

Challenge 5: Growing Beyond Earth®

YOUR CHALLENGE:

As NASA looks toward a long-term human presence beyond Earth's orbit, there are specific science, technology, engineering, and math (STEM) challenges related to food production in space. Established in 2015 as a partnership between Fairchild Tropical Botanic Garden and NASA's Exploration Research and Technology Programs, Growing Beyond Earth® enables student community scientists to actively contribute data toward NASA mission planning.

New GBE Schools will conduct the following experiment:

- **Novel Crops** – Research Protocols to be shared during mandatory teacher workshop

Returning GBE schools will choose on of the following experiments:

- **Novel Crops**
- **Neighboring Effect**
- **Water Stress**
- **Fruiting Crops**
- **Fertilizer Placement**

POINT SYSTEM

Maximum Points	75 pts for Trial 1 data
	75 pts for Trial 2 proposal
	75 pts for Trial 2 data
	75 pts for optionally submitting a presentation and presenting at the Growing Beyond Earth® Symposium
Submissions per middle school	1

**You must register with the GBE program
by August 29, 2025 to participate in this Challenge**



MANDATORY Teacher Workshop (choose one):

Teachers NEW to GBE:

- Virtual Workshop: September 12, 2025
- In-person Workshop: September 27, 2025 @ Fairchild

RETURNING GBE Teachers:

- Virtual Workshop: September 19, 2025
- In-person Workshop: September 27, 2025 @ Fairchild

IMPORTANT DATES:

Trial 1 Data Due: November 21, 2025 by 5pm

Trial 2 Proposal Due: December 12, 2025 by 5pm

Trial 2 Data Due: March 21, 2026 by 5pm

Optional Trial 2 Presentation Due: April 2, 2026 by 5pm

Research Symposium: Saturday, April 11, 2026

Participants per submission: Student Group



This work is supported by NASA under grant award No 80NCCS22M0125. Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Aeronautics and Space Administration.

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✓	SUBMISSION REQUIREMENTS to earn Fairchild Challenge points:
	Teachers must register to attend a mandatory workshop led by NASA and GBE facilitators.
	Trial 1 + 2 data sheets. – Submitted to GBE portal
	Proposal • Student designed, original research project informed by Trial data. • Proposal utilizes the <u>provided template</u> with all sections completed. • Proposal includes a bibliography citing 3 sources, MLA or APA format.
	OPTIONAL presentation powerpoint of Trial 2 results
	OPTIONAL student presentation at GBE Symposium on April 11, 2026
	One set of Fairchild Challenge points earned per middle school.

For more detailed information and resources,
please visit the **Middle School Challenge 5 webpage**.



You can also check out
the **Growing Beyond Earth® website** here.



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Prior Knowledge:

To be successful, students should be familiar with these concepts:

- Best methods to effectively conduct research from reliable resources
- Understand the scientific method and the process of developing a hypothesis

Standards/Learning Targets:

Subject	Strand	Standard(s)
Science	The Practice of Science	SC.6.N.1.1, SC.7.N.1.1, SC.8.N.1.1 Define a problem from the sixth/seventh/eighth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
	Earth in Space and Time	SC.8.E.5.10 Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.
		SC.8.E.5.12 Summarize the effects of space exploration on the economy and culture of Florida.
	Matter and Energy Transformations	SC.8.L.18.1 Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.
Math	Mathematical Thinking and Reasoning	MA.K12.MTR.2.1 Demonstrate understanding by representing problems in multiple ways. • Mathematicians who demonstrate understanding by representing problems in multiple ways: ◦ Build understanding through modeling and using manipulatives. ◦ Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations. ◦ Progress from modeling problems with objects and drawings to using algorithms and equations. ◦ Express connections between concepts and representations. ◦ Choose a representation based on the given context or purpose.

For more detailed information and resources, please visit the Middle School Challenge 5 webpage.

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Standards/Learning Targets Continued:

Subject	Strand	Standard(s)
Math	Represent and interpret numerical and categorical data	MA.7.DP.1.3 Given categorical data from a random sample, use proportional relationships to make predictions about a population.
		MA.7.DP.1.2 Given two numerical or graphical representations of data, use the measure(s) of center and measure(s) of variability to make comparisons, interpret results and draw conclusions about the two populations
	Data Analysis and Probability	MA.6.DP.1.2 Given a numerical data set within a real-world context, find and interpret mean, median, mode and range.
		MA.6.DP.1.4 Given a histogram or line plot within a real-world context, qualitatively describe and interpret the spread and distribution of the data, including any symmetry, skewness, gaps, clusters, outliers and the range
		MA.7.DP.1.1 Determine an appropriate measure of center or measure of variation to summarize numerical data, represented numerically or graphically, taking into consideration the context and any outliers.

Learning Goals/Objectives:

By the end of this Challenge, students will be able to:

Design an experiment addressing the challenges related to growing plants in space

Collect quantitative and qualitative data consistently

Analyze and present data graphically

Communicate findings to the scientific community

Differentiation:

We strive to be inclusive of all learners. Please contact us at challenge@fairchildgarden.org if you have questions about accommodations specific to your students' needs.

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