

Teacher Notes-“Diaphragm- Relax And Breathe”

We never think about breathing because we never have to (thank goodness). It is a process that may seem complicated, but as this lesson shows, when lungs fill with air and then empty, it's by a process that is pretty simple.

*Note-As you prepare for this lesson, it will take you some time to get the materials ready. But after you've done this once you're set to do this lesson instantly every year with almost no prep.

Materials per group (2 students): empty 2-liter soda bottle, small balloon, straw, clay, Ziploc Sandwich Sac, masking tape (3-inch piece)

Bottle Prep: Cut the top 3 inches off a 2-liter bottle. The baggie will slip over this opening later. Then drill hole in bottom of bottle with 5/16” drill bit for the straw to fit through later.



Procedure:

(Build your own beforehand. This will help you explain it better and know what things to watch out for. This is not optional!)

1. Give students a copy of the handout (or have them take out a sheet of notebook paper).
2. Introduce the lesson: have student take 10 quiet seconds and notice themselves breathing. Ask what they notice- their chest getting bigger, possibly feeling a muscle below their lungs moving around. Talk about their observations.

3. Begin the PowerPoint (see last page). Have students copy the definition.

A nice visual aid to help them understand a muscle better is to stretch and contract a rubber band. They're about the same thing.

A key word in this definition is "cause". Give examples of things that *cause* other things- your foot striking a chair causes it to move. An alarm clock causes you to wake up. A brush stroked through your hair causes it to straighten. The chair, you, and your hair didn't do anything- they were *caused*. They just sat there and reacted. Now re-read the definition- "the muscle that *causes* the lungs...". Your lungs don't do anything to make themselves fill with air, do they?

4. Check materials to make sure everyone is ready to start: balloon, bottle, straw, clay, small piece of tape, sandwich sac. This also gives you a chance to remark how simple of a structure this is going to have to be, given these materials.

Have extras of everything on standby. Things happen, you know.

Before beginning assembly, tell students that they must pay close attention to your instructions, and not just kind of listen...some. This lesson will go well if everyone listens. It will not if they don't.

Diaphragm (dī-uh-fram)

-the muscle across the bottom of the rib cage that causes the lungs to fill with air



5. Assemble the Lung:

- Place the end of straw into the balloon
- Wrap tape around balloon
- Then push tape down firmly onto straw



This seals the balloon to the straw in a somewhat airtight manor. Do this along with your students, then hold up one of these so your students can see what you mean. Many times they want to push the straw all the way into the balloon (not good).

6. Now insert straw through the small hole in the bottle by going up through the large hole (small hands help!).



7. Next, press clay around where the straw comes through the hole. This will help make it airtight.



8. Finally, put the sac on:

- Place baggie over the end of the bottle, but not all the way on yet
- Push the end of baggie inside bottle opening (as shown)
- Pull baggie snug over bottle



**Note*-use “Ziploc Sandwich Sacs”- they fit perfectly snug over the bottle, so you won’t need to tape it to the bottle.

9. Your diaphragm is now complete! Pull on the baggie and watch what the balloon/lung does- inflates! Then push the baggie in and watch it empty.

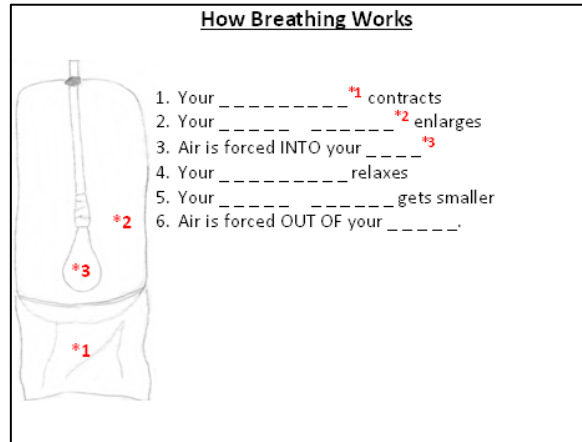


10. Come back to your key point as you watch it working- the lungs themselves don’t do anything. They’re just sacs that sit there and fill and empty with air in response to what the diaphragm muscle does.

11. On the Student Handout (or on their paper) have students make a sketch of the diaphragm and then copy the 6 steps of breathing as shown.

Answers:

1. diaphragm
2. chest cavity
3. lungs
4. diaphragm
5. chest cavity
6. lungs



After doing first 3 steps to breathing, present the last 3 as their opposites. 4 is the opposite of 1; before revealing 4, re-read #1 and ask what the opposite of that would be. 5 and 2 are opposites. And 6 and 3 are opposites.

12. A nice way to finish is to show the 1 minute YouTube video of a diaphragm working-
<http://www.youtube.com/watch?v=hp-gCvW8PRY> (if this link is dead, search YouTube for “3D view of diaphragm”).


If you show this video, you'll notice what looks like 3 holes in the diaphragm. Yes, they're supposed to be there, and you have those too. One is where your esophagus passes through. Another is for your aorta, the largest artery in your body. The last is your vena cava, a major vein bringing blood back to your heart from your lower half. Lead students through this and see if they can figure these holes out- “Ok, students, what’s just above your diaphragm (lungs, and... heart). Do you need blood in the lower half of your body? (yes) Well guess how it gets to and from there (2 holes). And when you eat, guess how the food gets from your

mouth, which is above your diaphragm, into your stomach, just below the diaphragm?"


FYI- a hiccup is a contraction of guess which muscle? That's right- the diaphragm!

Come back and visit InteractiveScienceTeacher.com to upgrade this lesson with:

PowerPoint- lead your students through the lesson click-by-click



1. Check materials: balloon, bottle, straw, clay, small piece of tape, baggie
2. Assemble the lung:
 - Place end of straw into balloon
 - Wrap tape around balloon
 - Then push tape down firmly onto straw



1. Check materials: balloon, bottle, straw, clay, small piece of tape, baggie
2. Assemble the lung:
 - Place end of straw into balloon
 - Wrap tape around balloon
 - Then push tape down firmly onto straw
3. Insert straw through the hole in the bottle
4. Press clay around where straw comes through hole
5. Put baggie on:
 - Place baggie over end of bottle
 - Push end of baggie inside bottle opening
 - Pull baggie snug over bottle
6. Your diaphragm is now complete! Pull on baggie and watch balloon.



Clean Up:

- Separate all materials; put in box
- Throw away piece of tape
- Put new piece of tape on box

Student Handout

How Breathing Works

Diaphragm (di-uh-fray) -

1. Your _____ contracts
2. Your _____ enlarges
3. Air is forced INTO your _____
4. Your _____ relaxes
5. Your _____ gets smaller
6. Air is forced OUT OF your _____

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