

# DESIGN A SPACE GARDEN

RESEARCH ON THE ISS

NAME \_\_\_\_\_

GRADE \_\_\_\_\_

OBJECTIVE	TEACHER PREP	EXTENSION ACTIVITY
Students will design and build their own plant growth chamber.	Encourage students to brainstorm answers to the following questions: <ul style="list-style-type: none"><li>• What environments and nutrients do plants require to grow?</li><li>• How do astronauts get food sent to them and how do they grow plants and vegetables on the ISS?</li></ul> <p><b>You will need:</b> Computer with Internet connection, cardboard, Styrofoam supermarket trays, egg cartons, clay and plastic pots, plant seeds, soil and water.</p>	Encourage students to research microgravity and its effects on the human body and the atmosphere.

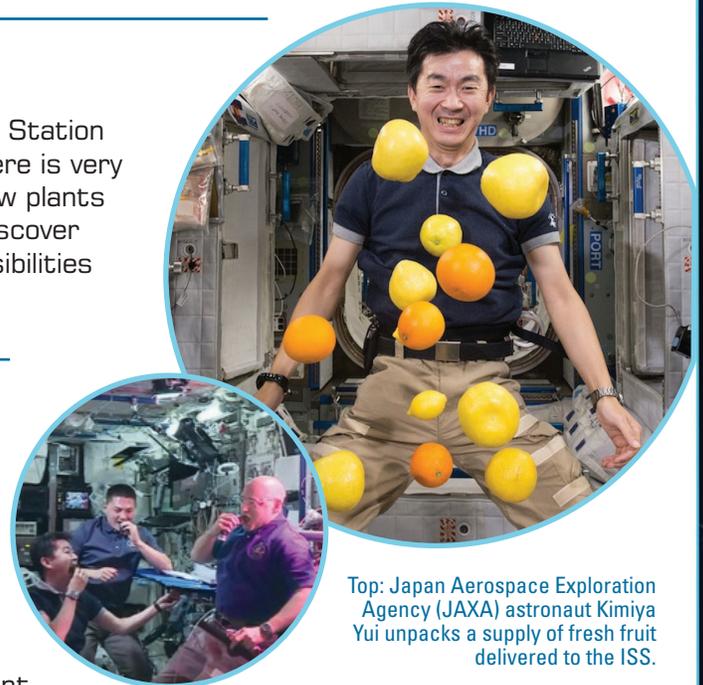
These lessons address NGSS standards: Engineering Design; Motion and Stability: Forces and Interactions; From Molecules to Organisms: Structures and Processes; Ecosystems: Interactions, Energy, and Dynamics; Biological Evolution: Unity and Diversity; Heredity: Inheritance and Variation of Traits; Earth's Systems; and Matter and Energy in Organisms and Ecosystems.

## BACKGROUND

The U.S. National Laboratory on the International Space Station (ISS) is different from laboratories on Earth because there is very little gravity. Because of this, scientists like to study how plants respond to their environment in microgravity. As they discover more about changes in growing "space plants," the possibilities of growing plants on other planets becomes more likely.

## DID YOU KNOW?

- For the first time in history, astronauts ate lettuce that they grew and harvested on the ISS in August of 2015.
- Plants like rice, tulips, onions, peas, radishes, lettuce, wheat and cucumbers have been grown on the ISS.
- Astronauts on the ISS have to perform many different experiments each day. Some experiments include living plants and animals.



Top: Japan Aerospace Exploration Agency (JAXA) astronaut Kimiya Yui unpacks a supply of fresh fruit delivered to the ISS.

Bottom: Japan Aerospace Exploration Agency (JAXA) astronaut Kimiya Yui and NASA astronauts Kjell Lindgren and Scott Kelly sample space-grown lettuce from the Vegetable Production System on the ISS.

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Special acknowledgment and thanks to the Center for Advancement of Science in Space (CASIS) and NASA for their contributions.



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## YOUR MISSION

Scientists are always exploring how to improve the different ways we grow food. With so many people on the planet, researchers and farmers need to find creative and efficient ways to grow crops. Your mission is to use the knowledge you've gained about plants in space to design and build your own unique plant growth chamber.

## YOUR TASK

### PART 1: HOW DOES YOUR GARDEN GROW IN SPACE?

- 1 Watch this NASA video about growing plants in space. <https://www.youtube.com/watch?v=SgpU08WJmOc>
- 2 Talk about the video and steps to growing a garden in space as a group.
- 3 Watch this NASA video of astronauts taking their first bites of fresh space-grown lettuce on the ISS. <https://www.youtube.com/watch?v=Yp6zLISoT0k>

### PART 2: HOW CAN I ENGINEER A PLANT GROWTH CHAMBER?

- 1 Use **Handout A – Research and Design: Space Station to Home: Design Your Own Plant Growth Chamber** to guide your engineering path. Start by doing research on the Internet or at the library about various plant growth chambers. Pay close attention to how the different containers help the plants being grown in them.
- 2 Write down questions you have about creating a plant growth chamber.
- 3 Draw some design ideas for your plant growth chamber and label the parts. Make a list of materials you will use to build your plant chamber.



### PART 3: LET'S BUILD!

- 1 Select your favorite design for a plant growth chamber from the designs you created on Handout A.
- 2 Get the design approved by your teacher. Build your growth chamber from the materials provided by your teacher. Set up the seeds or plants for growth.

### PART 4: TRACK RESULTS AND SHARE!

- 1 Use **Handout B – Observation and Results: Space Station to Home: Design Your Own Plant Growth Chamber** to track your results over time.
- 2 Share your results with your class. Be sure to share your plant growth results, your design build from start to finish and how you can improve your design.

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## HANDOUT A

RESEARCH  
AND DESIGN

Space Station to Home:  
**DESIGN YOUR OWN PLANT  
GROWTH CHAMBER**



### RESEARCH NOTES

### MY QUESTIONS

### MY PLAN

Draw and label your design



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