



EASY HYDROPONICS FOR KIDS

Time required:

45-60 minutes

Academic Standards:

- 3rd Grade – Social Studies – Standard 4 – 3.4.6, 3.4.7; Standard 9 – 3.6.3; Standard 7 – 3.7.2, 3.7.3; Standard 10 – 3.10.2
- 3rd Grade – Math – Standard 3 – MD.B.4, MD.B.7
- 4th Grade – Social Studies – Standard 8 – 4.8; Standard 9 – 4.9.4, 4.9.9
- 4th Grade – Math – 4.MD.B.4
- 4th Grade – Health – 7-E-2
- 5th Grade – Science – HS-EVSI-3, HS-EVS3-1
- 5th Grade – Math – 5.NF.A.1, 5.NF.B.2
- 6th Grade – Math – 6.NS.A.1



Lesson Objectives:

1. Students will be able to identify five elements plants need to grow and thrive.
2. Students will be able to describe how water is used to provide the right balance of nutrients to the plants' roots.
3. Students will be able to name two advantages of using hydroponics to produce food.
4. Students will be able to identify media used to support plant roots.

Video Link:

www.lsuagcenter.com/agmagicagventuresnw

Materials Needed:

- Recycled water bottles with caps
- Scissors or utility knife
- Aluminum foil
- Filtered water
- Water-soluble fertilizer
- Pea gravel
- Seedlings, such as basil, tomatoes, spinach, leaf lettuce, kale, etc.
- (Can use cotton twine for wick if needed.)

Introduction

When you think of hydroponics, you may think of a very technical, advanced way of growing plants, maybe even something that would see in Star Wars! However, growing plants without soil has been around for thousands of years. Hydroponics was used in the hanging gardens of Babylon. The Aztec Indians used floating rafts to raise crops, and Marco Polo even observed hydroponics being used in China during his expeditions.

In 1699, John Woodward, a British scientist, discovered that the primary use of soil was to support plant roots. In the 1800s, scientists began successfully growing plants in solutions of water with added minerals. In the 1930s, Dr. W. E. Gericke began raising tomatoes and other crops using floating rafts such as those used by the Aztecs. Gericke was the first to use the term hydroponics. Hydro is a Greek word that means water.

Just like humans, plants have basic needs that must be met for them to survive and thrive. Water, nutrients, light, and air are important as well as support for the root system of the plant. When we grow plants in soil, the plants get these needs met from the soil. However, soil is not used in hydroponics, so it is very important to get the correct balance of nutrients directly to the plant's roots. When this happens, the plant can put all its energy into producing leaves and fruits instead of sending out roots to search for nutrients. The primary nutrients needed by plants are nitrogen, potassium, and phosphorus. You will see these nutrients represented on fertilizer sources as N-P-K.

Some of the advantages of hydroponics are more consistent results with plants grown faster, fewer pests and no weeds. Also, more plants can be grown in smaller space, and growing seasons can be extended. With do-it-yourself methods, hydroponics can also be much less expensive.

Vocabulary Words

- **Hydroponics** – Growing plants in water without the use of soil.
- **Photosynthesis** – Plants convert nutrients into energy.
- **Germination** – To cause seeds to sprout or develop.
- **Nutrient** – Substance that provides nourishment essential for growth and the maintenance of life.
- **Nitrogen** – An essential element needed in plant development. Plants are rich and green and protein content increases when nitrogen is at optimum levels.
- **Potassium** – An essential element needed in plant development that helps in plant vigor and disease resistance.
- **Phosphorus** – An essential element needed in plant development that stimulates root formation and growth, giving plants a vigorous start. Phosphorus aids in flowering and seed formation.

Activity

Make a Hydroponic Growing System

1. Place students in small groups to work together to create one hydroponic growing container for each group.
2. Gather materials and wash pea gravel. Allow gravel to drain while preparing water bottle.
3. Prepare a used, clean water bottle by cutting the top of the bottle off and using the label as a guide. Cut just below the label.
4. With a sharp utility knife, cut a hole in the top of the bottle cap. (This will be used to expose the roots to the growing solution.) Set bottle top aside.
5. Wrap the bottom of the bottle with aluminum foil. This helps prevent algae from growing and replicates the dark conditions in which roots typically grow.
6. Properly mix and add nutrient solution to reservoir. (Special hydroponics growing nutrients may be purchased; however, a water-soluble fertilizer such as MiracleGro can be used at half strength.)
7. Gently place seedling into the inverted top of the water bottle, making sure the roots are through the hole in the bottle cap.
8. Gently place clean pea gravel around the seedling to provide support for the seedling.
9. Fill the reservoir (the bottom of the bottle) with the prepared nutrient solution until seedling roots are slightly touching the solution. Allow a small amount of air space between the solution and the bottle cap.
10. Allow the seedling cup to rest in the reservoir. Place hydroponic system (the water bottle) in a sunny window or under a grow light if available.
11. Check the solution level weekly and refill as necessary. Change the solution every three to four weeks, refilling with fresh nutrient solution. Use the old solution to water other plants.
12. Once the seedling grows to be approximately two-thirds of the height of the bottle, it may become top heavy. Gently remove it and place it in a larger hydroponic container, such as a 2-liter bottle made following the above directions.

Reflection

After conducting these activities, review and summarize the following key concepts:

- Hydroponics is the science of growing plants without soil.
- Plants need air, water, light, and nutrients to grow.
- Plants can grow without soil if they receive nutrients (N-P-K) from another source.
- More food can be grown faster, more consistently, with fewer pests and diseases, and less expensively.
- Growing seasons can be extended, which means more fresh food.

Notes:

Hydroponics is best used for nonfruiting plants, such as leaf lettuce, kale, spinach, herbs, swiss chard, bok choy, etc. This method can also be used on a larger scale for tomatoes or peppers.

After harvesting, add root balls to compost.

Extension:

Compare hydroponically grown plants to those grown in soil for size, color and taste.

Chart the growth of hydroponic plants versus those grown in soil.

Compare cost of hydroponic vegetables to that of purchased vegetables.

Use scientific method to determine which vegetable tastes better: hydroponic or store bought. What are the factors in the results?

References

Good tutorials:

<https://youtu.be/87A06gzcZZ0>

<https://youtu.be/BUpUfxqULXA>

<https://youtu.be/-fIA5mTQ05A>

Lesson references:

<https://agclassroom.org/matrix/lesson/654/>

<https://kidsgardening.org/lesson-plan-classroom-hydroponics/>

<https://study.com/academy/lesson/hydroponics-lesson-plan-for-elementary-school.html>

<https://home.howstuffworks.com/lawn-garden/professional-landscaping/hydroponics.htm>

<https://www.nps.gov/articles/hydroponics.htm>

<https://agclassroomstore.com/test-tube-hydroponics/>



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