

Teacher Lesson Plans Downloadable
Science Box/

Title: Lungs: The Breathing Machine

Primary Subject: Science

Grade Level: Upper Elementary

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Lesson Background:

Many students believe that the purpose of their ribs is to protect their heart. But the real function of ribs is to hold lungs within a closed, rigid box. Your rib cage (or thorax) is like a plastic bottle. The bottle's bottom is removed because in your body, the area below the rib cage is not rigid. At the bottom of your rib cage, there is a floor made of solid muscle called the diaphragm. Above your diaphragm is a fairly rigid box made of ribs. Below your diaphragm is a non-rigid bag that hangs from your ribs. That bag (or abdomen) holds your stomach, liver, bladder and gut. Of course the bag is also attached to your lower spine and to your hip bone or pelvis.

Diaphragm muscles are like the knotted balloon (below) that is pulled down or pushed up. When you suck in your stomach, you push up your diaphragm. That squeezes your lungs because your rib cage contains less space than before. Squeezing lungs makes you exhale. If your rib cage were not fairly rigid, your lungs would not be squeezed. Pulling your diaphragm down inflates your lungs because that expands the space inside your rib cage. Air is sucked in through your airway to fill your lungs. If the plastic bottle was a non-rigid bag, pulling or pushing the knotted balloon would not cause the tiny balloon (like lungs) to inflate and deflate.

Materials needed:

1 clear plastic bottle
Clay or Play-Doh
1 regular-sized balloon
1 tiny balloon
1 plastic straw
Rubber bands

Strategy:

Explain to the students that they will make a model of their lungs to help them demonstrate how the lungs and the diaphragm work.

1. Rib Cage: Cut the bottom off the bottle. It would be best to leave on a portion of the bottom edge since removing all of it would weaken the bottle's structure.
2. Lungs: Attach the tiny balloon to one end of the straw with a rubber band and insert the straw and balloon into the bottle so the open straw sticks out of the neck of the bottle. If you blow into the straw, the tiny balloon will inflate.
3. Airway: Seal the bottleneck around the straw with clay.

4. Diaphragm: Cut off the bottom part of a regular-sized balloon and discard. Tie the stem of that balloon into a knot and slip the balloon over the bottom of the bottle with the knot on the outside. Stretch the balloon tight around the bottle and secure it with rubber bands.
5. Let the children experiment by pulling down on the knotted balloon. The small balloon will inflate the same as when you expand your chest and inhale air through your nose and mouth.
6. Make an air leak by removing clay from the bottle neck. That demonstrates a collapsed lung. Changing air pressure outside the lungs is the only force that moves lungs. When the lungs are moved, air is moved in and out. That is a breathing machine.
7. After practicing with their models, the class will discuss and conclude that breathing is a mechanical process by which there is an interaction between the organism and the surrounding air and that lungs and other parts of the respiratory system perform this mechanical process.

We breathe air (a mixture of gases composed of oxygen, nitrogen and a minute amount of carbon dioxide). Oxygen, the gas the body needs, comes from the air. The lungs and other parts of the respiratory system remove carbon dioxide from the blood as a waste product and that this excess carbon dioxide is exhaled.

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