

RESPIRATORY SYSTEMS

An Elementary Science Lesson Plan

Designed For Group Inquiry

Based On The 5E Inquiry Model

GRADE LEVEL: This is a fifth grade science lesson. Students in fifth grade are learning plants and animals have structures for respiration, digestion, waste disposal, and transport of materials.

SCIENCE CONCEPT: This lesson explores the concept of respiration through inhaling and exhaling. Building a working model will allow students to explore the concept that the lungs expand and contract during the act of breathing. Students will observe the bellows-like expansion and contraction of the Alligator Lizard's rib cage and compare it to their own rib cage during breathing. Students will then design and implement a level 4 inquiry investigation related to respiration.

RELATIONSHIP TO CALIFORNIA SCIENCE CONTENT STANDARDS:

2. a. Students know many multicellular organisms have specialized structures to support the transport of materials.

LEARNING OBJECTIVES:

Create a question related to the respiratory system and then design an investigation to explore respiration in humans and compare it to that of the Alligator Lizard or Skink.

EVALUATION IDEAS:

Respiratory Systems

1. Formative: Teacher observes groups during model building. Work with groups to help ensure model works so students will make connections to respiratory system. Observe depth of inquiry during “How much air do you breathe” activity. Are students relating amount of air in a breath to lung capacity?

2. Summative: Investigation shows an understanding that respiration (breathing) through the lungs is seen through the rise and fall of the rib cage both in humans and the Alligator Lizard or Skink. Differences in respiration between humans and lizards are explored in a level 4 inquiry investigation.

CONCEPTUAL BACKGROUND:

Humans and reptiles need oxygen to survive. Oxygen is taken in through breathing. Breathing is controlled by movement of the diaphragm. When the diaphragm moves down, air is forced into the lungs. When the diaphragm moves up in the rib cage, air is forced out of the lungs.

LESSON IMPLEMENTATION PLAN:

ENGAGE-How do your lungs work to inhale and exhale gases?

Guide students to complete this model. For ease and safety, punch hole in bottom of plastic cup (step 3) ahead of time. Use the heated tip of an ice pick or other sharp metal object.

Steps for students to follow:

1. Have materials manager collect materials for this activity: plastic drinking straw, small plastic bag, two rubber bands, clear plastic cup, small balloon, and scissors.

2. Cut the straw in half.

Respiratory Systems

3. Punch a hole in the bottom of the plastic cup the same width as the plastic straw.
4. Stretch and blow up the balloon a few times to loosen it up.
5. Using a tightly wound rubber band, attach the balloon to the straw. Blow into the straw several times to make sure the balloon stays on and the rubber band does not crush the straw.
6. Push the free end of the straw through the cup's hole and pull until the balloon is in the middle (where the liquid would go) of the cup. Seal the area around the hole and the straw with modeling clay.
7. Place the open end of the cup into the small plastic bag with the edges of the bag overlapping the cup. Secure the bag to the cup with a rubber band or masking tape. The plastic bag should be loose, not stretched taut, across the cup's opening. It should be secure enough to the plastic cup that when you pull on the plastic bag, it does not slip off the cup.

EXPLORE-

Ask: *What do you think will happen to the balloon if you pull on the plastic bag?*

Direct students to: Pull on the plastic bag. Record your observation. Ask: *What do you think might happen if you push up on the plastic bag?*

Direct students to: Push up on the plastic bag. Record your observations.

Ask: *What changes did you observe in the system? Why do these changes happen? Where in your body do you have something that works like this?*

How Much Air Do You Breathe?

Respiratory Systems

Materials managers give each student a balloon, some string, one ruler for each table group, and a timer (or teacher can time whole class). Tell students they are going to do an activity to see how much air they can hold in one breath.

1. Breathe in as much air as you can.
2. Breathe out into the balloon and quickly tie a knot in the balloon.
3. Holding one end of the string, wrap it around the balloon at its widest point.
4. Mark the string where the ends meet with a pen.
5. With the ruler, measure the string. This measure represents the amount of air you breathe out.

Students complete *How much air do you breathe?* worksheet.

- Using a stopwatch or timer, tell the students to keep track of the number of times they breathe in for one minute. Inform them this is their breathing rate.
- On the whiteboard, make a chart comparing the string length and breathing rate of some students.

EXPLAIN-

Show students illustration or model of the human chest cavity (from *Our Body Respiratory System* book or students' textbook). Guide students to identify the parts of the body used in breathing and describe how they function, be sure to include the diaphragm in the explanation.

Ask: *How is the model you made like your lungs?*

Respiratory Systems

Show students the illustration of the internal organs of the lizard. Guide students to identify the parts of the lizard body used in breathing. Compare/contrast size and shape of human lungs to lizard lungs. Have students observe lizard/skink for evidence of breathing.

ELABORATE-Level 4 Inquiry- Instruct students to:

1. Ask a question
2. Form a hypothesis
3. Design an investigation to test the hypothesis
4. Seek permission to begin implementation/testing
5. Conduct the investigation
6. Draw a conclusion

EVALUATE-**Breathing Differences**

Students will complete a **Breathing Differences** lab sheet. Look for:

- specific question should be stated,
- clear hypothesis,
- notes from investigation,
- conclusion

DIFFERENTIATION PLANS:

Behavioral for Student A

- Deliberately group student with others who will provide a stable working group environment. Provide direct instruction on the inquiry task to ensure student A understands the end goal. Establish a personal behavior goal for student A to meet at

Respiratory Systems

conclusion of task with mutually agreed upon reward. Assess student's group frequently paying close attention to inappropriate emotional or physical behavior.

Cognitive for Student B

- Provide increased scaffolding through the use of “*questioning to guide active thinking*” especially in the Explain phase of the lesson. Increase the level of prompts as required for Student B to understand the role of the lungs in the exchange of gases through respiration.

Cognitive for Student C

- Gifted and Talented. Reptile skin is dry and scaly so they cannot use their skin as an organ of gas exchange (like when humans sweat); they depend only on their lungs. Research the system the American Alligator has in their body. What other type of animal is it similar to?

Affective for Student D

- In order to increase interest and motivation for student D, he/she will be able to choose their role in the group instead of it being assigned to them. Frequent, positive feedback will be provided and an appropriate level of scaffolding so the student feels supported yet challenged and the success of the task will be authentic.

Language Demands for Students E, F, G

- Teacher's speech will be modified to accommodate the language demands of students E, F, G by:
 - speak clearly and slowly

Respiratory Systems

- use short sentences with simple syntax
- provide visual aids of academic language i.e. photo of respiratory system
- Student E: Have student make vocabulary word card to place on the class word wall.
Student will use Verbal and Visual Word Association (VVWA) strategy to include word in personal dictionary. [Vocabulary examples: lungs, diaphragm, inhale, exhale.](#)
- Student F: Will be paired in group with bi-lingual students who will use first language as needed to clarify key concepts.
- Student G: Will be permitted to show evidence of learning in ways other than writing.
For example, breathing differences inquiry activity can be oral presentation or poster.

LIST OF MATERIALS (PER GROUP)

- Plastic cup
- Drinking straw
- Small plastic bag
- Small balloon
- modeling clay
- Rubber bands (2)
- Scissors
- Tape
- Ruler
- Timer/Stopwatch (teacher can be timer for whole class)
- Pen

LIST OF MATERIALS (PER PERSON)

Respiratory Systems

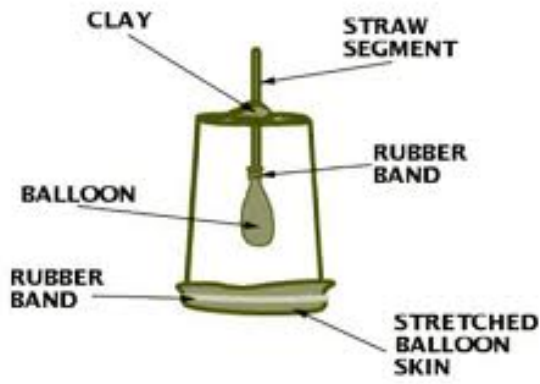
- Small balloon
- String
- How Much Air Do You Breathe? Worksheet
- Breathing Differences Worksheet

DIRECTIONS OR SPECIAL INSTRUCTIONS; SAFETY CONCERNS, ETC.

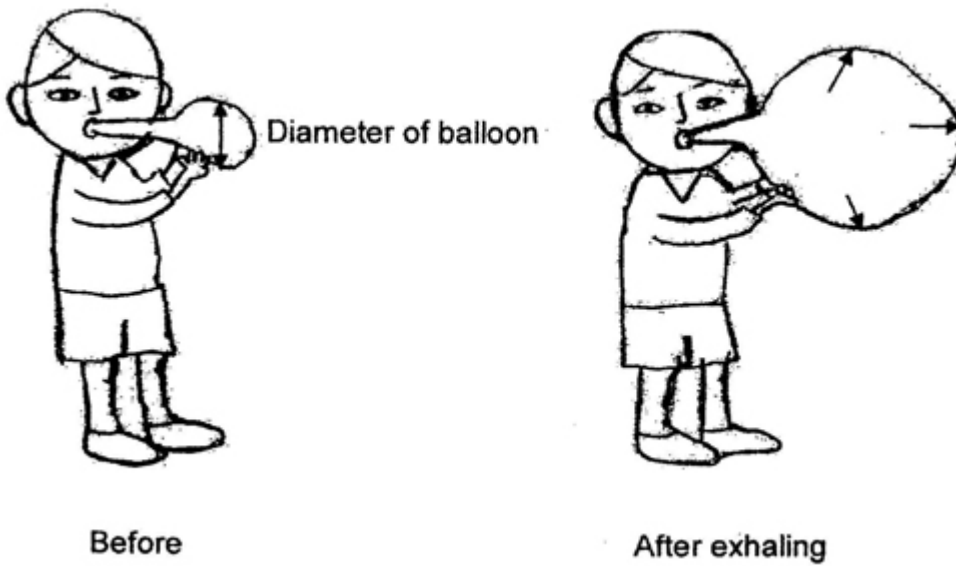
Punch a hole in the bottom of the plastic cups ahead of time using a heated ice pick. Do not offer this method to students.

Have students blow into balloons a few times prior to activities to loosen them up.

Model of Lungs



Lung Capacity



Name _____

Date _____