Say Goodbye to Soil

Lesson Description

Utilize household items to grow plants from seeds using a nutrient-rich water solution without traditional soil. Pick a vegetable and use this simple hydroponic method as a way to begin building a food garden!

Lesson Objective

Observe the growth cycle from germination to harvest, and understand what a plant needs to grow. Connect growing produce, like fruits and vegetables, with growing plants to understand food sources.

Vocabulary

- germination
- harvest
- hydroponics
- nutrients

Materials

- a 2-liter bottle
- growing media
  - coconut coir or gravel
- water
- string wick
- paper towel square (2 inches by 2 inches)
- aluminum foil or construction paper
- seeds
  - leafy greens or tomatoes
- permanent marker
- scissors or box cutter
- optional
  - plant nutrient additives

Introduce

We all know that plants need water, sun, and soil to grow. However, what if we did not need soil? Although soil makes it easier for plants to **germinate** (grow), we can grow fruits and vegetables without soil using **hydroponics**. Simply put, we can grow plants in water without any soil. We need to add **nutrients,** typically found in soil, to the water for plants' roots to absorb and grow.

The process of hydroponics eliminates soil, which then eliminates soil-borne pests, disease, and the need to use pesticides (poisons used to kill or repel pests, but also runoff into rivers and streams, harming fish populations). In addition, foods grown hydroponically taste fresher and have higher nutrients inside them, making them healthier than the soil alternative!

Elimination of pesticides prevents land, water, and air pollution. Hydroponics also offers a higher crop yield than traditional agricultural **harvesting**, making the process more efficient, thus conserving resources and energy. Furthermore, hydroponics is an option for areas that cannot support crops in soil, reducing energy consumption and carbon emissions generated by importing produce.

Investigate

Your Challenge: Grow your own plants using hydroponics!

1. Collect all the items listed in the *Materials* list.
2. Use the clean 2-liter bottle and draw a line around the bottle's circumference after the curve at the top of the bottle.
3. With an adult's help or supervision, use scissors or the boxcutter to cut the bottle along the line. **Safety First!**
    a. We will call the bottom part of the bottle the "bottom half" and the top part of the bottle the "bottle spout."
4. Cut a string wick 6-inches long or the length from the top of the bottle to the bottom.
5. Poke a hole through the square paper towel in the center and string the wick through tying a knot to keep it in place. Put the string through the mouthpiece of the bottle with the paper towel in the bottle spout.
6. Add 2–3 cups of the growing media (coconut coir or gravel) into the bottle spout on top of the paper towel.
7. Cover the bottom half of the bottle with aluminum foil or construction paper to block out light from causing algae to grow.
8. Take the bottom half of the bottle and fill it halfway with water and the optional plant nutrient mix.
    a. Tip: If using tap water, let it sit overnight to evaporate the chlorine, and it will be ready to use the next day!
9. Place the bottle spout (upside down) on top of the bottom half of the bottle. Make sure to submerge the string in the water (partially). Observe how the string absorbs the water and travels to bring the moisture to the growing medium. See the sample image.
10. Add the seeds ¼ to an ⅛ way deep within the growing media and add a little extra water to the seeds for help! Place the hydroponic planter in a sunny spot and watch the plants grow! Add water to the bottom of the planter as needed.

Wrap-up

Challenge Questions:

1. Explain the growth cycle of a plant from beginning to end.
2. What do plants need to grow, and how can we provide them with the necessary nutrients they need?
3. How is it possible for plants to grow without soil using hydroponics?
4. Where does the food we buy from the store come from if we do not grow it ourselves? Do farmers use a similar process as the one we used today?

Watch and read it!

With an adult or an adult's permission,

- 2-Liter Bottle Hydroponics Tutorial - A visual and descriptive guide to creating a hydroponic garden.
- Gardening Hydroponics Basics - An article with information about hydroponic gardening and other helpful resources.
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    - Pinterest: @energyiseverything
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Glossary

Word	Part of Speech	Definition
germination	noun	The development of a plant from a seed or spore after a period of dormancy.
harvest	noun	To gather for use, as in the need to collect resources in order to use them as sources of energy.
hydroponics	noun	The process of growing plants in water without using soil.
nutrients	noun	A substance that provides nourishment essential for growth and the maintenance of life.

Works Cited

Johnson, L. (2009, December 3). *Why Use Hydroponics*. EZ GRO Garden. https://ezgrogarden.com/hydroponics/why-use-hydroponics/.