Activities

Student Activities *continued*

4 Place the balloon inside the harbottle and stretch the mouth of the balloon over the bottle opening. Blow into the balloon. When it is fully inflated, put the rubber stopper at the bottom hole of the Harbottle. Release your mouth from the harbottle and the balloon stays inflated! Why? Ask students to work in pairs or groups to discuss why the balloon stays inflated. Give students about 5 minutes to discuss and then discuss the answer with class. When you place the rubber stopper in the harbottle, there is no room for air molecules to move or go anywhere so the air molecules stay inside the balloon and in between the glass and balloon. Take the stopper out of the harbottle and the balloon will deflate.

5 Ask students what they think will happen if you put water in balloon instead of air. Have a student come up to class and put water inside the balloon and insert the rubber stopper. Have towels on hand for when you remove the stopper! :)

TEACHERS GUIDE

GRADE LEVEL 5+

HARBOTTLE

ITEM # 6080-40

MECHANICS - DEMONSTRATION DEVICES

Discover air pressure like never before. With just a balloon and a bottle, it has the “WOW” factor you have been searching for! Simply place the balloon into the opening of the bottle and stretch the mouth of the balloon over the mouth of the bottle. Blow into the balloon and, when it is fully inflated, close the bottom hole of the bottle with a stopper. The normal air pressure from outside allows the balloon to stay inflated! No twisting or tying required. Astonish your students even more with the strength of air pressure by filling the balloon with water before releasing the stopper! Excellent teaching tool for introducing pressure and discussing its applications, such as vacuum cleaners, flight, pumps, weather, and even how we breathe. Includes glass bottle, two balloons, rubber stopper, and Teacher’s Guide with background information and activity suggestions for your students. Measures 5” in diameter. Grades 5 and up.

Materials

- harbottle
- balloon
- rubber stopper
- water
- towels

Optional:

- video of diaphragm and lungs
- shop vac

Goals & Objectives

Students will:

- Student will review the concept of air pressure.
- Student will describe what is happening to the air pressure when the harbottle is demonstrated.

Discussion

Optional Real World Applications/Discussion

1 **Make your Own:**
Create your own experiment using a balloon that uses a "vacuum" to blow up a balloon.

2 **In your Environment:**
Show students a demonstration of lungs and diaphragm breathing. (Google a video.) Have the students take a deep breath and hold. Explain that the same concept used in the harbottle is what is at work when we take a breath. Our diaphragm pulls down on our lungs to expand our lungs and creates a vacuum which causes our lungs to fill with air.

3 **Critical Thinking:**

- What do you think would happen if you put water in between the harbottle and balloon?
- Using what you know about air pressure, predict what would happen with an empty water bottle that was tightly capped as an airplane descended in flight. (Water bottle will collapse a bit.)

4 **More Fun:**
Put the balloon in the harbottle, take out the stopper and have the student use a shop vac to suck the air out of the globe.
(NOTE: TRY THIS FIRST BEFORE DEMONSTRATION WITH STUDENTS.)

Activities

1 Review the definition of air pressure. Air pressure is the weight of the air molecules pressing down on the surface of the earth. Use a demonstration to explain. Even though we cannot see the air particles in the air, they are all around us. And they sometimes are squished close together and sometimes spread far apart depending upon different factors: temperature, humidity, volume of the container, type of gas, etc.

Note
It is always best to DO an experiment ahead of time to be able to best present it to the class.

2 Ask for several volunteers from the class (about five or so students.) Have the students stack their hands on top of each other in a stack in front of the class. Ask students to imagine that this is what air molecules are like on the earth's surface. The air molecules are stacked tightly at the earth's surface because of gravity. The air molecules higher up in the atmosphere are not as "tightly" compressed or stacked. Ask the person whose hands are on the bottom to try and lift their hands up. It is very hard because of the weight of all the other hands. Ask the person whose hands are on the top of the stack to do the same. They can easily lift their hands because there's not much weight.

3 Ask students to raise their hand if they have been in an airplane. Ask them to describe what happens to their ears when they go up and down in an airplane. Based on the hands demonstration, ask the class if they can predict why their ears are "popping." Allow students to discuss possibilities in pairs or in groups. Then discuss as a whole class. When you are on the ground in an airplane, the air molecules inside your head and outside your head are the same density. (They are tightly packed on the inside and outside.) When you go up into the air in an airplane, the air molecules inside your head are starting to move around and want to "escape" out of your head so they are putting pressure on your ear drum. When your ears "pop" the pressure equalizes so that the air molecules are less dense in and outside of your head. When you descend in an airplane, the molecules outside of your head start putting pressure on your ear drum once again to equalize the pressure.

4 Introduce the harbottle. Show students the harbottle.

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