What's the Big Deal about the Breathing?

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Grade Level: 2nd-4th                      Time Required: 30 minutes

Keywords: respiration, lungs, heart, pleural space, mediastinum, model

Summary

In this lesson, students will learn about the function of the heart and lungs and their roles in respiration. This lesson will also go over the pleural space (encasing the lungs) and the mediastinum (encasing the heart) and their relation to the lungs and heart. Finally this lesson will teach students what happens when excess fluid or air gets into these spaces and how that affects the heart, lungs and furthermore, respiration. During this lesson students will make basic simulators of the heart and lungs.

After completion of this lesson plan, students should be able to:

- Know the two mechanisms of respiration (inspiration and expiration)
- Know the function of the lungs in respiration
- Know the function of the heart
- Demonstrate the movement of the diaphragm during respiration
- Identify the mediastinum and pleural space with the aid of a illustration
- Know the consequence of air or fluid inside the mediastinum or pleural space

Lecture 1- What is Respiration and the Lungs

Materials:

- 2 Liter bottles (enough for class split into groups of three)
- bag of balloons (different colors- enough for 2:1 balloon bottle ratio)
- scissors (to precut the bottom off the bottles)
- tape (to tape the sharp edges of the bottles after the bottoms are cut off- and to attach balloons)
- clay (enough to plug each of the bottle necks)
- straws (one for each bottle)

Script: Who here is breathing? (All should raise their hands) Good! Does anyone here know why we breathe? (a child can answer- if the answer is along the lines is to stay alive or get air into the bodies- accept the answer) We breath so that all of the little cells that make up our body stay alive. The act of getting air from the outside of our body to the inside and to the little cells and the exchange of waste to the from our cells to the outside of our body is called respiration. There are two parts to respiration. Inspiration is when air goes into the lungs and oxygenates the blood. The blood then takes the oxygen to the cells so that they can use it. Expiration is when waste-carbon dioxide is transported from our cells back out of the lungs. Air gets into and out of the lungs with the help of the diaphragm. The diaphragm is a muscle that is under the lungs it pulls down the lungs
so that air rushes into the lungs and pushes up on the lungs so that waste is pushed out of the lungs. Everyone stand up! Can everyone take a breath in (push hands in a downward motion to signify diaphragm going down)? - that is inspiration! Now breath out (push hands in an upward motion to signify diaphragm going up)- that is expiration. The lungs is where the oxygen and waste are exchanged.


Let's make some of lungs to see what's going on inside of our bodies.

**Making the lungs**: [http://www.youtube.com/watch?v=CBv2BqqAydE](http://www.youtube.com/watch?v=CBv2BqqAydE) (for instructor use- not to be shown to the children)

- During the activity children should be able to identify what represents the lungs, diaphragm, chest. Instructor may also ask children to do the mechanisms of respiration along with the model. Children may also feel the air coming out of the straw and identify what should go into the "lung" and what should be coming out of the "lung." Instructor should note that children have two lungs - not one.

**Lecture 2- What is the Heart and How Does it Relate to Respiration?**

**Materials:**
- small balloons (may be the same size as used for the lungs)- one for each child
- stethoscope (optional)
- access to a sink (fill the balloons but make sure that they can be squeezed without popping)

**Script**: Does anyone know how the oxygen and waste is transported from the lungs to all of the cells (child may answer through blood- acceptable)? The oxygenated blood from the lungs through channels called **blood vessels** are transported to the **heart** so that the heart can pump the blood to the rest of the body’s cells through more blood vessels. These vessels make a loop with the waste from the cells that go back to the heart so that it can pump the blood to the lungs to go out of the body. Inside the heart there are **valves** so that the blood only goes one direction in the loop.

**Video**: (stop at 1:06) [http://www.youtube.com/watch?v=H04d3rJCLCE](http://www.youtube.com/watch?v=H04d3rJCLCE)

Let's pump some hearts!

**Activity**: Listen to resting heartbeats with the stethoscope or have the children feel their own heartbeats and pump the balloon hearts to the same beat. Do jumping jacks for 1 minute then listen to heartbeats with stethoscope or have the children feel their own heartbeats and pump the balloon hearts to the same beat. Ask children why the heart would be beating faster after exercising.

**Lecture 3- The Pleural Space and Mediastinum- What Happens When Air/Fluid Enter the Space.**

**Materials:**
- large bucket filled with water (children should be able to put their hands in the water and push out their arms
- paper towels (or access to a hand dryer)
Now that we've learned about the lungs, heart and respiration. Let's learn about the spaces around the heart and lungs. The mediastinum is the space that the heart is in. The mediastinum is the space in between the two lungs and allows for the heart to expand while pumping blood (picture).

Taken from [http://www.unmc.edu/dissection/idg20lungs.cfm](http://www.unmc.edu/dissection/idg20lungs.cfm)

The pleural space is in between two membranes (linings) surrounding the heart and inside the chest cavity.

Sometimes when people get very hurt or during surgery (children may ask how hurt- teachers may answer with broken ribs or diaphragm rupture) these spaces can fill with air or fluid. Let’s see what happens when the mediastinum fills with fluid.

**Activity:** Have children put their hands together in front of them and open and close their arms in the air. Explain that each heart beat is one cycle of opening and closing of their arms- note how easy it is for the children to open and close their arms. You can ask the children to change the temp at which they open and close their arms if they were sleeping versus if they were running around. Bring out the large bucket of water and ask the children to do the same motion but in the bucket of water- the bucket represents the mediastinum and the water represents if fluid is in the mediastinum. Their arms represent the heart- they should find that it is harder to open and close their arms in the water.

**Script (cont.):** Do you feel like it’s harder to open and close your arms? If the mediastinum fills with fluid it is harder for the heart to pump the blood to the rest of the body. How can we fix this (children may answer get rid of the water)? Chest tubes are put into the mediastinum to drain the water. Doctors put the tube in to the space and nurses make sure that all of the liquid is out so that the heart can pump blood easily again. Let’s see what happens if air or fluid get into the pleural space.

**Activity:** Keeping the groups of three children, split those groups into overall two groups. One group will cut a hole into the "lung" and one group will fill the bottle or pleural space with water. The children will then try expand the lungs and find that it’s harder.

**Script (cont.):** The pleural space has negative pressure which means that it has less pressure than the parts surrounding it. The negative pressure allows the air to rush into the lungs when the lungs expand. When we put holes in the lungs or fluid in the space, the space has a positive pressure so the lung cannot expand the whole way. Like the fluid in the mediastinum, tubes are put into the pleural space by doctors and are monitored by nurses.

**Discussion:**

- What are the two parts of respiration? Can you show what the diaphragm does?
- What do the lungs do in respiration?
- What does the heart do?
- Why is it important to keep the pleural space and mediastinum clear?
- If you were a nurse what do you think you should look for?- examples could be fluid coming out, air bubbling out, monitor heart rate, see if patient is breathing.
- What can we do to protect our heart and lungs?- wearing chest protection while playing baseball, not smoking, etc.

**Wisconsin Academic Standards Covered in this Lesson**

**Health Sciences:**

- HSF1.a.1.e: Identify parts of the human body.
- HSF1.b.2.e: Identify methods that promote recovery from human diseases.
- HSF2.a.5.e: List qualities of a good listener and speaker in healthcare scenarios.
• HSF8.a.2.e: Practice working as a team to help others.
• HSF8.b.3.e: Participate in team building activities.

Technology and Engineering:

• BB1.a.2.e: Identify that systems have parts or components that work together to accomplish goals.
• BT1.a.4.e: Recognize technological advances have made it possible to create new devices, to repair or replace certain parts of the body and to provide a means for mobility.
• ENG3.a.1.e: Asking questions and making observations helps a person to figure out how things work.
• ENG5.a.1.e: Discover how things work.
• ENG5.b.3.e: Discuss following step-by-step directions to assemble a product.