



My nature connection

ABLOOM WITH AQUAPONICS

GRADE: 1+
TIME: 45-60 MIN.

HOW CAN WE EAT FOOD GROWN WITH THE HELP OF A GOLDFISH?

INTRODUCTION

Aquaponics is a method of growing vegetables and fish through an aquatic farming system. Plants and fish form a **symbiotic** relationship when the fish rely on the plants for survival, and the plants rely on the fish. Both organisms benefit from each other, making it mutualistic.

Can you think of any relationships between humans and another species that are mutualistic?

THREE-PART CYCLE

Aquaponics is a three-part cycle. First, the **FISH** are fed. The fish then produce waste (poop) that they release into the water. That water is carried from a fish tank through tubes. The solid waste gets trapped in a filter, while the water is led to the plants to provide nutrients.

This process is fertilization. Fertilizer is a substance (either chemically or naturally made) that is added to soil, land, or water, to increase the growth of plants. Animal waste is also a natural fertilizer!



WHAT YOU'LL NEED

Art materials: paper, pencils, markers, scissors, glue, optional popsicle sticks and magazines for collage

Optional: Build your own aquaponics supplies in Activity 2

STUDENTS WILL:

Learn about symbiosis and ways that different species rely on each other for survival, especially through the workings of an aquaponics system.

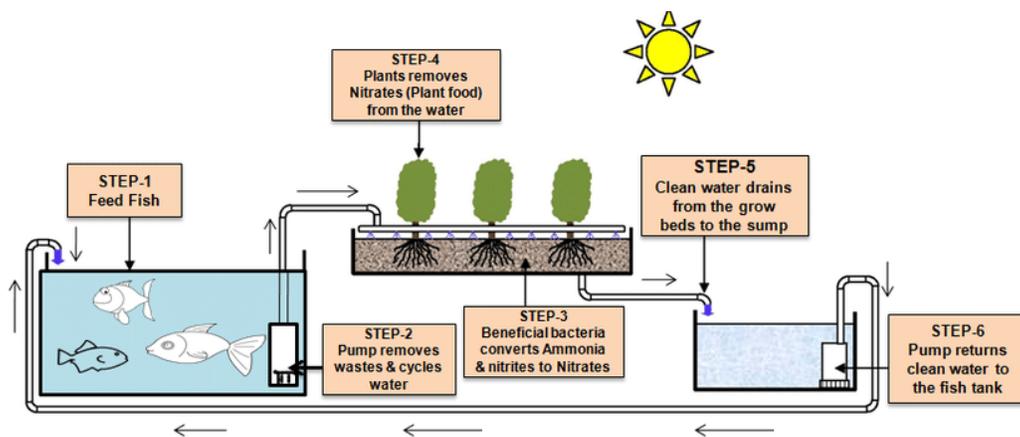
SETTING

Anywhere that you enjoy crafting.

CYCLE CONTINUED...

Next, **BACTERIA** transforms the waste in the water into nutrition for plants. Animal waste is filled with tons of nutrients that are great for plant growth, but also some things that aren't so great. Fish waste is filled with ammonia, which plants cannot absorb. But Bacteria transforms it into nitrates, which plants love!

Finally, **PLANTS** filter and clean up the water before it is released back into the fish tank. You can think of plants as similar to the filter that keeps faucet water clean. The plant roots take in the nutrients, bacteria, oils, and chemicals that might be floating in water. Carbon dioxide also lives in water and when plants take that in, they turn it into oxygen for us to breathe. Through this process, both can live harmoniously together while relying on each other for a balanced and healthy ecosystem.



WHY AQUAPONICS?

What are some reasons that you think someone might choose to have an aquaponics system rather than a soil garden? Aquaponics gardens...

1. Use less soil, and less water.
2. Eliminate weeds and the time for pulling them.
3. Can double as a fish farm on a large-scale when using fish breeds that can be consumed as food.

MORE SYMBIOTIC RELATIONSHIPS IN NATURE

Clownfish and sea anemone: Sea anemone sting most fish, but not clownfish. The clownfish use the anemone for habitat and protection from predators. Clownfish benefit sea anemone by eating algae and bacteria that build up around it.

Seeds and wildlife: Many animals eat the fruits that grow on plants. When they do so, they consume the plant's seeds. Seeds are then spread to other areas once the animal disperses seeds in their waste, helping to grow new plants.

Humans breathe in oxygen and produce carbon dioxide that is released into the air. Carbon dioxide is then taken in by plants which release oxygen for humans to breathe.

ACTIVITIES

ACTIVITY 1: MAKING A MOVING COLLAGE (30 MIN.)

Create a moving collage that has all of the parts of an aquaponics system at work. In the example below, as the fish eats food and releases bacteria, the plant converts it to fertilizer and grows bigger.

1. Start by drawing a fish tank or a large container on a piece of paper. Cut it out with scissors.
2. Next, draw a fish and some plants on different colored pieces of paper. Personalize your aquaponics system with your favorite fish and plants. The example shows a goldfish helping a basil plant grow.
3. Cut the plants and fish out and glue long strips of paper or popsicle sticks to the back of each.
4. Make a small cut towards the top of the container for the plants to fit through, and one towards the bottom for the fish. Do so by pushing a scissors through the middle of the paper and making a small cut. The black lines in the image below show this. If uncomfortable working with a scissors or unsure about this step, ask an adult for some help.
5. Draw plant roots growing below the top cut.
6. Insert the collage parts into their spots. Consider drawing fish food to help complete the cycle. Then tell a story about growth as you move the pieces up and down.
7. Consider taking a video and sharing your story with us online by using the hashtag #MyNatureConnection.

MAKING CUTS IN STEP 4



GOLDFISH & BASIL



ACTIVITY 2: BUILDING YOUR OWN AQUAPONICS (60 MIN.)

What you'll need:

- Containers: This can be a **simple jar or small fish tank**. Additionally, you'll also need a container that holds the plant in the water called a net pot.
- Fish: You can work with many different types of fish, but a **goldfish** is a great start. These are found at local pet stores. Choose the species that best fits your available space, and do not overcrowd your tank. Happy fish need enough space.
- Plant: When choosing a plant, **grow something that you enjoy!** Many types of herbs, fruits, and flowers grow well in aquaponics systems. Lettuce, strawberries, and basil are some great options. Rather than planting a seed, you'll need to use a plant "starter," which is a seed that has already grown into a small plant. You can buy these at many local plant stores or start a seed in soil and transfer it to the aquaponics system when the roots grow large.
- Grow medium: This is a substance to help support and give nutrients to the plant roots in the net pot. This is one of the most important parts of the system. **Clay pebbles** called "Lightweight Expanded Clay Aggregate" (LECA) work well and can be found online and in some pet stores.
- Bacteria: This is produced by the fish when you feed them. You'll need to purchase **fish food** and feed your fish daily.



There are many different species of goldfish that vary in size, color and life span.



SETTING UP THE SYSTEM

1. If you plan to have decorative elements in the container, add these first.
2. Fill the jar with water so there is about an inch of space at the top of the jar for the roots and fish to take in oxygen.
3. Add the fish to the water. Wait a couple of days for the fish to introduce bacteria to the water before adding the plant.
4. Once the water is ready, place the net pot and plant in the water and scatter the grow medium around the plant roots.. Make sure that the roots are submerged in the water.

5. If using a jar with a ring, screw this on over the net pot.
6. Place your aquaponics in an area that is exposed to a lot of sunlight.
7. Maintenance: If the jar starts to develop algae, give it a good clean and replace the water. Remember to feed your fish regularly and watch it grow!

AQUAPONICS AT CAMP FIRE

Camp Fire has a large aquaponics system in the lower level of our Community & Dining Center, as well as nature programming centered around the aquaponics garden. Look to our website for more information!

GRAPHIC RESOURCES

Illustrations and graphics in this lesson were originally found in the following sources:



Watch this video to learn about a group of students who built their own aquaponics.

<https://www.youtube.com/watch?v=u1v3K3m1ivA>

EDUCATION STANDARDS

Grade Level

Science Education Standard

Grade K

0.4.2.1.1 Observe a natural system or its model, and identify living and nonliving components in that system.

Grade 1

1.4.2.1.2 Describe ways in which an animal's habitat provides for its basic needs.

Grade 2

2.4.2.1.1 Recognize that plants need space, water, nutrients and air, and that they fulfill these needs in different ways.

Grade 3

3.4.1.1.2 Identify common groups of plants and animals using observable physical characteristics, structures and behaviors.

Grade 4

4.1.3.3.1 Describe a situation in which one invention led to other inventions.

Grade 5

5.4.1.1.1 Describe how plant and animal structures and their functions provide an advantage for survival in a given natural system.

Grade 6

6.1.3.1.1 Describe a system in terms of its subsystems and parts, as well as its inputs, processes and outputs.

Grade 7

7.4.2.1.2 Compare and contrast the roles of organisms within the following relationships: predator/prey, parasite/host, and producer/consumer/decomposer.

Grade 8

8.1.3.3.3 Provide examples of how advances in technology have impacted how people live, work and interact.

Grades 9-12

9.1.3.1.1 Describe a system, including specifications of boundaries and subsystems, relationships to other systems, and identification of inputs and expected outputs.