

**Title:** Respiratory System

**Introduction:**

In this lesson, students will build a model of a lung and experiment with ways to inflate and deflate the lung. This experience will help students visualize the functions of the nose, trachea, lungs, and diaphragm in the respiratory system. Students will also identify cause and effect relationships between the organs of the respiratory system. In addition, students will use technology to further their understanding by examining a digital “patient”, and attempting to diagnose and treat based on research done on each vital organ.

**Learning Outcomes:**

The student will explain the function of the nose, trachea, lungs, and the diaphragm as part of respiration.

The student will test theories of how to inflate and deflate the lungs by experimenting with a model.

The student will research to learn that the respiratory system is responsible for taking in oxygen from the atmosphere and giving off carbon dioxide.

**Curriculum Alignment**

**Fifth Grade Science Essential Standards**

5.L.1 Understand how structures and systems of organisms (to include the human body) perform functions necessary for life.

5.L.1.2 Compare the major systems of the human body (digestive, respiratory, circulatory, muscular, skeletal, and cardiovascular) in terms of their functions necessary for life.

**Fifth Grade Reading Common Core**

Informational Text (Craft and Structure)

Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.

Fifth Grade Informational and Technology Essential Standards

5.IN.1 Analyze appropriate strategies when reading for enjoyment and for information.

5.TT.1 Use technology tools and skills to reinforce and extend classroom concepts and activities.

**National Science Standards**

Standard A : Science as Inquiry : Students develop abilities necessary to do scientific inquiry. Students develop understandings about scientific inquiry.

### **Classroom Time Required**

This lesson will take two 45 minute lessons.

### **Teacher Preparation**

Day One: The teacher will need to gather all materials listed for day one and have copies of the cause and effect chart for the exploration of the lung model. (slide 3 of the *Respiratory Interactive Slides*-attached)

Day Two: The teacher will need to have access to a laptop for pairs of students, or schedule time in a computer lab for students to access the Smart Notebook files. In addition, the students will need copies of the questions that accompany the web quest. (*Respiratory System Internet Research Questions*-attached) Students and teacher will need internet access to model and complete the internet research necessary. The teacher will need to place the Smart file on the laptops, or on a school server so that students can have access.

Before using the entire unit, the teacher should make sure the links for Day 2 of each lesson are still active and working. The links are located in the Smart lesson and are indicated on each slide. Please check by clicking on the noted area and see if you are redirected to the correct website. If by some chance, a link does not work- changes would need to be made to match the questions on the worksheet.

### **Materials Needed**

Day One: The teacher will need to gather the following for each child that builds the model. At the very least, have one set of materials for every two students.

<b>Lung Model Materials</b>	
1 small water bottle with the lid (8 floz worked well) (prepared as described below)	1 large balloon or rubber glove
1 balloon	1 straw
2 rubber bands	1 small ball of clay (about a 1 in square)

### **\*\*Bottle Preparation:**

The lid of every water bottle needs to have a hole in the top big enough to fit the straw through it. To do this, consider using a drill bit very close to the size of the straw. You don't want the straw to be too loose, because it will be hard to seal it with the clay later.

Also, the bottom needs to be cut off of each water bottle. I used a razor blade tool to do this and it was very easy.

\*\*In addition, students need a pair of scissors, 8 sticky notes, copies of *Respiratory Trivia* game (print from slide 2 from *Interactive Respiratory System*) and the **Cause and Effect** worksheet. (print from slide 4 from *Interactive Respiratory System*).

### Technology Resources

Day One: The teacher will need a Smart board to display images of the respiratory system. The teacher will also need to show an animated slide show from Scholastic Study Jams, so internet access is necessary.

Day Two: The students will need to either be able to use a laptop individually, with a partner, or have access to a computer lab. Students need to have Smart Notebook 10 software on the computers they are accessing, because the lesson is a Smart interactive lesson. In addition, students will need headsets if they will be allowed to listen to the text on the websites.

### Pre-Activities

**\*\*This lesson is one of five human body lessons, and the “prior knowledge” activity could be used before any of the systems were taught. There is not a particular order for the systems to be taught, so the Circle Map would be done at the beginning of the Human Body Unit of study, before the FIRST system. It is not necessary to repeat this before each system, but students could be encouraged to add to their maps as part of the closing each day, then additions could be discussed prior to the start of each new system.**

### Day One:

**Prior Knowledge:** Students should be introduced to the concept of the human body as many different parts that work together. Creating a Circle Map (slide one of the *Respiratory Interactive Slides*) to assess what students already know about the human body would be a great pre-lesson activity. This allows the teacher to be aware of what concepts, vocabulary, and possible misconceptions students may have before starting the unit.

Students do not need any specific content knowledge about the respiratory system prior to starting this lesson. For the lesson, they will be working with materials with a partner, so having clear expectations for management is important. For example, distributing the materials in closed bags, having students keep materials in the bag until given directions, asking students to use materials in a respectful manner, and having verbal and non-verbal cues for directions during the activity will help the lesson flow well.

Students will be using a Cause and Effect flow map, so they will need to understand the relationship between causes and their effects.

Students will need to know that volume is a measure of capacity and that air can be measured with volume.

Day Two: Orally review key functions of the body parts using slides and images from day one (***Respiratory Interactive Slides***-attached) and distribute handouts (***Respiratory System Internet Research Questions***-attached) for the web quest. Tell students that we have a patient today that is suffering from respiratory issues and that it is up to us to learn more about each organ's function within the system. As his "doctor" they will need to correctly diagnose and treat him so he can continue to live a healthy life.

(Prior to teaching any specific content) In order to help students become curious about the material, the teacher will post the Respiratory Trivia facts (Slide 2 of ***Interactive Respiratory System***) on the board and distribute the worksheet, Respiratory Trivia. Students will cut out trivia facts and try to match what numbers go with the information about the respiratory system. The purpose is not necessarily to get the "right" answer, but to get students thinking and talking. Students will be excited to see if they are correct. Save the answers for a closing activity.

### **Activities:**

Day One:

Distribute materials for lung model to students having them keep their scissors from the previous activity. Display the directions for making a model on the Smart Board. (slide 4 ***Interactive Respiratory System***)

Step 1: Cut open the large balloon and spread it out to cover the opening at the bottom of your water bottle. Seal it tight with a rubber band.

Step 2: Holding the lid to the bottle separately, put the straw through the hole and attach the small balloon to the end inside the bottle. Use a twisted rubber band if it doesn't fit snugly.

Step 3: Put the top on the bottle and seal it tight with clay.

Ask to students to try to change the volume of air inside the balloon. They need to keep track of what they do (Cause) and record what happens to the balloon inside the water bottle each time.(Effect) Allow students to share results with other students and try what others did. Discuss changes that occurred and any surprises the students may have encountered. "What did you do to change the volume of the balloon?" (blew into the straw, sucked air from the straw, pulled on the balloon covering the bottom, shook the bottle) "What happened when you tried that?" "Did anyone try the same thing and get the same results? Different results?" "Why do you think that causes the balloon to inflate (or deflate)?"

Share Learning Objectives (slide 6 of ***Interactive Respiratory System***)and explain to students that we have just built a model of the respiratory system. Tell students that they will watch a slide show about the respiratory system. It will show specific locations and functions of the organs in the respiratory system and students will use this to help identify exactly what was built in the model. Give students the sticky notes and then show slide show:

<http://studyjams.scholastic.com/studyjams/jams/science/human-body/respiratory-system.htm>

Pause the slide show to read the comments for each image. Allow students to use their sticky notes to label the parts of their model during the slide show. (straw- trachea, balloon on straw- lung, balloon covering bottom of bottle- diaphragm, bottle- rib cage) These are some of the labels they will use. The slide show demonstrates a few more specific features that our models do not represent. Give students a minute to share orally any other labels they created. Also, discuss any variations in the labels students may have had. Use slide 7 from ***Interactive Respiratory System*** to show the diagram of the respiratory system, and a picture of the model that was made. Label the model accurately and make sure students correct any misconceptions.

In closing, go back to the slides from the opening pre-activity with number facts and allow students to come up and match facts with the numbers. The answers are on the following slide.

If time allows, the last slide (slide 8 ***of Interactive Respiratory System***) has an animated patient that needs his respiratory system put back together. Students drag the organs over to the chest cavity of the patient, then click “resuscitate” to see if the organs are correctly placed. If correct, the patient starts breathing, if not, the patient gets a “flat line” and does not survive. (It is a cartoon character.)

### **Guided Practice**

Day Two:

1. Display the Learning Outcomes again, using yesterday’s model system as a reference for discussion. Show students the “***Is There a Doctor in the House Respiratory?***” Smart lesson. Tell students they are going to be “visiting” Patient 5 today and diagnosing his problem involving the respiratory system.

\*At this point, have students move to computers in a lab or laptops and view the Smart lesson. Guide students to click on Patient 5 and read the patients chart. Following the directions under the chart, students will click on each of the body parts, using the text to answer the questions on the worksheet. They will continue through the worksheet clicking on the links, reading, and answering questions.

\*Students will need guidance doing this if they have never done it before. It is beneficial to instruct them to read the worksheet questions before going to each link. Also, explain to them that they should read the screen looking for key words from the questions in order to locate the answers properly.

As students finish, the teacher should start a discussion about what the patient’s problem might have been and what the proper diagnosis and treatment would be. For example, “What were some of Robert’s problems?” (difficulty breathing, coughing, chest felt tight) “How could you tell this was a problem with his respiratory system?” (problems are related to breathing, chest is where lungs are located.) The purpose of this discussion and activity is not to have students accurately diagnose the patient necessarily, but to hypothesize and have a purpose to learn more about each organ in the cardiovascular system. \*\*Remember that this activity is to give them a real life application of their learning, and to give a reason to learn more about each part of the system you are focusing on today- NOT to make a perfect diagnosis. (Accept any diagnosis related to the respiratory system, as long as students support their thinking. Ex: asthma, pneumonia, lung infection, etc. ) Treatment would be

examples of exercising, not smoking, wearing a mask around chemicals. Some students with asthma may say an inhaler would be appropriate for this patient.

### **Assessment**

As an informal, formative assessment, students could add to their circle map from before the lesson began to show knowledge gained from the lesson. I suggest students add learned information in a different color from the prior knowledge so they can see what they are adding to the circle map.

Students' writing and recording from their model system activity as well as their answers to the questions from the web quest could be assessed for understanding. The answers to the web quest are provided.

The cause and effect activity would be an excellent assessment of student participation and understanding of how the model worked. After discussion, students should go back and change or redo the same cause and effect flow map, but change words from the model into words from the respiratory system. Ex: When I pushed on the (balloon on the bottom of the bottle) diaphragm, it made the (balloon inside) lung shrivel. When I blew into the (straw) trachea, it made the (balloon inside) lung inflate.

**Modifications: This lesson provides a large variety of activities appropriate for meeting the needs of multiple learning styles.**

### **Day One:**

Slides from the Notebook lesson could be printed and provided to students for support and reference. This is beneficial if students have disabilities in written language. Students that have difficulty with motor skills could work with a partner that could cut the paper out for them, or the teacher could prepare the papers in advance.

Students may work in groups of two having each person be in charge of a different part of the model building. This will benefit students that struggle and need support from peers for completing work, yet holds them accountable for specific areas of content.

Alternative Assessment:

If the teacher had a poster or model of the respiratory system, she could have students move their sticky notes to the model and discuss. Students could also be given a worksheet to label the parts of the respiratory system.

A Jigsaw method could be used to share Day 2's questions with groups of 4 students assigned a link to go to and answer questions about. Students then come together with other students having the same link and share answers. Students then return to their original group and all share answers with one another to complete the worksheet.

### **Critical Vocabulary**

**Nose:** Your nose lets you smell. The nose is also the main gate to the respiratory system, your body's system for breathing.

**Trachea:** the bony tube that connects the nose and mouth to the lungs

**Lungs:** Lungs are the primary organs that make up the respiratory system and in the human body are located within the chest cavity on the right on either side of the heart.

**Diaphragm:** a sheet of internal skeletal muscle[2] that extends across the bottom of the rib cage

**Rib cage:** a component of the human respiratory system; It encloses the chest cavity, which contains the lungs.

**Oxygen:** Oxygen atoms make up almost a quarter of the air on Earth, and they're necessary for all animals (including people) to breathe.

**Carbon dioxide:** molecules that leave the body during respiration

**Inhale:** to breathe in oxygen

**Exhale:** to breathe out carbon dioxide

#### Websites

<http://kidshealth.org/kid/htbw/nose.html>

<http://yucky.discovery.com/flash/body/yuckystuff/snot/js.index.html>

<http://kidshealth.org/kid/htbw/lungs.html#>

<http://www.fi.edu/learn/heart/systems/respiration.html>

<http://studyjams.scholastic.com/studyjams/jams/science/human-body/respiratory-system.htm>

#### Comments:

The materials and instructions for the lung model are from the book The Bones & Skeleton Game book (A Challenging Collection of Puzzles and Projects) by Karen C. Anderson and Stephen Cumbaa

As students diagnose and treat the patient, it is not about that being a perfect process. The real purpose of the activity is to expose students to more informational text about each organ and provide them with an “authentic” reason to research.

#### Author Info:

Tracy Pendry is a fifth grade teacher at Shoals Elementary School in Pinnacle, NC. She is a National Board Certified Teacher and has a master’s degree in Educational Technology. Tracy loves teaching science as well as all other subjects daily. It gives her great pleasure to see students get excited and

motivated to learn through the investigation process. She developed this lesson to spark students' interest in the body system as well as to help students' have a deeper understanding and visualization of what the respiratory system does in the body. Finally, Tracy wanted students to see a personal connection to their own life as they try to diagnose and treat their patient.