



The Water Cycle: Exploring Terrariums

Grade Level: K-2

Time: 45 minutes to build terrarium; 45 minutes for observation/inquiry

Objectives: Students will learn about the importance of water for living objects by observing a desktop terrarium.

Materials:

- Clear plastic bottles (large enough to hold at least 1 liter)
- Scissors
- Clear tape
- Soil
- Small plants
- Filtering charcoal (optional)
- *Living or Non-living* worksheet, for every student
- *Choosing Plants for Terrariums*, handout

Student Vocabulary

Terrarium:	miniature garden enclosed in a clear container
Living:	anything that ever has, is, or will be alive (breathes, moves independently, requires food and water, can grow and reproduce)
Non-living:	anything that never has, is, or will be alive

Background:

Plants release water vapor into the air (transpiration) when there is light and heat present. Since the terrarium is an enclosed environment, when the water vapor leaves the plant (evaporation) and comes in contact with the side of the container, it forms droplets of water on the inside of the container (condensation). Once enough water accumulates or the temperature decreases, the condensation will then fall back (precipitation) down the sides of the container into the soil. The water gathers on the ground whether in the soil, a body of water, or elsewhere (collection), until it evaporates and the water cycle continues.

Water is essential for living things. Students often don't consider plants to be living things because the plants don't appear to be moving/breathing/drinking water/etc. Through this terrarium activity, students will both recognize that plants are living things and living things require water.

Laying the Groundwork:

Ask, "How do we know if something is living? How do we know if something is non-living?" Make a list on the board to illustrate the comparison (i.e., living: can move on its own, breathes, can grow, requires energy in the form of food, require water; non-living: can't move on its own, doesn't breathe, doesn't grow, doesn't require food/water) "How are living and



non-living things similar/different? Are all things that move alive? What kinds of non-living things move?" (i.e., water, air, etc.)

Show students two living plants that are the same and two artificial plants that are the same. Allow students to pass them around and look carefully at the two plants. Ask, "Are these plants living or non-living?" (Depending on their responses, phrase the next question to continue the discussion about components of living and non-living things.) "How do you know this plant is living/non-living?" Ask, "What do you think would happen to a living thing if it didn't get what it needed to stay alive?" (It would die.) Explain to the students that they will participate in building a terrarium. Instruct them that a terrarium is a miniature garden, which, when water is added can be closed for a longer period of time because the water will remain in the container and the plant will have what it needs to survive.



Exploration:

1. Cut the bottom off the plastic bottle leaving at least five inches remaining on the bottom portion of the bottle. (Some alternate options for terrarium containers include: glass jars, fish bowls, food containers, etc. Just make sure the container is big enough for you to reach your hand in for planting and maintenance.) If you choose to make one terrarium for the entire class rather than individual/group terrariums, you could use a larger container.
2. Clean the container using soapy water and rinse well. Dry completely.
3. (Optional) You can put some filtering charcoal (not the type used for barbecuing) on the bottom of the container to help control odors. The charcoal is not necessary as long as the terrarium maintains proper moisture levels.
4. Fill the container approximately one-third full with moist potting mix. The amount of soil you put in will depend on the size of the container. (You need to have enough room for plant roots.)

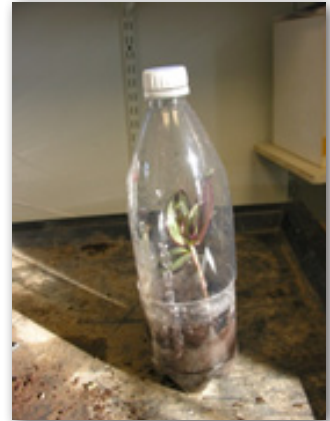
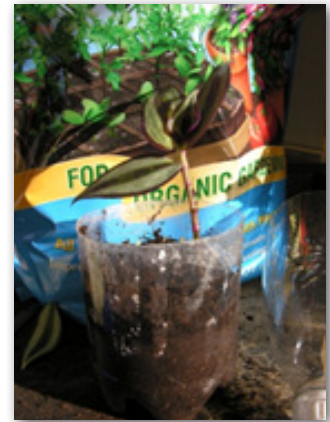


Teacher Tip:

Use a sterilized potting soil mix to avoid problems with mold and fungi. (Small bags of potting soil are available at most garden centers.) The moisture level of the soil put into the terrarium is very important. Pour the soil into a bowl or tub and mix with water until the soil is moist enough to cling together in a ball when pressed into your hand. If water drips from the soil when pressed into a ball, then it is too wet and you should add more dry potting soil to your mixture. Once you find the perfect balance, place the soil in your container. Try to avoid getting soil particles stuck on the sides of the container above the soil level.



5. Add the plants. (See handout “*Choosing Plants for Terrariums*”)
6. After planting, attach the container lid, or cover the opening of the terrarium with plastic. Place the terrarium in a windowsill with indirect lighting or under grow lights. Do not place it in strong direct sunlight or water will evaporate too quickly and the plants may burn.
7. Observe your terrarium closely for the first few days to make sure you have the proper moisture level. The top and sides of the terrarium should get misty with water droplets when in bright light, indicating the proper moisture level. If there is no moisture along the sides, then you need to add more water. If the top and sides remain very wet continuously making it hard to see the plants, remove the cover for a few hours. This will allow the water vapor to escape (evaporate). Once your terrarium has the proper moisture level it should not need frequent attention.
8. Check on your terrarium periodically. Prune or remove plants with excessive growth. Try to keep plant leaves from touching the sides of the container to prevent them from having water constantly on the foliage. Also, monitor the moisture levels since water may evaporate over time.



Digging Deeper

1. Provide the students with the worksheet, “*Living and Non-living*”. Have them circle all of the living things (i.e., trees, animals, grass, flowers). Remind students to ask themselves how they know each thing is living. Refer them to the classification of living versus non-living things. If time allows, students may color the worksheet.
2. Take the students out to the garden and continue to discuss how water affects plants outside. Point out that the garden must be watered by people when there isn’t enough rain. Help them to understand that sometimes people help plants because plants help keep people fed and healthy. Although water is not living, it is essential for all living things to continue to thrive.
3. Create an additional terrarium with a plant in dry soil and do not add water. Allow students to watch as the plant begins to wilt as a result of not having its need for water met.

This lesson plan was developed by Cynthia Domenghini, NGA staff.



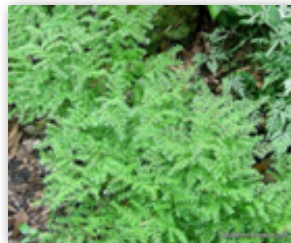
Choosing Plants for Terrariums

Choose plants that are small, slow-growing, and perform well in humid environments. How the plants are arranged will depend on the size and location of the terrarium. If the terrarium will be viewed from only one side, then place the tallest plants in the back and shortest plants in the front. If your terrarium will be viewed from all sides or if you plan to rotate it, plant the tallest plants in the middle and the shorter plants along the outside.

There is a wide range of plants to choose from. Most garden centers have an area reserved for indoor plants and you can usually find a variety of plants in 2-4 inch pots. Another option is to take cuttings/divide plants you already have or start plants from seed. This will allow you to not only save money, but begin your terrarium with small plants. Experiment with different plants. If they appear to grow too vigorously or respond poorly to the humidity, remove them and try something new. With closed-top terrariums, avoid planting cacti or succulents. These plants favor a drier environment as opposed to the humidity in a terrarium. Here are some recommended plants for terrariums:



African violet



Artillery fern



False aralia



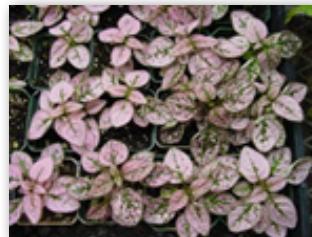
Jade plant



Miniature peperomia



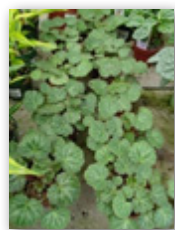
Nerve plant



Pink polka dot plant



Prayer plant



Strawberry begonia



Small philodendrons



Swedish ivy



Spider plant



Small ferns