



Science Magic Post-Lab Lesson

Underwater Mystery

Overview

In this lesson, students work in pairs or small groups to predict, observe, and explain what happens when a tissue is submerged in water, yet does not become wet. As was the case in the live e-Lab event, the nature of scientific inquiry is emphasized as students complete a PAW Report (Predict, Actual, Why?) to document their findings.

Materials

Per Class

- Pushpin
- Tape
- Paper towels

Per Group

- 2 clear, 10-ounce, soft plastic cups (the cups with the letters PETE or recycle code 1 on the bottom seem to work best)
- 8 to 10 tissues
- food color
- 1 large mouthed container (ex. Small, plastic aquarium, or plastic bucket, or large beaker)

Getting Ready

- Make one copy of the PAW report worksheet for each student.
- Each group will need one plastic cup **with** a hole and one **without** a hole. To make a hole in the bottom of the cups, insert a pushpin with a twisting motion through the bottom of each cup until the cup is punctured.
- Fill the large mouthed containers 2/3 full of water and add a few drops of food coloring.

Procedure

1. Distribute one cup (with no hole), the container of water, and 4-5 tissues to each group.
2. Introduce the activity by asking students to make observations (not inferences) about the materials they have been given.
3. Have students crumple the tissues and fit them tightly into the bottom of the plastic up so they won't fall out when the cup is turned upside down. Make sure students invert their cups and test their set-up. A small piece of tape may be used to secure the tissues if necessary.
4. Ask students to **predict** what will happen when they invert the cup (with tissues) and submerge it in the container of water. Have students record their predictions on their PAW reports.

5. With the cup upside down, ask students to push the cup down into the container of water until it is completely submerged. **Students must keep the cup straight as they are pushing it into the water.**
6. Keeping the cup straight, have students withdraw the plastic cup from the water.
7. Dry the lip and the outside of the cup with a paper towel and have students remove the tissues from the cup. They should observe that the tissues remained dry.
8. Have students record their observations in the “Actual” section of their PAW report.
9. Distribute a cup with the hole to each group and a few additional tissues if the original ones have gotten wet. Have students repeat steps 3 – 8 with this cup. Make sure when they are fastening their tissues in the bottom on the cup, they do not tape over the hole.
 - Depending upon the size of the hole, students may have to submerge the cup for a little while before something happens.
 - Students should observe small bubbles of air escaping from the hole in the cup while it is under water. When the cup is removed from the water, they should notice that the tissues are wet.
10. Ask students to propose explanations for why the tissues stayed dry with the first cup but not with the second. During the discussion, write key phrases on the board to help students come to the correct scientific explanation for this “magic trick.” Once the students have formed the correct conclusion, have them complete the “Why?” section on their PAW reports.

Explanation

Although we cannot see it, there is air inside the plastic cups. Air, which is a mixture of different gases, is an example of matter and therefore, it takes up space inside the cup. If water is going to enter the cup, the air must have a way out. When the first cup was inverted and submerged in the water, the air in the cup essentially becomes trapped and it forms an invisible “barrier” around the tissues. The air in the cup prevents water from entering and the tissues stay dry.

When the cup with the hole was submerged in the water, the tiny bubbles seen near the hole indicate that the air from the cup is escaping into the water. Pushing the cup underwater also pushes on the air in the cup. The hole provides an “escape route” for the air. As air leaves the cup via the hole, there is now room inside the cup for water to enter. Therefore, the tissues in this cup become wet.