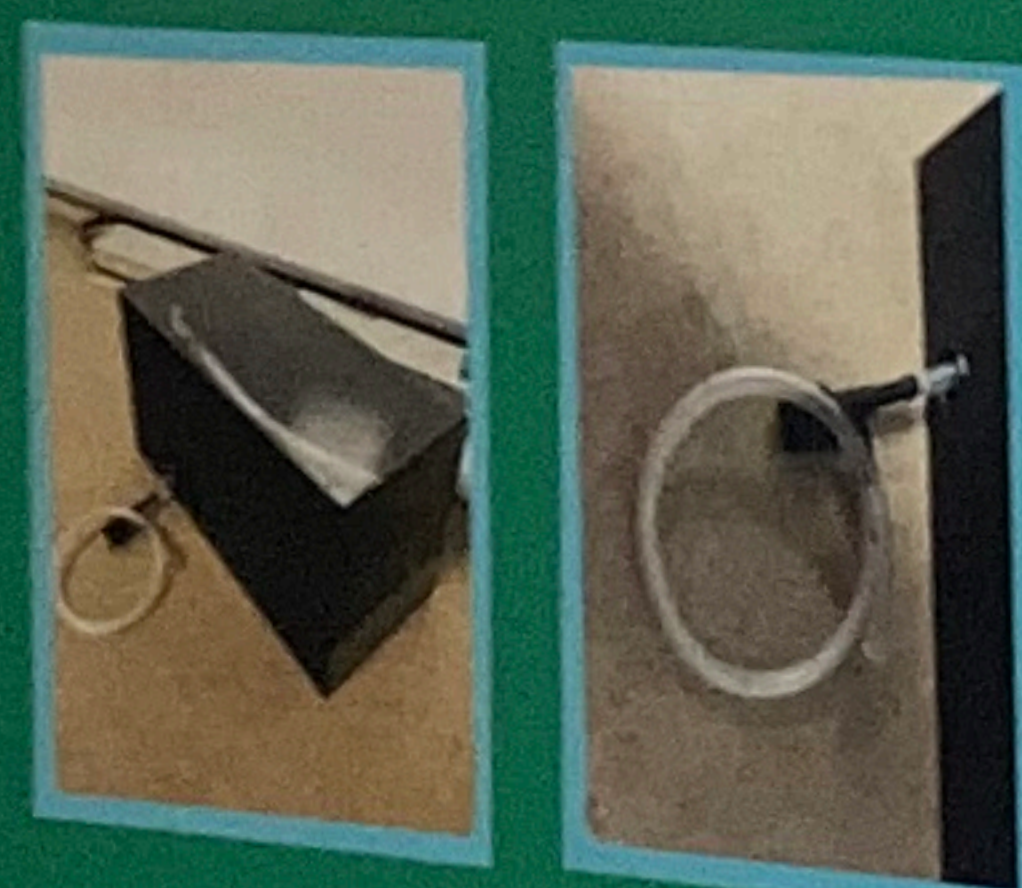
Our fermentation nanolab has sensors to detect oxygen, carbon dioxide, as well as the ability to open the gear stirrer device. The chamber with a camera and lights. Our fermentation system is designed to be able to be used in a variety of ways. It can be used to monitor the fermentation process, or it can be used to control the fermentation process. It can be used to monitor the fermentation process, or it can be used to control the fermentation process. It can be used to monitor the fermentation process, or it can be used to control the fermentation process.



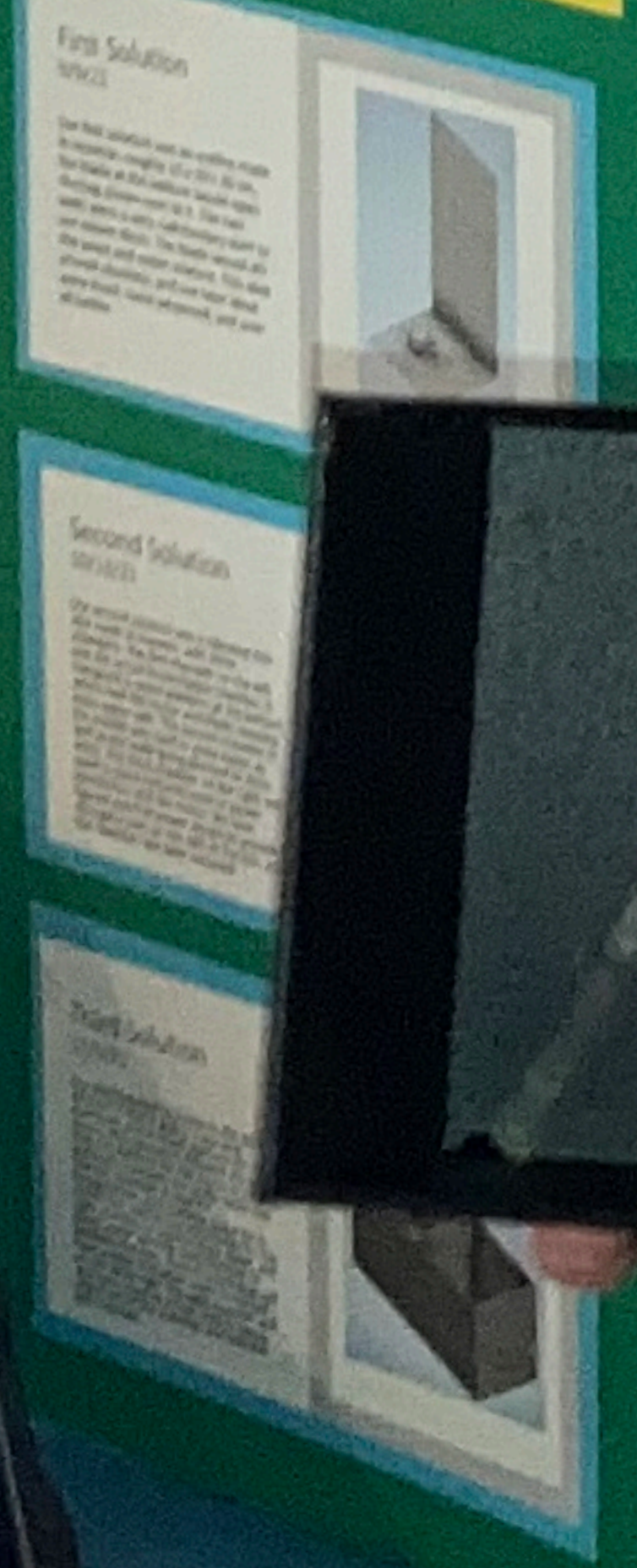
FERMENTATION NANOLAB

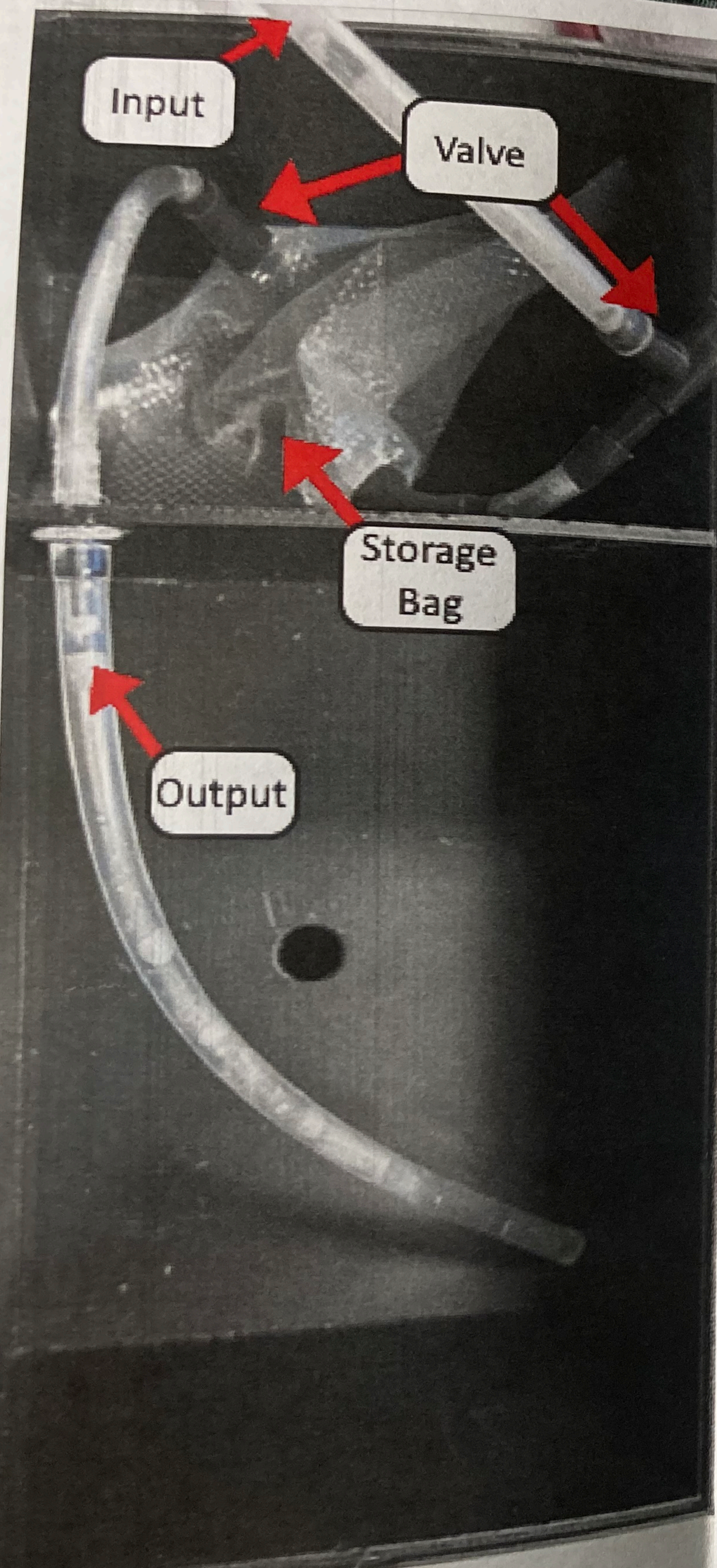
Write-Up

PICTURES



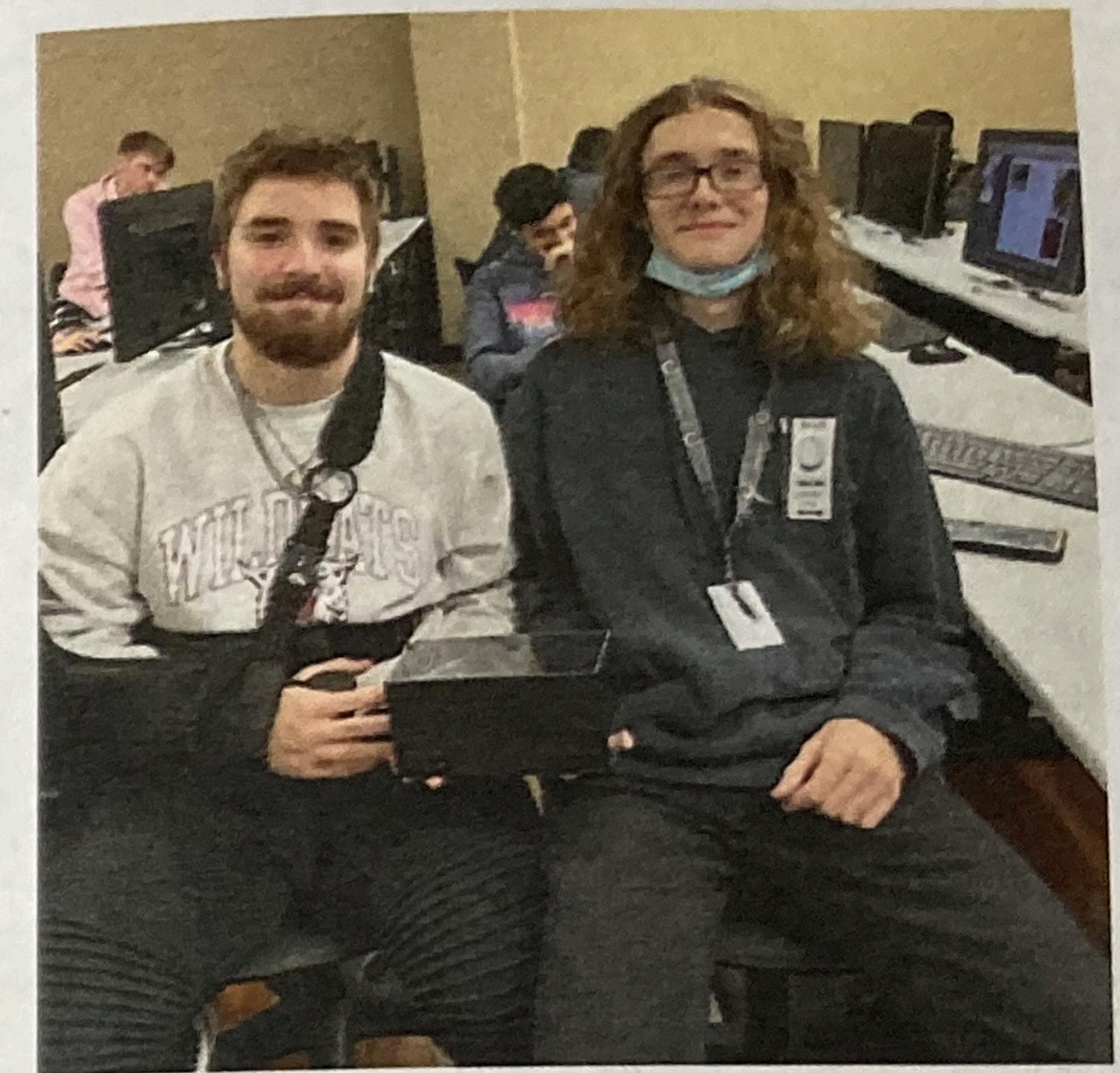
PREVIOUS SOLUTIONS





PROBLEM STATEMENT:

Fermentation can be used for alcohol, or bread. Fermentation has been used by civilizations for centuries, and the ability to ferment in space would drastically decrease food waste, and improve quality of life aboard the ISS by allowing for food to be created on-board. Our lab should be capable of filtering out Carbon Dioxide, as well as alcohol.



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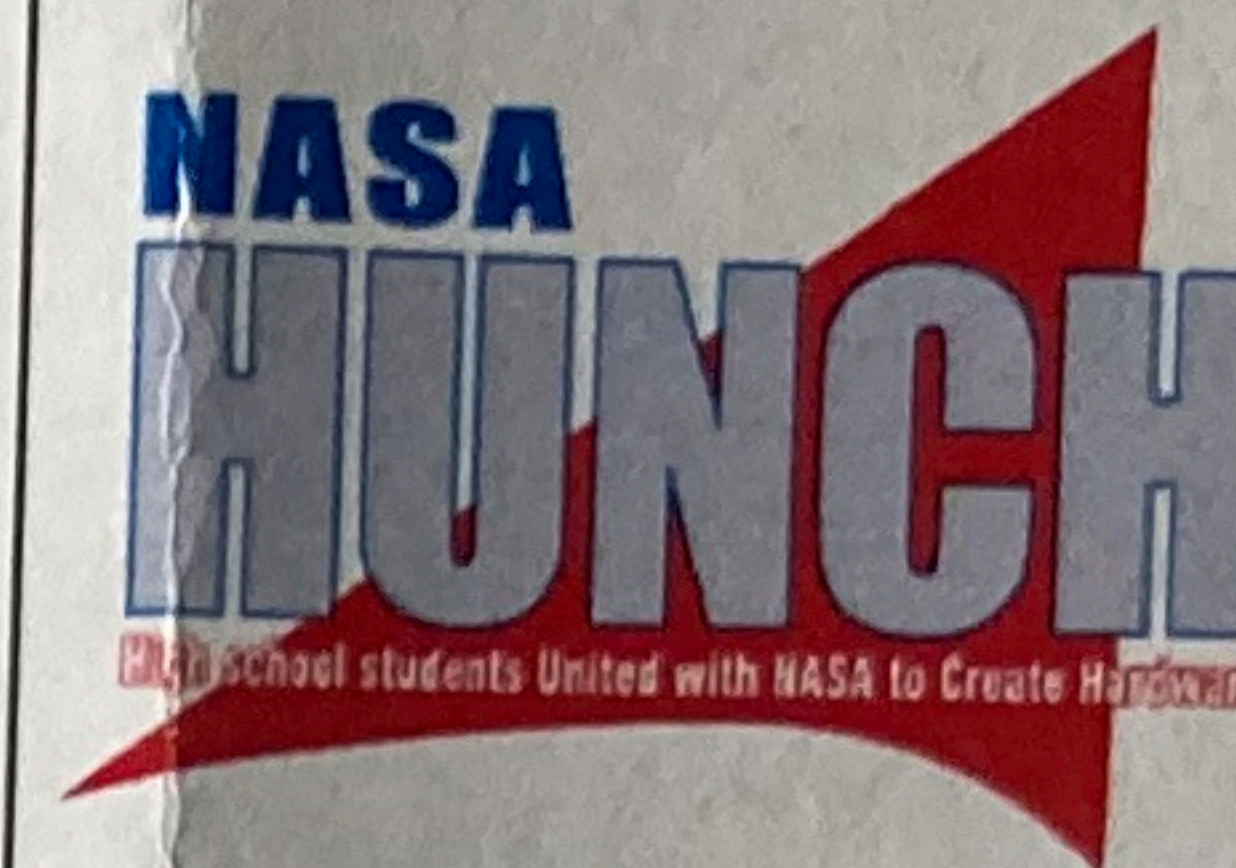
Instructor
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PROBLEM STATEMENT

The problem is to build a very compact Nano Lab that can fit in an ISS locker. The Nano labs must be protected from radiation in space while fermenting alcohol. The fermentation Nano lab must be able to filter CO_2 and other gasses while not deterring the fermentation cycle. Nano Labs must be studied to figure out the correct yeast to liquids what will work in zero gravity situations with different pressure than earth. Fermentation is a natural process but in order to make deeper research in how the higher radiations in space affect the human cell, they need to send it to the space station the problem is CO_2 don't separate in zero-g like it does in the earth, if the CO_2 and alcohol mix it might shut down the reaction on the yeast cells also affecting their growth and it can stop the experiment early. These also needed to be programmed so they can run autonomously without human interaction.



FERMENTATION NANO LAB

By:

Ethan McLeod and Kennedy Pelico

For:

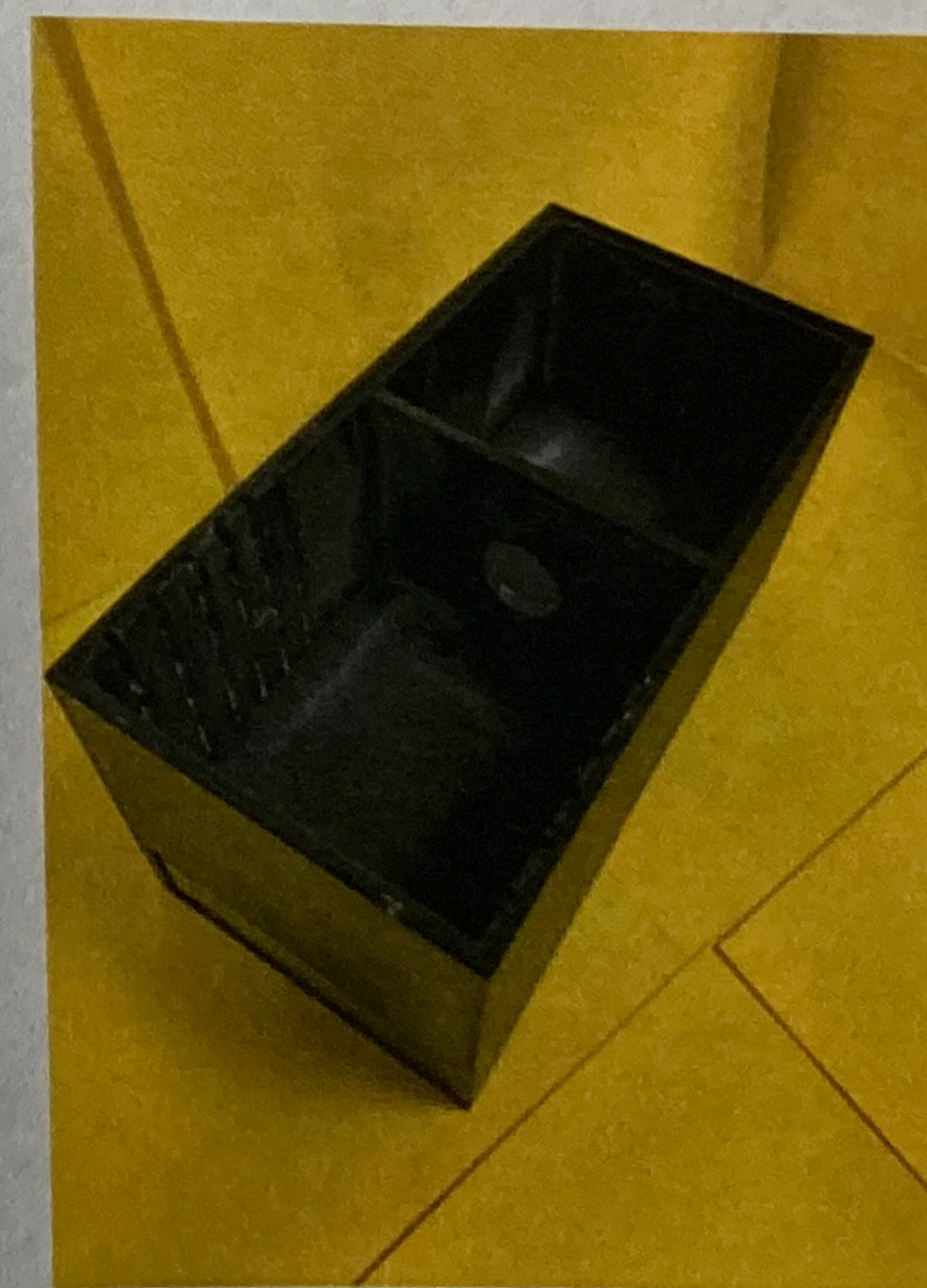
Mr. Merritt

Engineering Design and Development

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Joseph M. Pileci

Kyle Ducote

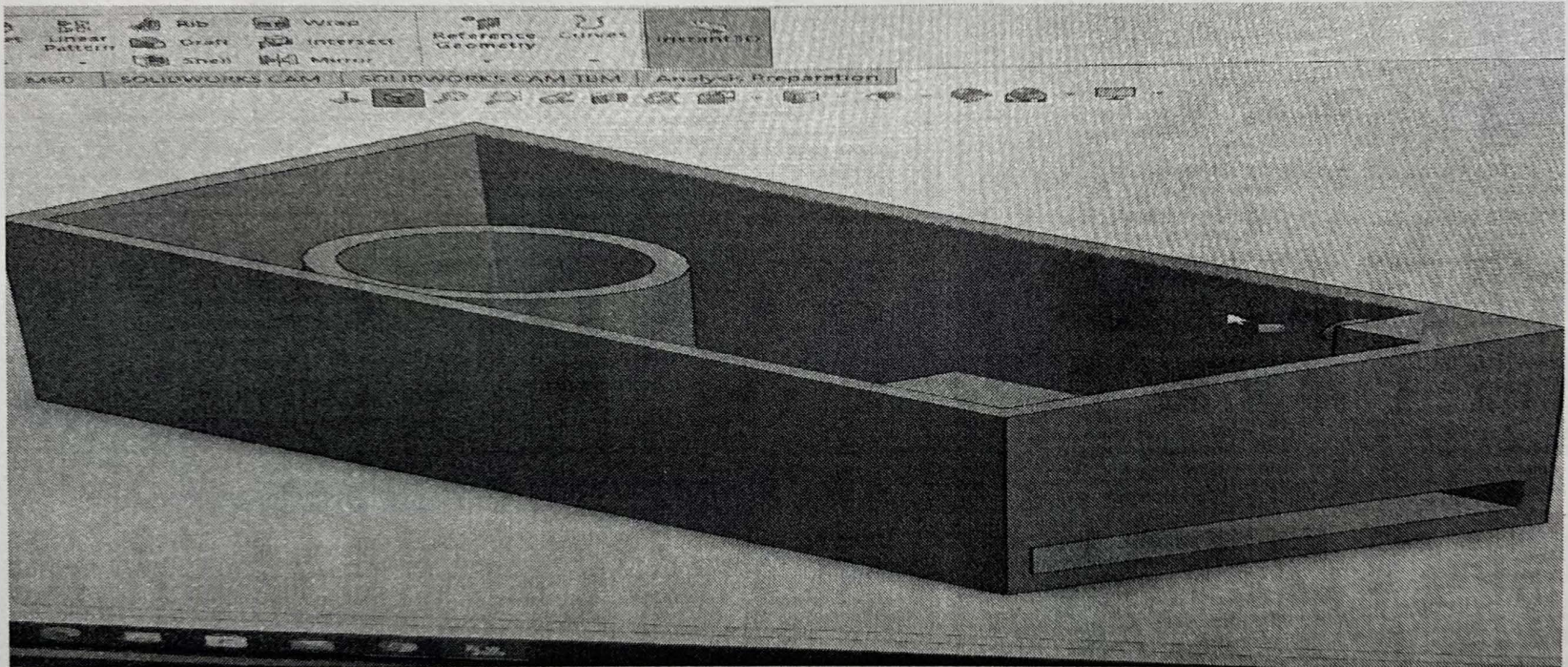
Adrian Magelitz

Takyia Wallace

Fermentation Nanolab

Problem- Scientists and Researchers are wanting to send up experiments to the ISS but they don't have enough experience designing labs and understanding of space hardware. We want to make it easier for researchers to experiment with science.

CAD Drawing -



Solution - Must figure out a way to keep the filtering of carbon and oxygen so the yeast will continue to grow. Have sensors with light, camera, and temperature. It must be a certain temperature for the yeast to grow and a certain amount of light and the camera is to keep observation on how well that it's growing. Must find a material that would keep all the materials in the box in place when it is in zero-g.