

Bottle Biology

Purpose | Construction | Experimentation | Data | Conclusion

I. PURPOSE

- A. Design an ecosystem that is self contained.
- B. Observe and understand the interaction of biotic and abiotic factors.
- C. Understand nutrient flow cycling and energy flow.

II. POSED QUESTION

Can the ecosystem be self sustained and maintain life of all original organisms within it?

III. HYPOTHESIS

If designed correctly, it will be self sustaining.

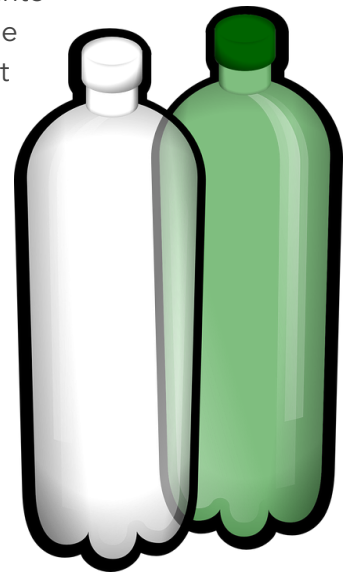
IV. MATERIALS

- ▶ Aquatic animals
- ▶ Terrestrial animals
- ▶ Plants
- ▶ Water
- ▶ Wicking string
- ▶ Clear tape
- ▶ 2 2 liter bottles
- ▶ Box cutter



V. PROCEDURES

1. *Clear, empty, no labels...* make sure your bottle is transparent with nothing inside it. There should be **no labels**.
2. *Cutting the bottle...* with a razor, cut the bottles into two separate parts. For one of the bottles, cut the top portion of the bottle; for the other bottle, cut the bottom portion of the bottle.
3. *Add aquatic material...* in the lower level, add aquatic life and plants. Be sure to include living fish and plants.
4. *Add terrestrial material...* in the upper level you must add terrestrial life and plants. This includes: plants, snails, soil, and detriovites.
5. *Sealing the bottle...* after adding all the necessary material, tape the two bottles together. No removal of anything is permitted.
6. *Completion...* set your bottle near a window so the sun can shine through.



V. PROCEDURES WITH VISUALS



Step 1: Clear, empty, no labels



Step 2: Cutting the bottle



Step 3: Add aquatic material



Step 4: Add terrestrial material









Step 5: Sealing the bottle



Step 6: Completion

VI. DATA

Day Number	Morning	Afternoon
1		
	Condensation has occurred after setting the bottle aside over the weekend.	No dramatic change was made besides an increase in the amount of condensation.
2		
	Sprouts in the terrestrial portion of the bottle became noticeable.	By the afternoon there was less water in the aquatic portion. This shows that the soil was absorbing the water.
3		
	The condensation in the bottle made it hard to see the inside of the bottle.	No drastic change from the morning.

Day Number	Morning	Afternoon
4	 <p>The plants in the terrestrial option began to grow more.</p>	 <p>A little more condensation in the bottle than in the morning.</p>
5	 <p>Growth of the fishes and plants became more noticeable!</p>	 <p>Plants and fishes seemed to be thriving in the environment.</p>

VII. CONCLUSION

A. Purpose...

Designing a self-sustaining ecosystem is not as complicated as it may seem. Since the ecosystem is self-sustaining it does not require much. All of the nutrients needed to make the ecosystem thrive was internal.

Plants growing in the terrestrial section of the bottle intake nutrients from the surrounding soil and, with the aid of the wick, take water and other substances from the aquatic portion below.

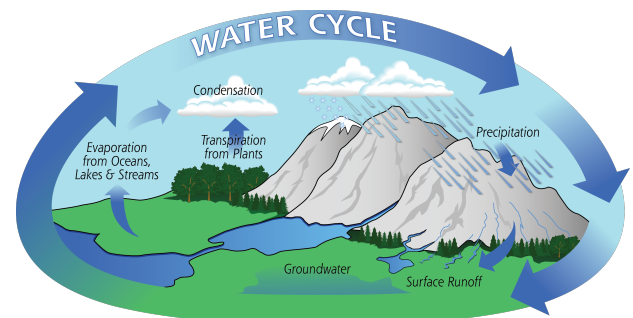
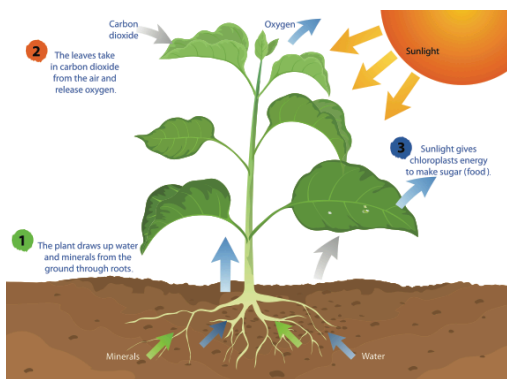
B. Posed Question...

The bottle can be self sustaining because within the bottle two processes aid in the existence of the living material— photosynthesis and the water cycle. Plants take carbon dioxide (CO_2) out of the air by photosynthesis.

Using the energy from the sunlight (that passes through the bottle) it intakes those carbons and strings them together to make glucose, releasing oxygen (O_2) as a waste product. So, the algae in the aquatic environment is both a food and oxygen source.

The water cycle first takes place in the aquatic portion of the bottle. The sunlight heats up the water in the bottle and converts the water into water vapor by the process called evaporation.

The plants in the ecosystem lose their water in the form of water vapor as well and this is known as transpiration. Lastly, as the water vapor rises, it begins to cool down, forming water droplets; this is known as condensation.



C. Hypothesis...

The hypothesis formulated was proven to be true. Building the bottle falsely or correctly can indeed impact the experiment in a positive or negative manner.

D. How does this lab activity apply to the global scale?...

The bottle biology was a small scale ecosystem, with this it was clear to see how abiotic and biotic features correlate on a global scale. Knowing now that photosynthesis and the water cycle are the two processes needed for any ecosystem to live.

References

Mr. Gordon T. Davis and Mrs. Sonia Hernandez