Biology in a Bottle!

Overview: The basic components of the Bottle Biology Column are soil, water and plants. Plants growing in the upper part of the Bottle take nutrients from the surrounding soil and, with the aid of the wick, take water and other substances from the aquatic portion below. Substances you add to the terrestrial section will move down, or percolate, through the soil and drain into the aquatic section.

Episode Connection: Food Chains, Habitats

Time Required: 50 minutes, plus observation time over the next few weeks

Materials:

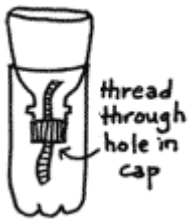
- One 2-liter soda bottle per student
- One bottle cap per student
- Scissors
- Clear, heavy duty tape (i.e. packing tape) or silicone sealant
- Wicking material-fabric interfacing or cotton string
- Daring needle or safety pin (to poke small air holes in bottle)
- Awl or drill (to make holes in bottle caps)
- Marking pen (to label each student's bottles)
- Water (tap or collected, see Step 4)
- Soil (potting or collected, see Step 6)
- Seeds or plants (See Step 7)

Instructions:

1. Remove the label from the 2-liter bottle. Cut the bottle ~1cm below the top shoulder.

2. Poke or drill a 1 cm hole in the bottle cap.

3. Screw cap on bottle and thread a thoroughly soaked wick through the bottle top. The wick should be long enough to reach the water reservoir and thread loosely through the cap when completing Step 5.
4. Fill the base of the bottle with water. Water can be from tap or from a pond, lake, puddle or fish tank.
    a. Water from natural reservoirs will possibly contain algae, phytoplankton, plant seeds and insect larvae. Store-bought or tap water will include far fewer organisms.
5. Insert the bottle top upside-down into the base of the bottle. Secure with tape or sealant.



6. Add soil you collect or potting soil to the top section. To be effective, the wick should run up into soil, not be plastered along a side of the bottle. For better drainage, place a layer of gravel, sand or vermiculite in the bottom of the soil unit.
    a. If using collected soil to fill the bottle, it may contain plant seeds or insect larvae. Store bought soil will contain fewer organisms.
7. Place plants in the soil section.
    a. Grasses, particularly lawn seed mixes, work well. Prairie grasses grow more slowly but have deep roots that are interesting to observe. Radishes and beans also work well, though you will need to soak dried beans overnight before planting. Fast Plants (www.fastplants.org) have been developed to complete their life cycle in 35-40 days and are ideal candidates for experimentation.
8. Observe your Bottle over time and see how the components of this system interact.

Tips

- Create 1 Bottle using collected soil and water and create another using store bought soil and water. Compare the differences between the two systems by observing them side-by-side.
- Terrestrial and aquatic plants are excellent indicators of change in your system. Fast-germinating and fast-growing plants will most effectively register change in a short period of time.

Think About This…

How do land and water interact in your area? Does runoff from fertilized lawns or agriculture threaten the quality of your streams or groundwater? Is salt pollution a problem, from either road salt, irrigation, or saltwater intrusion? Are landfills affecting local groundwater?

Links: http://www.bottlebiology.org
Standards Addressed:
National

Sunshine State

- Grade 5
  - SC.5.N.1 (SC.5.N.1.1, SC.5.N.1.2, SC.5.N.1.6)
  - SC.5.P.8 (SC.5.P.8.2, SC.5.P.8.3)
  - SC.5.L.14
  - SC.5.L.15 (SC.5.L.15.1)
  - SC.5.L.17 (SC.5.L.17.1)
- Grade 6
  - SC.6.N.1 (SC.6.N.1.1, SC.6.N.1.4,)
  - SC.6.N.2 (SC.6.N.2.2)
  - SC.6.L.14
  - SC.6.L.15
- Grade 7
  -
- Grade 8