



Superior Fresh Aquaponics/Hydroponics **INSTRUCTOR GUIDE**

Elementary School – Middle School – High School

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BACKGROUND

Wisconsin Farm Technology Days 2021–Eau Claire was hosted on Huntsinger Farms July 20 - 22, 2021. Innovation Square and the Farm Tours featured six innovative farms that are producing food for Wisconsin, the Nation and beyond using the latest farming practices and technology to position their farms for the future with sustainability, yield, quality, and taste in mind.

Our continuing mission is to educate the general public about the changing face of agriculture and **to inspire and educate youth** about the many different exciting careers associated with agriculture. The all-volunteer Executive Committee commissioned a new online resource to bring the farms from Innovation Square and the Farm Tours to the people of Wisconsin who could not attend the show.

These farms are: Chippewa Valley Bean/Doane Farm, the largest processor of red kidney beans in the world; Ferguson's Orchards, the largest producer of apples between the Rocky Mountains and Lake Michigan, Huntsinger Farms/Silver Spring Foods, the largest grower and processor of horseradish in the world, Marieke Gouda/Pentermann Farm, the award-winning farmstead Gouda cheese company, Nellie's Holsteins, a recently expanded and modernized 5th-generation dairy, and Superior Fresh, the largest aquaponic – hydroponic farm in the world.

The website is <https://chippewavalleyfarming.com>.

In addition, agriculture educators at Chippewa Valley Technical School and Holmen High School developed a full suite of educational materials for Elementary, Middle School and High School youth to be used alongside the videos and background featured on the website free of charge to all educators.

All the instructor guides and student work sheets are available as downloadable Word documents on the website (<https://chippewavalleyfarming.com/education/>) so that teachers can edit them to fit their curricula. We hope your students of all ages will enjoy learning about farming different crops, herds and fish in the Chippewa Valley and be inspired to learn more about agriculture as a hobby or career.



Aquaponics/Hydroponics **INSTRUCTOR GUIDE**

Elementary School – Middle School – High School

Professional Video, Background, Overview and Activities at
<https://chippewavalleyfarming.com/superior-fresh/>

ELEMENTARY SCHOOL LEVEL

Objectives

I will be able to distinguish between aquaculture and hydroponics.

I will be able to explain how we can farm raise fish.

I will be able to explain how an aquaponics facility works.

Interest Approach

1. If you have a live fish available- place it at the front of the room. Ask students if that fish is considered a farmed animal?
2. Guide discussion asking follow up questions regarding fish life.
3. Then place 4 photos on the board. Fish in a tank at someone's house, fish caught in a watershed near your school, fish raised in the ocean, and fish raised at Superior Fresh. Talk about the differences in purposes and living conditions. Like how the fish in a tank at someone's house is for viewing pleasure while the fish at Superior Fresh purpose is to be consumed.

Pre- Video Activity

1. Have all the students stand in the middle of the classroom.



2. Verbally communicate the following directions. “I will be asking a series of questions. Go to the side of the room which best fits you and your experiences.”



3. Ask the following questions while pointing to opposite sides of the room to signify their various experiences.
 - a. Go to the “door side” of the room, if you have ever caught a fish yourself and go to the “sink side” of the room if you have never caught a fish.
 - b. Go to the “door side” if you have ever eaten fish while out to eat and go to the sink side of the room if you have never eaten fish out at a restaurant.
 - c. Go to the “door side” if you have ever grown lettuce or another green veggie at home and go to the “sink side” if you have never grown lettuce or another green at home.
 - d. Go to the “door side” if you believe that all of the fish we consume is caught by fisherman and go to the “sink side” if you think we farm raise fish in controlled environments.
4. Inform the students that we do in fact farm raise fish in controlled environments like the company Superior Fresh does that we are about to learn about through the video.

Video

1. Before playing the video, define the following words on the board.
 - a. Aquaculture: the raising of aquatic animals or plants
 - b. Hydroponics: the process of growing plants in a media or substance other than soil, typically water and nutrients
 - c. Aquaponics: the process of growing plants using a soilless media while using water full of nutrients from the fish waste
2. Pass out the video guide sheet.
3. Read through the questions on the sheet out loud.
4. Play video and pause once they pull the romaine lettuce out of the water to allow students time to draw the plant on their video sheet.
5. Once the video is complete, walk through the video while going over the video sheet, and answer any other questions or discuss other thoughts that arise.



Middle School Level Activity

Purpose

Become familiar with external Anatomy of the Atlantic Salmon

Objectives

I will be able to converse with a partner to complete a task.

I will be able to identify 11 external parts of the Atlantic Salmon.

I will be able to identify an Atlantic Salmon by sight.

Directions

Use the following from The Atlantic Salmon Trust- https://atlanticsalmontrust.org/wp-content/uploads/2016/12/atlantic_salmon_anatomy.pdf

1. Place the following external anatomy parts on the board
 - a. Caudal Fin
 - b. Adipose Fin
 - c. Lateral Line
 - d. Dorsal Fin
 - e. Operculum
 - f. Eyes
 - g. Mouth
 - h. Pectoral Fin
 - i. Pelvic Fin
 - j. Vent
 - k. Anal Fin
2. Draw out a large atlantic salmon on the board including all the parts from #1 but do not label.
3. Have students create a 2D or 3D Atlantic salmon, the bigger it is, the easier to complete the next part of the activity.



4. Using a pencil, allow students to converse with a partner regarding their placement of their anatomical parts. Have them label what they believe to be correct.
5. After most students have completed their drawing, go through the parts of the fish and label them correctly on your board. Allow students to write with a more permanent tool the correct parts.

Optional

- a. If time allows, allow students to color in their fish by using <https://www.superiorfresh.com> to reference the color and design of an atlantic salmon.
- b. If time allows, discuss the functions of the different parts using the same resources.
- c. If allowed, use fishing wire and a hole punch to hang the fish from the ceiling to show off students work to other classes.

NOTE:

You may want to use students who fish often as assistants during this activity or call upon them if other students are hesitant to share verbally.



High School Level Activity

Purpose

Build a bucket Hydroponic system

Objectives

I will be able to build a simple bucket hydroponic system.

I will be able to use a power drill.

I will be able to determine which seed I would like to grow.

Background Information

This is a very simple hydroponic system that your classroom can create for a reasonable price (~\$40). This is not a standard set up but will mimic a hydroponic system. Even if your class is familiar or even has a larger set up of a hydroponic system, this setup is very tangible for an at home living space or a non- greenhouse growing space. It is not going to be as ideal as a commercial growing system but will mimic the concept and has the potential to be effective. Do note that in this system the water is not being moved in any way so the effectiveness will not be the same as a standard Float or Nutrient Film Technique Hydroponic system.

Directions

1. Obtain the following materials to make a bucket hydroponic system
 - a. 5-gallon bucket
 - b. Air pump (many come with two holes so you could create two systems if you just purchase another container.)
 - c. Air stone(s)
 - d. Net pots (size and number depending on what you want to grow)
 - e. Paddle bit (that is the size of your net pot)
 - f. Rock wool (same size as your net pot)
 - g. Project Panel Foam
 - h. Sharpie
 - i. Exacto Knife
 - j. Power Drill
 - k. Scissors
 - l. Liquid nutrients
 - m. Optional: Total Dissolved Solids (TDS) Reader



2. Use the sharpie to trace the bottom of the bucket on the project panel foam.
3. Use the exacto knife to cut the traced foam. If done properly, the foam should fall almost to the bottom of the bucket which allows for water to evaporate and the plant to continually receive water.
4. Decide how many net pots you want in your bucket. This will depend on what you want to grow. For ease of this example, we are going to have 3 net cups we are going to use. (You sub our number 3 for whatever number of plants you desire to grow at once.)
5. Using your power drill and your paddle bit, drill 3 holes distributed throughout the cut-out project panel foam, like a triangle shape.
6. Place the net pots in the holes and ensure they fit so that the top of the pot sits on top of the foam.
7. Drill another hole for the air stone to go into the water. Cut the tubing for the air stone that sits on the bottom of the bucket and easily reaches the air pump.
8. Fill the bucket with water almost all the way to the top. If you have access to reverse osmosis (RO) water, use that otherwise tap is fine. (Using RO water allows you to have a lower amount of solid parts in the water which will make your nutrients more accurate when you use your Total Dissolved Solids reader.
9. Add nutrients to the bucket following the label of whichever product you purchased.
10. Using the growing media of rockwool, submerge the rockwool in regular tap water or if you have reverse osmosis water- use that.
11. Place the rockwool in the net pot pushing it down so the bottom of the rockwool is touching the bottom of the net pot.



12. Place one seed of whichever plant you are growing into the notched opening of the rockwool. Make sure the seed has contained the rockwool so it will get moisture from the now partially submerged rockwool.
13. Lastly plug in your air stone pump and ensure it is working. You can tell it is functioning as air bubbles will be produced.
14. Repeat in another container if applicable.

NOTE:

- a. Algae will grow when the water is exposed to light. Make the air stone hole as small as possible and do not allow sunlight into the water for long periods of time.
- b. You can use a dark colored tote with a lid as well rather than a bucket.
- c. Change out your water, monthly or sooner depending on the amount of nutrients/ and sunlight your water is receiving.
- d. You can start the seeds in a shallow container a week before your bucket is available to get the process going sooner, or once you get the system functioning, about a week prior to a harvest, start your seed so it is already germinated.
- e. Healthy roots are white!
- f. Clean and sanitize your net pots between harvest and planting (bleach water works).
- g. This is just one of the several at home methods of hydroponics- once you get more familiar you could try making an aquaponics (fish) set up.



Conclusion and or Extensions

1. Bring in a caught or farm raised fish and prepare it. Work with your family and consumer science or agriculture teachers.
2. Do a career exploration on the types of jobs that a place like Superior Fresh employs. Use [UW- Stevens Point website](#) to learn more about education options in this field of study. Assign or let students determine a career they would enjoy related to Aquatics, Horticulture, or Engineering, ect.
3. Contact your local [US Fish and Wildlife](#) workers as a virtual or in person guest speaker.
4. Have students create their own 2D or 3D fish using craft and recycled supplies. Here is a listing of [WI Fish Species](#) from the WI DNR.
5. Determine [where](#) people in your community could purchase Atlantic salmon and fresh greens from Superior Fresh.



SUPERIOR FRESH VIDEO WORKSHEET

Follow along with this video as we learn about Superior Fresh and aquaponics.

1. What type of fish does Superior Fresh grow?

Atlantic Salmon

2. Besides fish, what else do they grow?

Leafy greens and herbs

3. True or false. Superior Fresh is a family business.

True

4. How many acres is the native restoration project that Superior Fresh is housed on?

800

5. How often does Superior Fresh get eggs which they then hatch on site?

Every two months

6. What country does the fish feed come from?

Canada

7. Draw a lettuce plant growing in the aquaponics container. Include all the parts.

Students drawings should include the roots, the growing media and the green

8. How long does it take for the greens to get to your local store?

As quickly as just over a day.



Name: _____

WORKSHEET

Follow along with this video as we learn about Superior Fresh and aquaponics and hydroponics.

1. What type of fish does Superior Fresh grow?

2. Besides fish, what else do they grow?

3. True or false. Superior Fresh is a family business.

4. How many acres is the native restoration project that Superior Fresh is housed on?

5. How often does Superior Fresh get eggs which they then hatch on site?

6. What country does the fish feed come from?

7. How long does it take for the greens to get to your local store?



8. Draw a lettuce plant growing in the hydroponics container. Include all the parts.