Hydroponics: Soilless Farming

Grade level: Upper elementary

NATIONAL STANDARDS
NS.5-8.3
NS.5-8.5

Student Learning Objectives

After completing this lesson, students will be able to:

1. Define hydroponics.
2. Create a hydroponic system and raise plants in it.

Time: 50 minutes

Tools, Equipment, and Supplies: Writing surface, copies of Activity Sheet 29:1, jar filled with water, pot or planter filled with soil, plant with soil removed from its root system.

Hydroponic system supplies: two liter soda bottle (1 per group), plastic foam, aquarium bubbler, aquarium tubing (1 cm diameter), knife or scissors, lettuce seeds or small lettuce plants

Key Term(s): Hydroponics

Background Information

Hydroponics is the growing of plants in a soilless environment. The plants obtain all of their required nutrients through a water supply instead of soil. Growing plants hydroponically has allowed farmers to grow more food faster in smaller areas such as greenhouses. There are several types of **hydroponic** systems. Passive systems do not circulate the water, while active systems rely on energy to move the nutrients in and out of the plants root zone. Most commercial **hydroponic** systems use an active system to ensure the nutrients are reaching the plants.

Interest Approach

Students, I have a very important question for you today. We need to plant this plant and we have two choices: We can either put the plant in this jar with water or we can plant it in this pot.

Use the ME-YOU-US e-Moment® to answer the following question.

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Which container should I use to grow this plant and why?

Capture the students' answers on the board.

OBJECTIVE 1: **Define Hydroponics.**

Great answers! A lot of us believe that we should place the plant in the pot filled with soil. Most of us probably chose that option because plants we are familiar with typically grow in soil. But if you said that you'd put the plant in the jar with water you are also correct! Sometimes plants are grown in water. This method is called "**hydroponics.**" The word **hydroponics** comes from a Latin word that means "working water"; however, a more detailed explanation of **hydroponics** is "the process of growing plants without soil in a water solution that provides all the required nutrients for the plant."

Use a Picasso e-Moment® to illustrate the definition of hydroponics. Allow the students to perform a gallery walk to view each other's work.

OBJECTIVE 2: **Create a hydroponic system and raise plants in it.**

Prior to the class gather all lab materials and separate the items needed by each group. Depending on the age of the students, you may want to have all of the items precut for safety purposes. See Activity Sheet 29:1 for a complete list of materials needed for the activity.

It looks like we all are wonderful artists and that we have a good understanding of **hydroponics.** Let's see if we can now raise our own plants hydroponically. Farmers and gardeners use hydroponic systems to raise plants. Hydroponic systems can be as simple as our glass jar to huge containers that require electric pumps to circulate the water. We are going to make a system that will allow us to raise lettuce right here in the classroom.

Place students in pre-assigned groups or partners.

In order for us to create a **hydroponic** system, we will need to get into groups. In our groups we will need to be eager learners and listen carefully to the directions. First, each group will need to send one person to pick up the materials for this project. On the count of three, select the table runner. Okay. 1...2...3... Select. Great! Now that each group has a runner, when I say GO, let's gather our materials from the front of the room. GO!

Pass out Activity Sheet 29:1 to the students so they can read the directions and follow the steps as you go through the directions for setting up a ***hydroponic*** *system.*

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REVIEW/SUMMARY

Excellent job! All we have to do now is wait while we continue to care for the plants in our hydroponic system. We created a very simple hydroponic system; farmers use much more complex systems in their greenhouses to produce food. It is important to remember that **hydroponics** is the process of raising plants in a water solution instead of soil. This process helps farmers to raise more food at a faster pace in a smaller area.

REFLECTIVE REVIEW QUESTIONS:

- Who will summarize how a hydroponic system works?
- Describe how nutrients are delivered to plants in a hydroponic system.
- What other plants might be grown in a hydroponic system?

APPLICATION

APPLICATION 1: **Research other hydroponic systems and build a different system as a classroom model.**

APPLICATION 2: **Invite a farmer or greenhouse owner who uses hydroponics to come and speak to your class; or take a field trip to an operation that raises crops hydroponically.**

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ACTIVITY SHEET 29:1

Hydroponics Growing System

Materials:

Two liter soda bottle (1 per group)
Plastic Foam
Aquarium bubbler
Aquarium tubing (1 cm diameter)
Knife or scissors
Lettuce seeds or small lettuce plants

Directions:

1. Gather materials for the group.
2. Cut off the top of the soda bottles at the point where the bottle begins to narrow into the funnel shape.
3. Flip the top of the soda bottle and fit it into the bottom of the bottle.
4. Cut a one-centimeter hole in the funnel part of the soda bottle and run tubing from an aquarium pump into the hole.
5. Cut a piece of plastic foam (such as Styrofoam) to fit the mouth of the soda bottle. Make a slit half way into the foam. This will be used to hold the plant in place.
6. Put your plant or seed in the foam slit.
7. Place the foam with the plant into the soda bottle hole.
8. Remove the inverted funnel top of the bottle, fill the container with water and turn on the aquarium pump. Return the funnel top to the container.
9. Allow the pump to run and aerate the plant. Over the coming days and weeks you will see the plant grow.
10. Add fertilizer to the water to give nutrients to the plant.