Lesson 4: Respiratory System
Lungs
Structured Inquiry

Grade Level: This lesson is designed for a 5th grade science classroom.

Science Concept: This lesson is focused on helping students understand how a snake breathes and recognize how the snake’s respiratory system, specifically the lungs, differs from humans’.

Relationship to California Science Content Standards:
2b. Students know how blood circulates through the heart chambers, lungs, and body and how carbon dioxide (CO2) and oxygen (O2) are exchanged in the lungs and tissues.

Learning Objectives:
1. Students will compare and contrast a snake’s lungs and ribs to those of a human’s.

Evaluation Ideas:
1. formative: Accurate Play-Doh model with parts correctly labeled.
   2. summative: Venn diagram documenting at least 3 similarities and 3 differences between a snake’s respiratory system and a human’s respiratory system.

Conceptual Background:
Snakes are cold-blooded, which means that they do not keep their bodies at a constant temperature and thus require little oxygen. Warm-blooded animals, on the other hand, require much energy and oxygen in order to maintain a constant body temperature.

Since snakes don’t need as much oxygen as humans do, the structure of a snake’s lungs contrasts greatly from ours. For example, snakes have one large, elongated right lung and one very small left lung, and in some cases, no left lung at all. While human lungs are very spongy and contain air sacs to easily acquire oxygen from the air, snake lungs are less spongy and more hollow and thus less efficient at absorbing oxygen.

Not only that, humans inhale and exhale air through the push and pull of the diaphragm. However, snakes do not have this muscle, so they breathe in by
expanding their rib cage to create more space, causing air to be sucked in, and they breathe out by narrowing their rib cage to push air out.

Like humans, snakes inhale and exhale through their mouth and trachea (windpipe).

Most people forget that snakes are vertebrates and expect snakes not to have any bones, when in fact, snakes have vertebrae and ribs just like humans do. A snake’s ribs play an important role in protecting the snake’s organs, such as the lungs, and in fact, snakes can have between 130-500 vertebrae in their backbones with a pair of ribs attached to each vertebra compared to the 32 or 33 vertebrae that humans have.

**Materials:**
1. Play-Doh
2. Toothpicks
3. Labels

**Lesson Implementation Plan:**
Engage – I will tell the students that all living things need to breathe. Humans, along with many animals, inhale oxygen through their noses and mouths. However, other animals, such as frogs and earthworms, breathe through their skin. I will ask students to take some time to consider what they know about snakes and predict whether snakes breathe through their noses/mouths or through their skin. Then they will engage in Think Pair Share (TPS) with their elbow partners to explain their predictions. Afterwards we will have a large group discussion. I will confirm that snakes in fact breathe through their mouths and noses, and that they have nostrils similar to ours. Not only that, snakes also have a pair of lungs just like we do! Ask: “How do a snake’s lungs fit in its body?”

Explore – As a hands-on exploration activity, I will give each student two different colors of Play-Doh. I will instruct them to roll one color of Play-Doh into the shape of a snake that is a foot long (or half the length of their desk). The body should be about one inch thick (or the length of their thumb). Next, I will ask them to use the other color of Play-Doh to mold what they imagine a snake’s lungs to look like and mount it on top of the snake’s body where they believe the lungs are located. Then, they will share their Play-Doh models in groups of 4 with each student explaining why he chose to illustrate the lungs in that specific way.
Explain – I will then explain that since the body of a snake is long and thin, the organs must also be long and thin. Because the available space is limited, some organs have been reduced in size, or even eliminated. Thus, most snakes have one large right lung and one very small left lung. Sometimes the left lung is unused or may not even exist. I will draw comparisons between the snake’s lungs and a human’s lungs. I will then ask the students to amend their Play-Doh model to synthesize what they have learned, identifying parts with a labeled toothpick.

Elaborate – I will then ask students: “How do you think a snake’s lungs are protected?” Students will once again discuss in Think Pair Share. I will then show the class a model of a snake rib cage and compare it to a model of a human rib cage (both rib cage models can be borrowed from SERC). Although the rib cage is not directly associated with the respiratory system, I will explain that it is an important structure to protect the vital organs of a snake’s respiration. Students will then add the rib cage to the Play-Doh snake model, labeling it with a toothpick.
Evaluate –

a. summative – Venn diagram documenting at least 3 similarities and 3 differences between a snake’s respiratory system and a human’s respiratory system.

b. formative – Accurate Play-Doh model with parts correctly labeled.

**Differentiation Plans:**

Some students will be frightened of the snakes and maybe react unsuitably. Remind students to remain calm, and try to alleviate any fears students may have of venomous snakes, snakes that bite, etc.

Other students may find snakes disgusting, thinking them slimy and gross. Have another student describe to

them how the snake feels, s

Behavioral for Student A
If a student is too active, I will assign him an extended activity with the Play-Doh. He will use the Play-Doh to model a human’s respiratory system.

Cognitive for Student B
If a student has a hard time keeping up, I will pair him with a student who is at a higher level to help guide him through the activities.

Cognitive for Student C
If a student is ahead, I will ask him to further research how gas is exchanged once the oxygen reaches the snake’s lungs.
Affective for Student D

If a student doesn't want to participate, I will ask them to draw a picture of a snake and label the organs that are involved in breathing. If they enjoy writing stories, I will ask them to write a narrative of the journey of an air molecule as it travels through a snake.

Language Demands for Students E, F, G

Beginner: Provide visuals of both snake's lungs and ribs and human's lungs and ribs. When explaining the snake's organ, point also at the corresponding human organ so the correlation is clear and apparent.

Intermediate: Provide sentence frames for student to describe the path that oxygen travels as a snake breathes. "First, the air travels through _______. Next, the air travels through _______. Then...Afterwards...Finally, the air arrives in the _______.”

Advanced: Use compare and contrast to describe, either orally or written, the similarities and differences between a snake's respiratory system and a human's respiratory system.

References: