



Read & STEAM

Indoor Farms, Outdoor Farms



Lesson Summary

Students will learn about hydroponics through the book *Indoor Farms, Outdoor Farms* and completing a pH testing experiment

Grade Level

K-5

Length of Lesson

45 minutes

Materials

- One 15oz bottle of lemon juice
- One gallon of distilled water
- At least 15oz of tap water
- Dish soap
- 4 Dixie cups per group of 3-5 students
- At least 4 pH test strips per group of 3-5 students
- Projected image of pH scale

Reading Guide

1. Introduce the story using these questions (2 min)

- a. Have you ever been to a farm?
- b. What does a farm look like?
- c. What happens at a farm?

2. Indoor Farms, Outdoor Farms by

Lindsay H. Metcalf (10 min)

3. Reflect on the story with these questions (3 min)

- a. What does a farm look like?
- b. What were they growing at the indoor farm?
 - i. Introduce the term hydroponics: growing plants without soil. All of the nutrients the plants need are added into the water the roots sit in.
- c. How did they keep the plants healthy in the indoor farm?
- d. “Today we will learn about one of the steps indoor farms take to keep their crops healthy!”

Vocabulary

Hydroponics: Growing plants without soil. All nutrients the plants need are added into the water the roots sit in.

Aeroponics: Growing plants without soil. The plant roots hang in the air and are sprayed with a mist of water and nutrients.

Additional Lesson Links

- Matrix Lessons
 - [Exploring Aquaponics](#)
 - [Test Tube Hydroponics](#)
 - [What? No Soil?](#)
 - [Robots in High Tech Farming](#)
 - [High Tech Farming](#)
- Other Resources
 - [Virtual Farm Tours](#)

Standards

NALO:

T1.3-5.a

T3.3-5.b

T4.3-5.d

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pH Testing

1. Begin “pH Testing” activity (25 min)

- a. Ask: “Have you ever tasted something sour like a lemon? Or felt something slippery like soap?”
 - i. Project an image of the pH scale
 - ii. Explain: “The pH scale tells us how acidic or basic something is. Acids taste sour and are a low number pH of 0–6. Pure water is neutral and has a pH of 7. Bases feel slippery like soap and have a high number pH of 8–14. Today, we will be testing the pH of different liquids!”
- b. Break students off into groups of 3-5
- c. Give each group labeled dixie cups with each of the following liquids:
 - i. Tap Water
 - ii. Purified Water
 - iii. Lemon Juice
 - iv. Soapy Water
- d. Give each group 4 pH test strips and explain, “These strips are a tool that can test liquids to tell us where on the pH scale they are. The color on the strip will match with a number on the scale!”
- e. Instruct students to dip one strip in each of the solutions and let them sit for a couple seconds
- f. Ask: “What color did the pH strip turn in the tap water?”
 - i. Write their answers up on the board
 - ii. Repeat for each of the 4 liquids
- g. Ask if each liquid is an acid or base according to the color on the test strip (match it up with the color on the bottle)
- h. Explain: “In hydroponics, the water needs to stay at a certain pH. If it is too high or low, the farmer needs to adjust it. They also have to add nutrients so the plants can grow!”

2. Review the activity with these questions (5 min)

- a. What kinds of food can be grown at an indoor farm?
- b. How do farmers take care of their crops at an indoor farm?
- c. “Not all farms look the same! No matter if it is an indoor farm or an outdoor farm, farmers put in a lot of work to produce food for us!”

pH Scale

