Alternative Method of Instruction

Grade 5
Day 4

Literacy: Farming in Space

Be sure to use complete sentences to answer the discussion questions and question number 5.

Social Studies: Learn About Your State

Math: Multi Step Problems

Science: Scientific Method- Answer All questions
In this informational text, Amy Hansen discusses scientists’ work to grow plants in space, specifically Dr. Mary Musgrave’s accomplishments with the task. As you read, take notes on what happens to the plants in space.

What will astronauts eat when a space voyage takes years or even decades?

Lots of fresh vegetables, says Dr. Mary Musgrave of the University of Massachusetts. She has spent the last 10 years learning how to grow plants in space. And it’s a good thing she has already started her work, because extraterrestrial gardening can be tricky.

In 1997, while the Mir Space Station spun around Earth, astronaut Mike Foale peered at a sealed growth chamber. The astronaut had planted Dr. Musgrave’s quick-growing seedlings in the chamber, but none of the stems were showing.

"Astronauts are helping other scientists learn how to grow plants in space." by NASA is used with permission.

Confused Plants

He opened the container and saw the problem. The white stems weren’t growing upward. Instead, they threaded downward or sideways. Some of the roots snaked up, while others twisted around. These were confused plants.

On Earth, a plant’s roots and stems take cues from gravity, using the Earth’s pull to find “up” and “down.” This process is called gravitropism. On the Mir, there was almost no gravity.

Dr. Musgrave suggested a solution: give the plants more light. This idea made sense because plants also use sunlight to find their way — a process called phototropism.

And it worked. Once the seedlings had more light, the stems turned up and the roots went down.

Now Dr. Musgrave was free to worry about the next problem: Would her baby plants live to flower?

Can we grow food on a space voyage?

1. Voyage (noun): a long journey
2. occurring outside the Earth or its atmosphere
3. signals
Starving for Air

Many plants died in space. But Dr. Musgrave thought she knew why. She thought the space plants were starving for air.

Plants live by taking up carbon dioxide from the air. Since a plant uses up this gas in the air around it, the plant needs air currents to bring more carbon dioxide close to its surface.

On Earth, the air is always moving. Gravity pulls down cold air, and warm, lightweight air rises. So the air is shifting even when we can’t feel a breeze. And with these shifts, plants get plenty of carbon dioxide.

Air Currents

Many earlier experiments with plants in space had used closed chambers. On the Mir Space Station, Dr. Musgrave tried a new greenhouse that had a fan pulling in a constant supply of the air inside the space station.

The plants loved it. They flowered and even produced more seeds, which Mike Foale was able to plant and grow. Using Dr. Musgrave’s method, he completed the first seed-to-seed experiment in space, and moved one plant closer to an extraterrestrial garden.

“And this,” says Dr. Musgrave, “is good news for long-term space travel.”

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Text-Dependent Questions

Directions: For the following questions, choose the best answer or respond in complete sentences.

1. PART A: Which statement identifies the central idea of the text?
   A. Farming techniques that are used in space can also be applied to plants on Earth.
   B. The plants grown in space don't provide the same nutrients as those grown on Earth.
   C. Scientists are still struggling to keep plants that are grown in space alive.
   D. Growing plants in space presents problems that gardeners don't encounter on Earth.

2. PART B: Which detail form the text best supports the answer to Part A?
   A. "And it's a good thing she has already started her work, because extraterrestrial gardening can be tricky." (Paragraph 2)
   B. "Gravity pulls down cold air, and warm, lightweight air rises. So the air is shifting even when we can't feel a breeze." (Paragraph 12)
   C. "On the Mir Space Station, Dr. Musgrave tried a new greenhouse that had a fan pulling in a constant supply of the air inside the space station." (Paragraph 13)
   D. "Using Dr. Musgrave's method, he completed the first seed-to-seed experiment in space, and moved one plant closer to an extraterrestrial garden." (Paragraph 14)

3. Which of the following describes the relationship between plant growth and gravity?
   A. Gravity helps plants grow in the correct direction and moves air to provide them with carbon dioxide.
   B. Gravity forces the stems of plants up from the soil and encourages them to grow stronger and taller.
   C. Gravity pushes down on plants and requires them to develop strength to grow tall and straight.
   D. Gravity helps move oxygen towards plants so that they don't starve from the lack of air in space.

4. How do paragraphs 1-3 contribute to the development of ideas in the text?

   _______________________________________________________
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________
   _______________________________________________________
Discussion Questions

*Directions: Brainstorm your answers to the following questions in the space provided. Be prepared to share your original ideas in a class discussion.*

1. Would you eat food that was grown in space? Why or why not? Do you think food grown in space would taste differently than food grown on Earth?

2. In your opinion, what do you think the future will look like if astronauts can grow their own vegetables in space? What are the advantages and disadvantages of this discovery? What impact could farming in space have on space travel and discoveries?
Learn About Your State

Learn about your state by researching answers to the questions below.

1. What state do you live in? Can you locate it on the map below?

STATE: ______________________

2. What is the official bird of your state?

3. What is the official fish of your state?

4. What is the weather like in your state? Is it hot, cold, rainy, humid, dry?

5. What are some popular landmarks or monuments located in your state? Which ones have you visited?

6. Does your state have any state parks or reserves? List the ones that are close to your house.

7. What does your state's flag look like? Draw your flag below.

8. What is the capital city of your state?

9. Who is the current governor of your state?

10. How many representatives does your state have in the House of Representatives in Washington, D.C.?

11. When was your state accepted into the Union?

12. What is the population of your state?

13. Are there any manufactured or agricultural items your state is known for? List them below.
Multiple-Step Problems

a. Calvin paints pictures and sells them at art shows. He charges $56.25 for a large painting. He charges $25.80 for a small painting. Last month he sold six large paintings and three small paintings. How much did he make in all?
   Show your work and label your answer.

   answer: ______________________

b. Jennie makes quilts. She can make 7 quilts with 21 yards of material. How many yards of material would be required to make 12 quilts?
   Show your work and label your answer.

   answer: ______________________

c. Brayden and Gavin were playing touch football against Cole and Freddy. Touchdowns were worth 7 points. Brayden and Gavin scored 7 touchdowns. Cole and Freddy's team scored 9 touchdowns. How many more points did Cole and Freddy have than Brayden and Gavin?
   Show your work and label your answer.

   answer: ______________________

d. On Thursday the Meat King Market sold 210 pounds of ground beef. On Friday they sold twice that amount. On Saturday they only sold 130 pounds. How much more meat did they sell on Friday than Saturday?
   Show your work and label your answer.

   answer: ______________________
Scientist Dr. E. McSquare is compiling his scientific findings into a single volume. He forgot to give titles to the sections of his reports and now they’re all mixed up! Use the definition guide to help Dr. McSquare label his reports.

**Definition Guide:**

**Q = Question:** The question is the first part of the scientific process. What question do you want to answer?

**H = Hypothesis:** A hypothesis is a statement that can be proven true or false. It is often written in the form "If (a) then (b)."

**E = Experiment:** The experiment is an activity that is used to test if your hypothesis is true or false.

**D = Data:** Data are the results of the experiment.

**C = Conclusion:** The conclusion is a final statement that describes what you learned from the experiment and results.

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**E** I will test my lab partners’ resting heart rates by counting their heart beats in three different positions: lying down, sitting, and standing up.

**Object:** Bounce count
- **Golf ball:** 4 bounces
- **Medicine Ball:** 7 bounces
- **Baseball:** 5 bounces

**Did heavier objects bounce higher on a trampoline?**

**If standing up requires more physical effort than lying down, then one’s pulse standing up will be faster than one’s pulse lying down.**

**From a fixed height, I will drop a variety of objects onto a trampoline several times and observe the number of bounces.**

**If there is and equal an opposite reaction to every action, then heavier objects will bounce higher off a trampoline.**

**Maurice:** Lying down - 55 bpm, Sitting - 59 bpm, Standing - 65 bpm
**Lucy:** Lying down - 58 bpm, Sitting - 60 bpm, Standing - 70 bpm
**Carlos:** Lying down - 51 bpm, Sitting - 54 bpm, Standing - 56 bpm

**How does your resting heart rate change depending on your position?**

**The experiment and data show that heavier objects bounce higher on trampolines.**

**A person’s position affects his or her resting heart rate. The heart rate is higher if the body is upright.**