

Teacher's Aid

Introduction to Hydroponics | Grades 5-12



Introduction

Students will learn about the history of and different types of hydroponics.

Objectives

After completing this experiment, students will understand:

- What is hydroponics
- Different types of hydroponics
- Advantages of hydroponics
- Essential items for growing plants
- Introduction to NASA and to microgreens

Keywords

Hydroponics, nutrients, photosynthesis, water, media, microgreens, local

Time

Suggested time is 10 days (45-60 minutes first day, 5-10 minutes each subsequent day, 45-60 minutes on final day of experiment)

Activity Materials

- Microgreen GrowKit (MoonKit™) 1 per student
 - Measuring cup 1 cup
 - Measure cup 1/4 cup
 - Tap Water
 - Paper towels for spills
 - Pen or pencil for writing
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Background Information

Plants will grow in or on anything. They just need water, nutrients, light, and oxygen.

Energy - the ultimate source of energy used by nearly all living organisms is sun light. Photosynthesis is used by plants to store energy conveyed by light to form food. Animals, in turn, eat plants and obtain stored nutrients and energy.

Water - is essential as the nutrient transport system of plants and is a major reactant in photosynthesis. Water is essential to plant life.

Environment - hydroponics allows us to grow plant in a soilless, nutrient rich environment. Plants are often suspended in a growing medium such as sand, coir, or water itself. Higher yields, much less water usage, and the ability to grow more nutrient dense food locally makes hydroponic production very attractive to cities.

Space Travel - NASA has an established veggie program and is already growing plants in space for future manned space missions. Hydroponics is essential to this task.

Microgreens - all plants begin as small seedlings called microgreens. When grown in water without light they are called sprouts. When grown in light, they are called microgreens until they grow fully and become the plant, vegetable or tree. They all begin as seedlings.

Lesson Plan

Lesson 1: Preparation of Moon Kits and Introduction to Hydroponics

In this experiment, students will grow their own microgreens over 10 days while learning more about hydroponics.

Components for Experiment:

- A projector or display to review pdf “Introduction to Hydroponics” (www.moonflowerfarms.com/moonkit)
- Microgreen grow kit for each student
- A cup measure for water, one 1 cup measurer
- A cup measure for water, one 1/4 cup measurer
- Paper towels in case of spills
- One printed sheet titled “Plant Journal” for each student from Introduction to Hydroponics
- A pen or pencil for each student to write notes on their Plant Journal

Day 1-10: Experiment Details

Day 1 (45-60 minutes)

1. Ask students if they have ever heard of hydroponics
2. Share with them that today they will be learning more about hydroponics
3. Show the students the presentation “Introduction to Hydroponics”
4. Allow them to ask questions after each page is reviewed
5. Share with them that today they will do a simple hydroponic experiment and grow microgreens over the next 10 days
6. Hand out one Microgreen MoonKit to each student - ask them to be careful and not shake them as the kits hold vermiculite (a growing medium) and seeds
7. Ask them to read information on the kit and then slide the band off the kit



8. If desired, they can write their name on the outside of the kit
9. Ask them to place the kit onto desk and slowly and carefully open the lid and read the insert inside
10. Note: the grow media used in the kits is vermiculite which is a natural mineral that is heated and then pops like popcorn and becomes lightweight. It is used in nurseries and is often added to potting soil to hold minerals and water better.
11. Allow them to ask questions and see if they understand next steps. If needed, students can pinch a little of the vermiculite and squeeze between their fingers - it will be gold and lightweight
12. Ask them to slowly add 1 1/4 cup of tap water to each one of their kits
13. Ask them to carefully place the clear lid on top of each kit - do not press down - loose on top
14. Kits can be placed on desktop or in a dedicated area with indirect sun
15. The next step is for each student to write in their Plant Journal Day 1 entry. Date, time, and type of microgreen they are growing, amount of water added, etc.

Note: some seeds such as radish and arugula will germinate faster than others such as brocolli and mustard (3 vs 5 days) Also, the grow media used in the kits is vermiculite which is a natural mineral that is heated and then pops like popcorn and becomes lightweight. It is used in nurseries and is often added to potting soil to hold minerals and water better.

Day 2 (5-10 minutes)

1. Ask students to retrieve their plant journals and document their observations

Note: some observations will be no change, moisture on lid but no growth seen, etc. Students can remove the lid and then place back on top after observation.

Day 3 (5-10 minutes)

1. Ask students to retrieve their plant journals and document their observations

Note: some observations will be no change, some germination seen, etc. Students can remove the lid and then place back on top after observation.

Day 4 (5-10 minutes)

1. Ask students to retrieve their plant journals and document their observations

Note: some observations will be no change, some germination seen, etc. Students can remove the lid and then place back on top after observation.

Day 5 (5-10 minutes)

1. Ask students to retrieve their plant journals and document their observations

Note: some observations will be no change, some germination seen, 1/4 inch of growth seen, etc. Students can remove the lid and then place back on top after observation.

Day 6 (5-10 minutes)

1. Ask students to retrieve their plant journals and document their observations

Note: some observations will be no change, some germination seen, 1/4 to 1/2 inch of growth seen, color, etc. Students can remove the lid and then place back on top after observation. If microgreens begin to lift the lid, then the lid can be removed completely to allow the microgreens to grow fully. Lid can be dried and placed under kit if needed. Do not place wet lid beneath grow kit.

Day 7 (5-10 minutes)

1. Ask students to retrieve their plant journals and document their observations

Note: some observations will be no change, some germination seen, 1/4 to 1/2 inch of growth seen, color, etc. Students can remove the lid and then place back on top after observation. If microgreens begin to lift the lid, then the lid can be removed completely to allow the microgreens to grow fully. Lid can be dried and placed under kit if needed. Do not place wet lid beneath grow kit.

Day 8 (5-10 minutes)

1. Ask students to retrieve their plant journals and document their observations

Note: some observations will be no change, some germination seen, 1/2 to 1 inch of growth seen, color, etc. Students can remove the lid and then place back on top after observation. By now, each grow kit should be completely uncovered to allow microgreens to grow fully.

Day 9 (5-10 minutes)

1. Ask students to retrieve their plant journals and document their observations

Note: some observations will be no change, some germination seen, 1 to 1.5 inches of growth seen, color, etc. Students can remove the lid and then place back on top after observation. By now, each grow kit should be completely uncovered to allow microgreens to grow fully.

Day 10 (15-30 minutes)

1. Ask students to retrieve their plant journals and document their observations
2. Ask students to cut or pull some of the microgreens and examine them.
3. Ask students to taste their microgreen and note what the taste is like. Arugula will be spicy and arugula like. Radish will be spicy and zesty. Mustard will be a little spicy hot. Broccoli will have a mild flavor.
4. Students can share flavors if needed.
5. Students can continue to grow plants in kits as needed.
6. Students can add 1/2 cup of water to each kit if plants begin to wilt.
7. Revisit the initial question - do plants need soil to grow? The answer is no. Soil is not needed for plant growth.

8. Ask students why plants not needing soil would be beneficial for people?
9. Revisit the Introduction to Hydroponics and see if students have questions
10. If needed, you can open the links to the references suggested in the Introduction to Hydroponics

Note: some observations will be no change, some germination seen, 1 to 1.5 inches of growth seen, color, etc. Students can remove the lid and then place back on top after observation. By now, each grow kit should be completely uncovered to allow microgreens to grow fully.

Additional Suggestions

- Students can continue to grow their plants and add 1/2 cup of water as needed if wilting occurs. They will notice that watering need will increase.
- Students can take a small plug from their kit and add to a small pot with potting soil and continue to grow plant until it gets much taller - more light will be needed
- Students can pursue some of the reference links included in Introduction to Hydroponics and can report back to class or perhaps write an essay on those topics

References:

<https://www.agritecture.com/blog/2022/5/18/growing-microgreens-in-space-how-nasa-is-feeding-astronauts-using-vegbed-grow-mats>

<https://ntrs.nasa.gov/api/citations/20190033178/downloads/20190033178.pdf>

<https://evanfolds.medium.com/the-history-of-hydroponics-99eb6628d205>

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