

PLANETS

Think Like an Engineer, Explore Like a Space Rover

The Planetary Learning that Advances the Nexus of Engineering, Technology, and Science (PLANETS)¹ project provides out-of-school time (OST) educators with science and engineering curriculum units that engage learners with science and engineering curriculum units that engage learners in collaborative problem solving through an engineering design process to build learners' habits of mind and improve their attitudes towards engineering.



PLANETS Science and Engineering Units:
Remote Sensing, Water in Extreme
Environments & Space Hazards

“It really started with learners wanting the problem to be solved—and then they started to persist.”

- PLANETS Educator

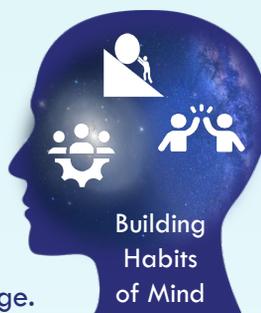
Learners demonstrated three
habits of mind practices
through the engineering design
process.^{2,3}

★ **Negotiating designs collaboratively**

Working together to design a solution to the given engineering challenge.

★ **Persisting through failure**

Evaluating what went wrong in a design, and planning for improvement.

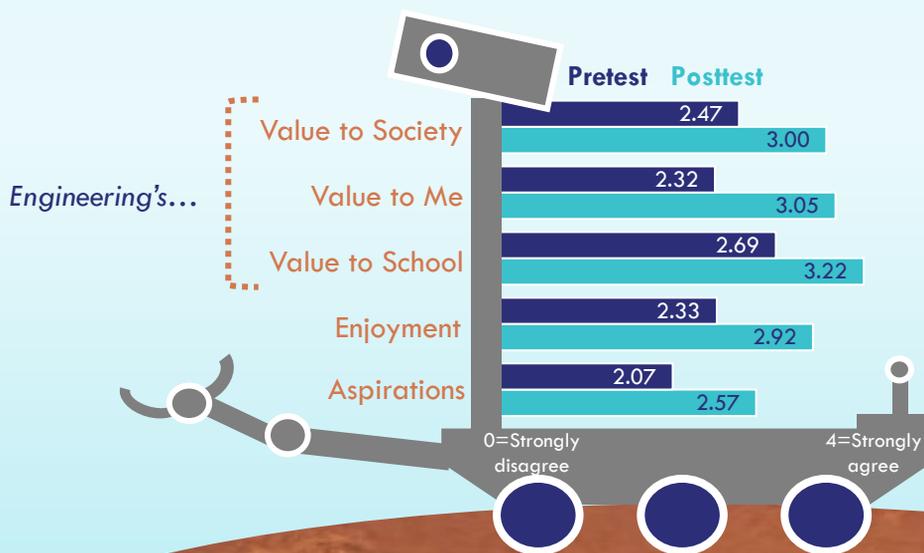


Building
Habits
of Mind

★ **Celebrating successes**

When a design improvement results in a positive outcome.

Building habits of mind significantly increased learner attitudes and interest in engineering.^{4, 5, 6}



After PLANETS participation, learners had higher levels of agreement with statements like...

Engineering is useful in helping to solve the problems of everyday life.

We learn about important things when we do engineering in school.

I am interested when we do engineering in school.

Get your learners thinking like an engineer and acting like a space rover!
Access the PLANETS curriculum guides at planets-stem.org.

¹ NASA 5-year grant involving a collaborative partnership with the Center for Science Teaching and Learning (CSTL) at Northern Arizona University (NAU), the U.S. Geological Survey (USGS) Astrogeology Science Center, and the Museum of Science, Boston (MOS)
² Haden, C. & Peery, E. (2021). Evaluation of the NASA-Funded Planetary Learning that Advances the Nexus of Engineering, Technology, and Science (PLANETS) Project: Five-Year Summative Evaluation Report [add link to full report]
³ The project research and evaluation included 15 out-of-school time settings, 18 out-of-school time educators, and 215 middle school learners.
⁴ Lachapelle, C.P. & Brennan, R.T. (2018). An instrument for examining elementary engineering student interests and attitudes. *International Journal of Education in Mathematics, Science and Technology (IJEMST)*, 8(3), 221-240. DOI: 10.18404/ijemst.428171 <https://www.ijemst.net/index.php/ijemst/article/view/289>
⁵ Survey scale sample sizes range n = 150–159. All survey scales are statistically significant at p < .001
⁶ Each scale ranged from 0 to 4, with 0 = strongly disagree, 1 = disagree, 2 = not sure, 3 = agree somewhat, and 4 = strongly agree
 Mars photo courtesy of NASA/MAVEN/Lunar and Planetary Institute. Milky Way photo courtesy of NASA https://smd-prod.s3.amazonaws.com/science-pink/s3fs-public/atoms/files/2020_SciAct_Primer_TAGGED.pdf
 This work is licensed under CC BY-ND 4.0