



3rd Grade Fall

LIFE SCIENCE LESSON

Note: feel free to eat tomatoes from the garden, so the kids have a chance to harvest produce.

Center 1: Radish Life Cycle Investigation and Planting

Location: Garden

1. Once in the garden, take a few minutes for students to acquaint themselves with what is currently happening in the garden. This is a good time to share about what they ***notice or wonder***.
2. Ask students to help you locate the radish plants, and to watch as you harvest one radish plant.
3. Bring the students back to a learning area with their notebooks and pencils.
4. Begin by asking students if they can describe a life cycle. Ask a student to describe the life cycle of a familiar animal, like a frog or a butterfly. Ask the class if they knew that plants have life cycles too! Set the goal for this lesson with the first guiding question: **What is the life cycle of a radish plant?**
5. Show the students a radish seed and the full grown radish plant. Students can observe the seeds and plant up close as you walk around the group.
6. Using this experience, ask students to create a model of the life cycle of a radish plant. Pass out the six [images](#) (laminated sheets) of the radish life cycle to volunteers. Ask them to come up to the front of the group and hold their image high and still, so everyone else can see. It is the job of the rest of the class to suggest how they should be arranged in order of the life cycle. After they succeed (remember the seed pod comes after the flower), challenge them by moving the seed to the end of the line, encouraging understanding that life cycles are in fact cyclical. Collect the images and ask the students to return to their spots.
7. Explain that people have used agriculture to grow food for more than 10,000 years. Modern radishes came to exist through **selective breeding**, which is what we will be doing today. Don't define selective breeding yet, tell them they will be discovering what that means.

8. **Brainstorm with the students what traits a garden plant might have that make farmers happy.** (possible answers include drought tolerance, pest resistance, high yield, ideal flavor, color, heat or cold tolerance, etc.)
9. Look at the current radishes that have gone to seed. Select a trait of a particular plant that might make it distinguishable (tall plant, lots of leaves, large radish root, leaves not eaten by insects, purple or white flower, etc.) Ask students to harvest the seeds from that particular plant, leaving some for the next class. **Tip: the brown crunchy seed pods will have the most mature seeds, so seek those out).** These are the seeds that they will then plant directly into the soil. **Explain that what they have just done is called selective breeding!** Check to make sure students understand that traits may be (not always) inherited from generation to generation.
10. **Plant the radish seeds where you find space. Planting tips: Radishes like to be half an inch deep and three inches apart.** Gardening doesn't always have to be precise. Today, we will press a small hole into the soil, one knuckle deep is great and drop one seed in each hole. Students then cover the seed. Explain that the garden is automatically watered.
11. Gather all the students and celebrate them for planting seeds! Invite students to wonder what the next generation of radish plants will look like? Students share their predictions, based on the traits they selected for.
12. While you're waiting for Center 2 to wrap up, feel free to ask the kids to draw the radish life cycle in chalk in the outdoor classroom.

Center 2: Water Conservation and Garden Irrigation Activity

Location: Outdoor Classroom

Usable Water Demonstration (coordinators: [watch video in advance](#))

1. Ask students to gather around a bin of water and the white board or chart paper. Brainstorm with the students all the different ways humans use water, both indoors and outdoors. These should be times that we have to turn on a faucet or activate a source of water. For example, humans need water to bathe, wash dishes, brush teeth, clean cars, fill swimming pools, water plants, grow food, flush toilets, etc. Write down their list on chart paper or a whiteboard. Avoid recreational water usage, like boating, rafting, or fishing, for example (these activities don't "consume" water or require it to be treated. They are more along the lines of humans enjoying water, not using water).
2. Model how much of the water on earth is usable for human needs to help answer the guiding question **"Why do we need to conserve water?"** You can watch a video (once made we'll send it out) to better understand how to run this model.
 - Ask students if they know about how much of the earth is covered in water. You can ask them to think about a globe or a world map to help estimate. Make a big deal out of the fact that 70% of the earth is water... "There must be so much that we never need to worry about wasting water, right?"
 - Inform students that you have filled the bin (large bin - pre-fill the bin) with five gallons of water. Ask the students to imagine that this water represents all of the water on earth.
 - Using the measuring cup, remove 2 cups (this can be approximate) from the bucket. What is left in the bucket represents salt water (97% of water on the Earth) and the 2 cups of water represents freshwater (3% of the water on Earth). You can use the "saltwater" and "freshwater" laminated labels and tape to label the different vessels of water now. **Ask students if they can use salt water for most of the water needs brainstormed earlier.**
 - Pour out 1 ½ cups from the 2 cups into the plastic cup that says "frozen water" (to the indicated line). That 1 ½ cups represents the amount of water stored in polar ice caps and glaciers. **Ask students if they can use frozen water for most of the water needs.**
 - From the remaining ½ cup, pour ¼ cup into the plastic cup labeled "water in soil and air" (to the marked line). That ¼ cup represents the water in the air (including clouds) or soil. **Ask students if they can use water tied up in the clouds and soil for most of the water needs brainstormed earlier.**

- The remaining $\frac{1}{4}$ cup represents all the groundwater and fresh surface water (rivers, lakes, streams). **Ask the students if all of this fresh water is easy to access and use?**
- Using the pipette, place 5 drops of water from the $\frac{1}{4}$ cup of fresh water into the third cup labeled “available water for human use”. Those 5 drops represent the amount of fresh water available to people that is accessible to humans. Compare the amount of water on earth (the huge bin of 5 gallons of water), to the amount that is actually accessible for humans to use. Remind them that this tiny bit of water needs to do many things (refer back to the brainstormed list of water needs).
- Define the word **Conservation**. To conserve means to carefully protect and not waste. **Discuss the five drops and the importance of conserving and caring for our water supply.**

Irrigation Activity

3. Explain that growing plants for food requires a lot of fresh water. The method of getting water to plants is called **irrigation**. Ask students to share ways that they think gardens or farms are irrigated. Answers will vary from rain, watering cans, hoses, sprinklers, to complex irrigation systems. You can show them some [pictures of irrigation systems](#) (folder). Help the students to understand that each method has pros and cons. For example, watering cans are great for conserving water, but might be a lot of work to water such a big garden. Waiting for the rain is free, but unpredictable. A high tech irrigation sprinkler system would be reliable, but very expensive.
4. Divide the group into three, and explain that each group will be given a set of plants that need to be watered. We want to investigate which method might be the most effective and least wasteful to answer the guiding question “**How can water be conserved in a garden?**” Remind them that we want to avoid wasting water. Not only does it cost the school money to get water from the spigot (this might be new information for students, so take a moment to explain that getting water from a faucet has a cost), but we now know how little usable freshwater there is on earth.
5. Each group will receive an [Irrigation Test Paper \(picture of plants and carrots with roots\)](#), an equal amount (approximate) of water in a cup (you can use the cups from the demonstration and fill from the 5 gallon bin of water), and an irrigation method picture and device (spray bottle for 2 groups, pipette for the third). Explain that they will need to water their plants’ roots, and when done, we can evaluate which method was the most effective and least wasteful. Before beginning, set the following expectations.
 - Take turns watering the plants.
 - The papers will get wet, and that is okay.
 - They might get a little wet, and that is also okay.
 - Keep going until all of your plant’s roots are wet.

Group 1 - Sprinkler irrigation	Group 2 - Drip irrigation	Group 3 - Mist irrigation
		
Spray bottle set to spray	Pipette	Spray bottle set to mist
They must act like a sprinkler and spray from the level of the ground, not from up above.	They must act like a drip, and bring water from the beaker to the plants with the pipette	They must act like a mister and spray from above

- Discuss the results, which certainly will vary based on each groups' interpretation of the rules and enthusiasm for a water fight. Hopefully it will be obvious that the drip irrigation group had the most targeted water soaking into the roots of the plants, with the least amount of waste. Have the students share what challenges arose from their type of irrigation, for example, misting lost water to the breeze and sprinklers were not very targeted towards the individual root systems.
- Focus the students' attention on the garden beds. Looking at a garden bed, see if students can predict how these garden beds get watered. See if they can determine which type of irrigation system is used. Help them to follow the journey of the water from the water line coming out of the ground, through the big black hoses. See if they notice the holes in the hoses. Explain that these hoses are a part of a drip system that allows water to slowly drip out of the hoses and water the garden plants right at the root system, which is the part of the plant that absorbs the water.
- Ask students if they have ever seen the drip irrigation system in this garden in action. Explain that the irrigation system is set to run around sunrise and sunset to avoid the heat of the day. See if any students can explain why we might do that, and direct students to understand that the heat of the day creates more evaporation and less percolation into the root systems, thereby wasting water. See if they can relate this idea back to when they usually see large scale watering of open grassy areas or neighbors' lawns.
- Inform the students that it is time to clean up, and ask them what should be done with the water from the lesson. Hopefully they will understand the critical need for conserving water and brainstorm ideas of what to do with the bin of water from the conservation demonstration. If you

are the first 3rd grade class to conduct this activity, perhaps you could leave the bin of water for the next class. Or if you are the last class to do so, you can direct them to use various vessels (buckets, sprayers, beakers, measuring cups, etc.) to spread the water around the base of the plants growing in the garden. Note that dumping a large amount of water at one time in the garden will cause soil erosion and expose roots, damaging the plants. Ask students to help clean up and gather all supplies, and return to the classroom for a follow up activity.

Inside the classroom (Time permitting)

10. Back in the classroom, play this [Selective Breeding Video](#), 90 second video that will reinforce the concept learned about in the garden today. Follow it with this [time lapse video](#) of 20 days of radish growth.
11. You can also play this 3 minute [video about water conservation](#), to reinforce the concept learned in the garden today and read the [Water Conservation Suggestion tips \(English\) \(Spanish\)](#).
12. Ask the students to share their work with the class and discuss ways that they plan to save water in their lives.