

Tomatosphere Unit Overview

Brief Background

Tomatosphere is a free program that has allowed students to connect with space since 2001. First the Seed Foundation leads the program in the United States, but it is a collaboration effort. Students are able to plant two groups of tomato seeds and compare their growth. The control seed group has remained on Earth. The experimental seed group has spent time in space aboard the ISS. The tomato seeds are all non-modified Heinz tomato seeds. The tomato plant was specifically chosen for its properties; providing a nourishing food source and purified water through evaporation.

Sign up to get your seeds! <https://www.firsttheseedfoundation.org/tomatosphere/register-for-tomatosphere/>

Driving Questions

How does a drastic environmental change (space) affect the growth of tomato plants?

How can we create conditions in space that promote growth of plants and food?

Vocabulary

- Control
- experimental
- homeostasis
- Hypothesis

- observation
- Photosynthesis
- Procedure
- Qualitative
- Quantitative
- Scientific method
- Variable

In your classroom

Science

- Engineering Design Challenge - How can I create an environment to best help my tomato seed grow?
- Calculate tomato and/or container's mass and volume.
- Explore ways people protect resources, environments and habitats.
- Identify and label parts of the plant.
- Diagram the growth process and/or photosynthesis.
- Discuss abiotic and biotic factors that affect plant growth.
- Investigate the effect gravity has on plants and growth.
- Gravity on Earth vs. Microgravity on the ISS
- Record qualitative and quantitative data through the process.
- Create a lab report.

Math (Measurement, Graphing) How can I obtain data from this experiment?

- Measure daily/weekly plant growth.
- Calculate circumference, radius, diameter and volume of a tomato.

- Convert inch measurements to centimeter measurements or convert centimeter measurements to millimeter measurements.
- Convert fraction measurements to decimal measurements.
- Compare data of control group with variable group.
- Graph data in a bar graph or line graph.
- Determine formula (for plant growth) to predict future growth.

Language Arts (Writing Process) **How can I best share this with others?**

- Create a daily journal to document plant growth and observations (informational)
- Create a news article describing Tomatosphere experience (personal narrative)
- Write a letter convincing other students or teachers to do the program (persuasive)
- Write a letter convincing First the Seed Foundation to use another plant. (persuasive)
- Research and present on related careers. (farmer, scientist)
- Describe the process from the perspective of the seed. (narrative)
- Write a poem about Tomatosphere, tomatoes, plant growth, or photosynthesis using figurative language. (poetry)
- Write a letter to a farmer, an astronaut, or a scientist who has worked with plants.
- Write a how-to-guide for growing a tomato plant. (informational)
- Have a debate on whether a tomato should be considered a fruit or a vegetable. (persuasive)
- Present to parents or other classes about the process and your plant's growth. (speaking & listening)
- Explore the biography of Henry J. Heinz and his family. (nonfiction genre)
- Analyze how the media portrayed the Heinz company. (media literacy)
- Evaluate Heinz commercials and how they've changed over the years. (media literacy)

- Research tomato farming. (nonfiction text features)

Social Studies *How does the geography and physical features of a region affect plant growth?*

How has/does farming impact(ed) culture?

How does/do urbanization, industrialization affect growth and trading?

- Native American farming practices.
- Medieval farming practices.
- Timeline of technological advances in farming.
- Explore the impact the Heinz brand has had on tomatoes and the American or global economy.

Technology

- Graph experiment results in Excel.
- Take photos of growth.
- Create a powerpoint to share the process (Scientific Method).
- Create a website or podcast about what you've learned or observed during the process.
- *Engineering Design Challenge - How can I create a robot to plant tomato seeds?*

Music

- Create a song or rap

Art

- Create a process drawing to show the steps
 - VTS
- Before and after as a pre/post 'assessment'
- During to make observations throughout the process

Physical Education

>Tomato Growth

- Students pair up to play rock, paper, scissors. If they win, they progress through the growth process. If they lose, they are “eaten” and return to the beginning as a seed.

Growth process: seed -> young plant-> mature plant -> flower -> tomato

- Students start as a seed and are sitting down.
- Then, they progress to young plants and kneel.
- After that, they are mature plants and bend over.
- Then, they become flowers, stand up and reach out their arms.
- Finally, they become tomatoes, remain standing and put their hands on their hips(to represent leaves).

>Tomato Tag

- Assign a few students to be rabbits. Rabbits hop.
- Assign a few students to be insects. Insects gallop and flap their arms as wings.
- Assign a few students to be raindrops. Raindrops wiggle their fingers. Raindrops can wear blue jerseys, pinnies or armbands, if available.
- Assign one student to be the sun. The Sun can wear a yellow, orange or red jersey, armband or pinny, if available.
- The rest of the students are tomatoes. Their goal is to make it to the garden to grow.
- The rabbits and insects can stop tomato growth by tagging the tomatoes. Once a tomato is tagged, he/she must remain in their spot.
- The raindrops and Sun can save the tomatoes by tagging them.

*Alternatives:

- Split students up into teams. Each team has a rabbit and insect to stop the other team's tomatoes. Students have to make it to the other team's garden. There is one raindrop and Sun for both teams.
- Have the rabbits, insects, raindrops and/or sun ride on scooters.
- Have the tomatoes wear flags that can be taken by the rabbits or insects.
- **Body Voting**
- Put up vocabulary terms and/or pictures around the room.
- Ask students questions.
- Students move to the poster that represents their answer.

Tomatosphere FREE Curriculum <https://www.firsttheseedfoundation.org/resources/>

- Tomatosphere Data Collection Sheet - chart
- Investigation Plan - Questions to answer
- Exploring Space - Questions to spark inquiry
- Glossary based activities - crosswords and word scrambles related to vocabulary

Student Investigations

- Energy from the Sun
- How Much Light
- Martian Crop Possibilities
- Martian Greenhouse
- Water Vapor in Closed Environment Systems

Space Science Investigations: Plant Growth NASA FREE App

<https://itunes.apple.com/us/app/space-science-investigations-plant-growth/id1131254597?mt=8>

Brainpop <https://www.brainpop.com/>

> Photosynthesis (Video)

- Vocabulary

> Seed growth (Video)

- Activity -> Identify and draw
- Graphic organizer (Venn Diagram)-> Comparing & contrasting gymnosperms and angiosperms
- Vocabulary
- Primary Sources: Examining 2 photographs of mountainside tree growth and answering questions.

> Build a Plant: Tomato (Game)

Flocabulary <https://www.flocabulary.com/>

> Photosynthesis "How Plants Make Life"

- Activity - Explaining and diagramming the process.
- Lyrics - Great way for students to follow along.
- Fill in the blank lyrics - students tend to focus too much on filling it in and less on the overall content.
- Vocab cards
- Lyric notes - Gives more information about certain lyrics in the song.

- Read and respond - Students read a paragraph and answer a multiple choice question based on what they read.
- Quiz - 10 multiple choice or true/false questions.
- Create and record their own way to explain photosynthesis.

Newsela <https://newsela.com/text-sets/237420>

Note: I do NOT own or have rights to the images. I included them ONLY to help others find the articles. All Newsela articles are able to be adapted to meet different reading levels. When a student changes the Lexile level of the article, sometimes the titles change as well. The pictures are to help teachers and students find the correct article.

Tomatosphere Text Set



Professors Push Students to Grow Plants in Mars-Like Soil



Low Amounts of Sunlight Cause Leaves on a Plant in the Rain Forest to Turn Blue



Ants Have Been Farming Some Plants for Millions of Years



Native Americans and Traditional Plant Use



Plant Life: What is a Seed?



NASA Planting Seeds to Grow More Edible Plants on Space Station

Henry J. Heinz Background

Biography

<https://www.biography.com/people/hj-heinz-39251>

<https://astrumpeople.com/henry-j-heinz-biography/>

Family <http://www.johnheinzlegacy.org/heinz/heinzfamily.html>

H.J. Heinz Company (PA) (Images of America) by: Debbie Foster & Jack Kennedy

Company Timeline <http://www.heinzketchup.com/Heinz-Timeline>

Pittsburgh Post Gazette article *History of Heinz - It all began with his mom's garden* by: Patricia Sabatini

<http://www.post-gazette.com/business/businessnews/2013/02/15/History-of-Heinz-It-all-began-with-his-mom-s-garden/stories/201302150279>

The Telegraph article *144-year-history of Heinz*

<http://www.telegraph.co.uk/finance/newsbysector/retailandconsumer/987034/The-144-year-history-of-Heinz.htm>

Visit - Senator John Heinz History Center (Pittsburgh)

<http://www.heinzhistorycenter.org/exhibits/heinz>