

Utilizing Microbes For The BioWeathering of Martian Regolith for Farming

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Research Background

- Shipping food supplies to Mars to support a colony is highly impractical compared to farming on site.
- Microbially reducing Perchlorate in Martian regolith could provide a regenerative agricultural source for the mission to Mars.
- Haloferax Denitrificans* and *Dechloromonas Denitrificans* are known to degrade perchlorate on earth, a major toxin on Mars.



Research Objectives

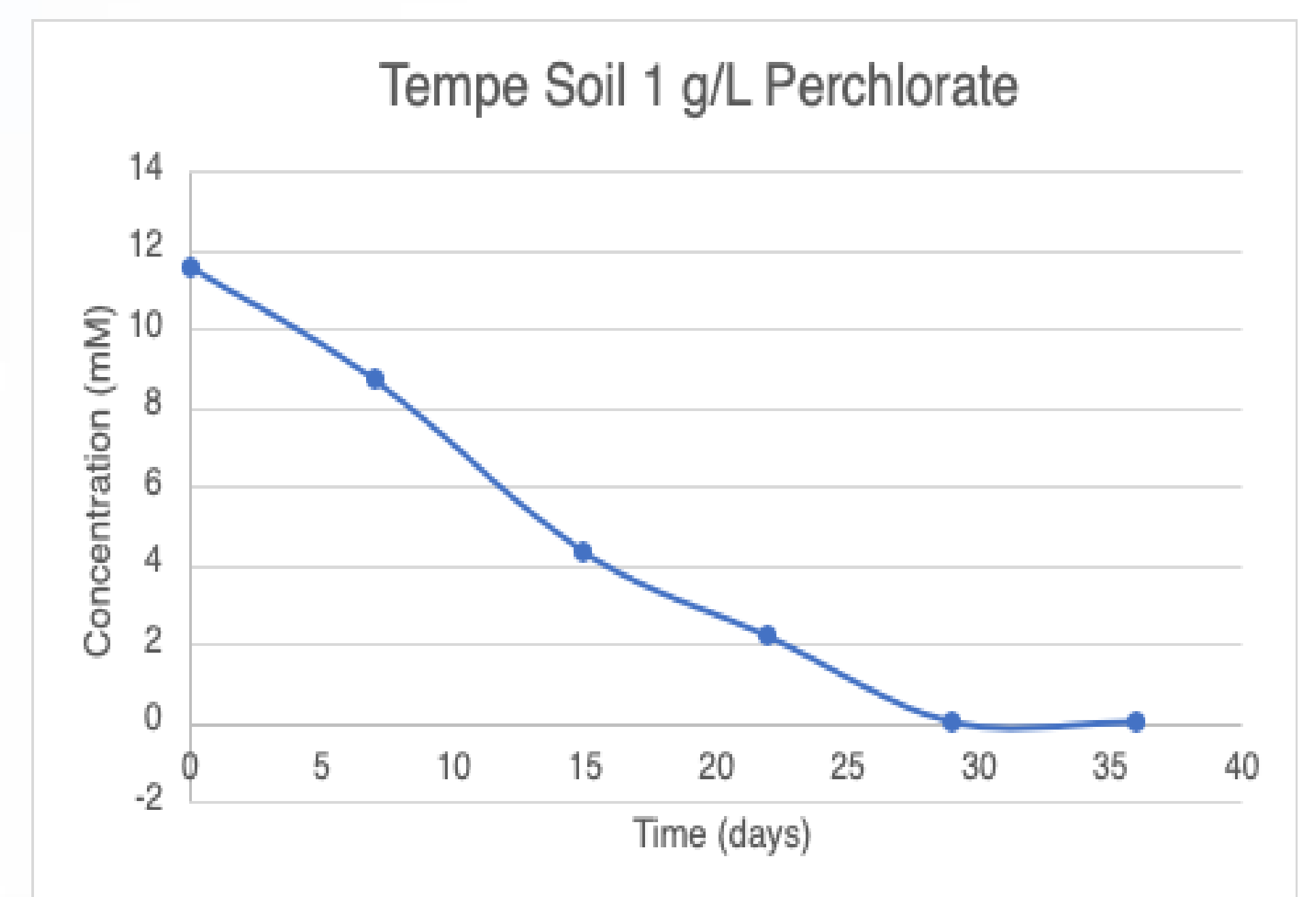
Culture *Haloferax Denitrificans* and *Dechloromonas Denitrificans* in ideal conditions to obtain optimal growth and monitor activity and measure known indicators of distress and activity.

We are testing which salt associations promote perchlorate reduction best.



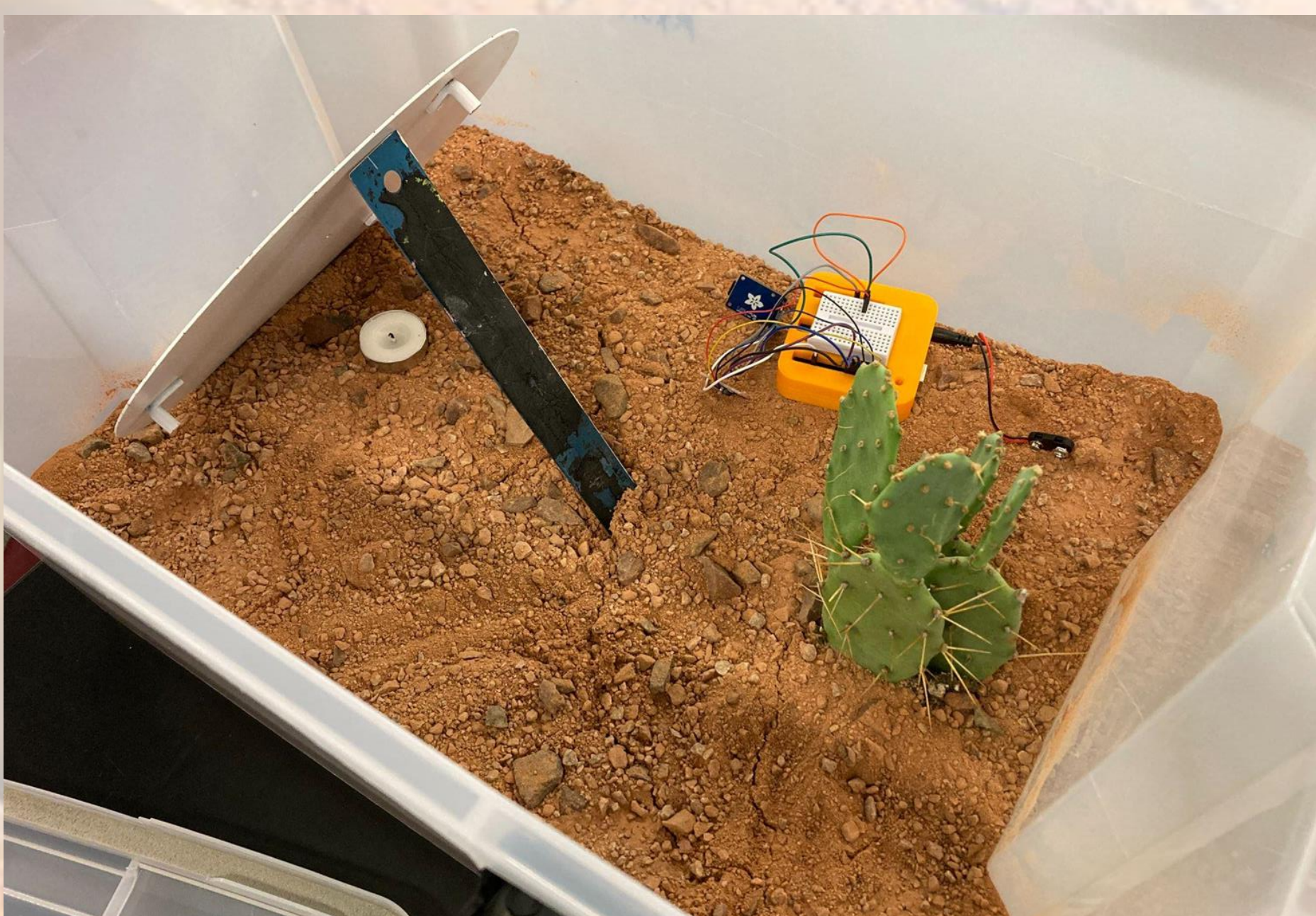
Research Conclusions

- Mg and Ca salts led to a lot of precipitation, unlike the Na salt.
- A lack of sulfur in the first trial medium prevented growth.
- A second trial rectified the issue and grew perchlorate reducers at 1 g/L and 5 g/L perchlorate.
- This graph of perchlorate reduction is from the second attempt using sodium perchlorate solution.



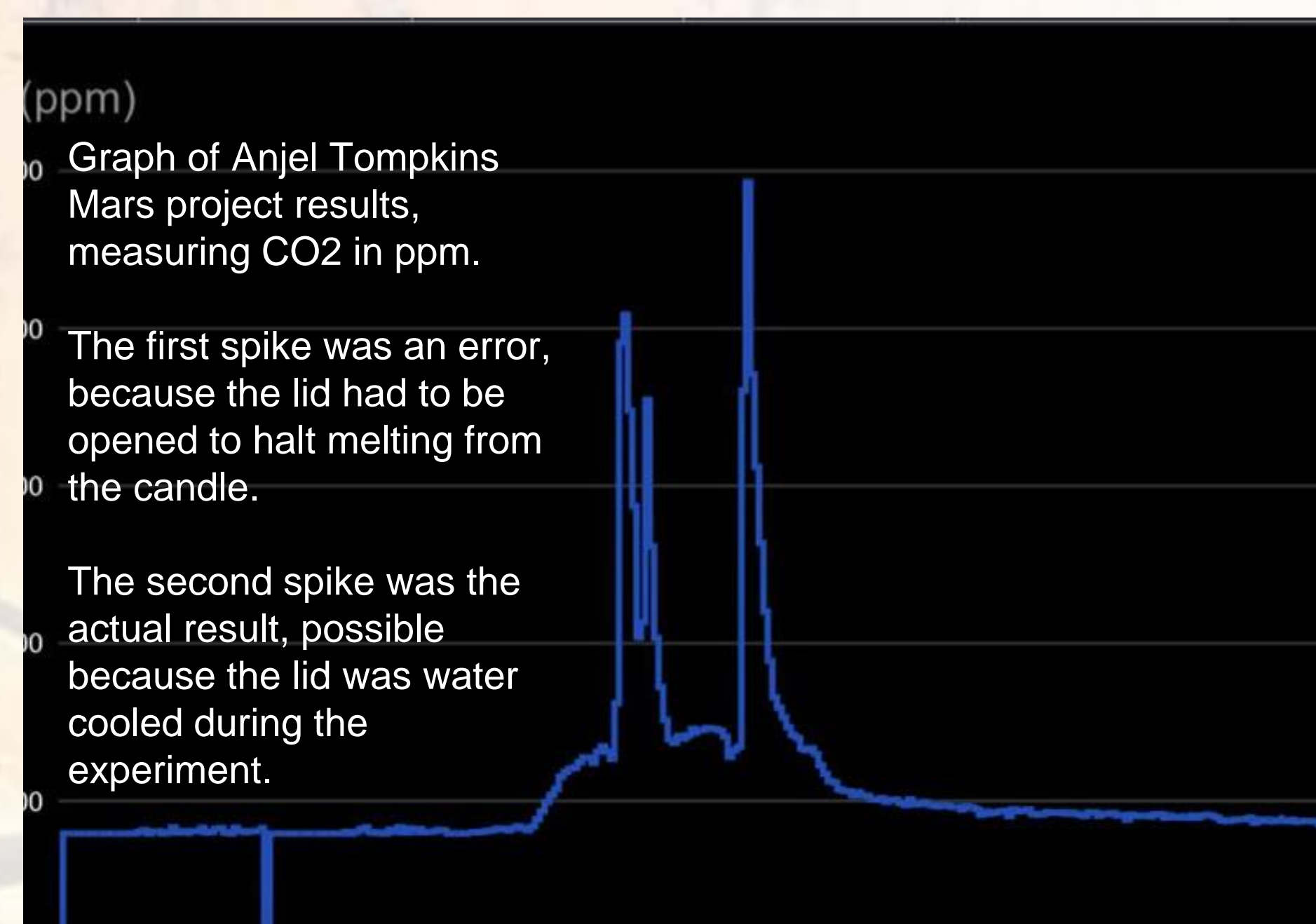
Lesson Description

- ASU is finding out how to detoxify Mars for farming.
- What is the minimum nutrient enrichment of Mars rock to make it farmable?
- Students will gather rock samples similar to Mars and enrich it a variety of ways for growing crops.



Lesson Objectives

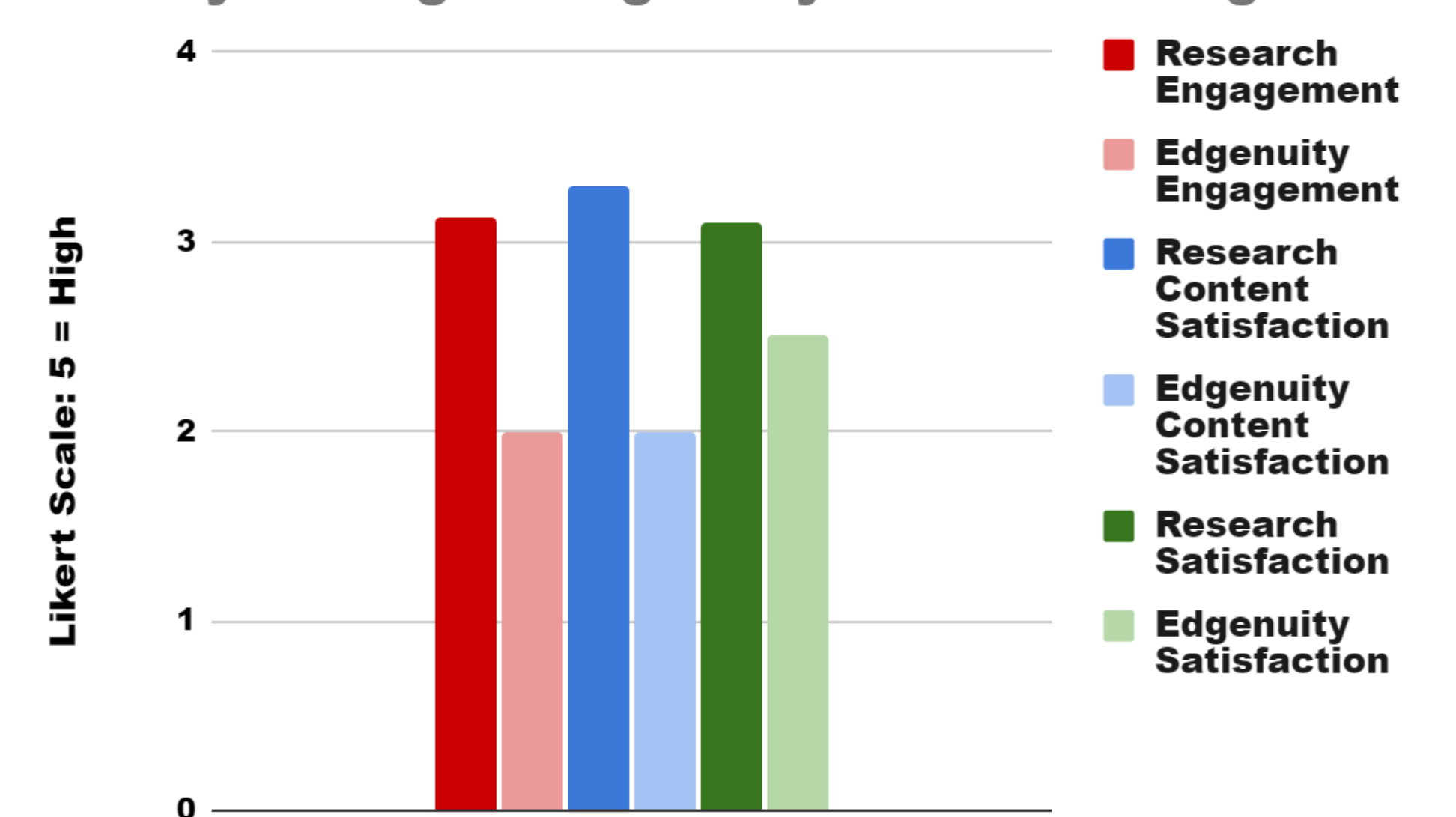
- Analyze reactions and reaction types (PS1B, PS2B, LS1D)
- Predict nutrient cycles in a closed system (LS2B-C, LS1B-C, LS4D, ESS2C-D, ESS3C, ETS1A-C)
- Setup a system monitor to optimize nutrient ratios (LS1D, LS1A, PS3B, LS3B, LS4B)



Lesson Outcomes

- Students selected, designed and ran trials that matched their needed State Standards goals.
- Student engagement increased, and the collaboration opened opportunities for talented students to excel.
- Refinement of the kits, grading, and orientation would help.

Survey Averages: Edgenuity VS. STEM Program



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