



**Objective:**

Students will understand what a human needs to survive, how our body deals with some of these things, and what we can do to help it!

**Vocabulary/Definitions:**

3 – 6 important (new) words

Biology: The study of living things

Primary Needs: Natural needs that every living thing needs to survive like food, water, and shelter.

Cardiovascular System: The system that moves blood and lymph all around your body.

Respiratory System: The system that helps living things respire (breathe).

**Materials:**

-Water (check with teacher before hand to make sure sink is available)

-Plastic water bottles (students bring their own, check with teacher)

**Blood Flow Demo**

1 3D Printed Aorta (to show visually)

2 plastic cups with straws attached

2 drainage bins

Clay/plug material

**Lung Capacity Demo**

Plastic straws (1 per child)

1 salsa dip bowl (for lung capacity demo)

2 2-liter soda bottles

**Plastic Lung Workshop**

Rigid plastic bottle (1 per student)

large balloons (2 per student)

*What should students have ready?*

Just their attention and enthusiasm! (And plastic water bottles depending on what is possible)

**Classroom Set-up:**

We will need a water source in the classroom and areas to set up the three stations. One set up by the sink. The other two set up at other places throughout the classroom.

**Classroom Visit****1. Personal Introduction:**

5 Minutes

Tell a little bit about graduate school at Berkeley, SECO, and who we are as scientists! Ask about science and what they think science is/scientists do. Each graduate student helping can do this.

**Topic Introduction:**

10 Minutes

What do humans (and animals) need to survive? (Board drawing)

Discuss Primary Needs/Secondary Needs. If the kids have a hard time answering these questions, you can ask what they do at least three times a day (eat), or what they do every night (sleep).



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Introduce vocabulary

Demonstrate how our body deals with getting these essential needs? Questions can include what in our body deals with air and oxygen? (lungs) What in our body has blood in it? (heart). This gives us some vocabulary words for organs within our body. (For questions, ask kids to raise their hands and pick a student to answer)

Air->**Lungs**

Blood->**Heart, Arteries, Veins**

For each of these, have the kids point to where these organs are in their body for better understanding. Next, segue into describing that we have scientific terms for the systems within our body capable of dealing with these processes. What are some things in the body associated with these Systems? These vocabulary words will be much tougher to get out of the kids, and it may be necessary to tell them these words.

Lungs->**Respiratory System**

Heart->**CardioVascular System**

## 2. Learning Experience(s):

36 \_\_\_\_\_ **Minutes**

*What will you do, what will kids do? Demonstrations, hands-on activities, images, games, discussion, writing, measuring... Describe in order, including instructions to kids.*

\_\_\_\_\_ **30-**

Demos(10-12 minutes per station)

### Demo 1: Blood Flow Demonstration with Cups

In this demo, the demonstrator has two plastic containers (“heart”) with water in them and two without water (“brain”). One straw is obstructed by a piece of clay or tape. Pairs of students can run the experiments with the obstructed and unobstructed tube simultaneously. In each pair, one student will hold the “heart” and plug the tube with their thumb and the other student will hold the “brain,” which will be filled from the “heart.” When the water is released, we see that one cup empties quicker than the other. Ask the students why this happens? It should be fairly obvious, but it will give the kids some intuition into fluids and how blood flows, etc. Turn this into a discussion on how it is important to be healthy, exercise, and eat the right foods. By not being healthy, lipids (use “fat” for the kids) build up on the inside of our **arteries** and **veins** (blood carriers), and less blood is transported to important organs in our body. In older people, this can cause Heart Attack, Stroke, etc!

If there is time, couple this demo with another demo. Have everyone raise one hand in the air for one minute. After a minute, have them bring their hands down and note the drastic change in color between their hands. Talk about how gravity (if necessary, review what gravity is) makes it easier transport their blood to the bottom hand rather than the top hand. Talk about how it may already be difficult for the **heart** to pump blood to your brain. You do not want to make it even harder by being unhealthy.

This demonstration should give the kids an idea of how blood gets transported through your body. It should also aim to help them understand that being healthy is going to allow better transportation of blood and help them avoid heart attack, stroke, etc.

### Demo 2: Bottle in tub of water to find lung capacity

This demo uses the salsa dip bowl with a 2 liter bottle. Start off this demo by asking how much air the kids think their **lungs** can hold. Show the 2 liter bottle and have the kids give a thumbs up or thumbs down on if they think their lungs can hold all the air in the bottle. Tell them, let's find out! Give each student a straw. In between each demo, clean the main clear plastic tube and refill the 2 liter bottle. Flip the bottle upside down into the salsa dip basin, and insert the clear plastic straw into the inlet. Then, insert the student's plastic straw into the clear plastic straw and have them blow (constantly and slowly). Tell them not to blow really hard, but blow at a constant pace. Give each kid a turn with this, and see how much they can fill up the bottle. At the end, try the demo yourself (you should be able to fill it easy). Tell the students that an adult **lung** can hold up to 6 liters of air! 3 times the bottle size! Pretty impressive.

If there is time at the end of the demo, have the kids use their straw for a simple demo. Have every kid plug their nose with one hand, and hold the straw in their mouth with the other. Have them breathe only through the straw. Talk about how much harder it is to breathe. Tell the students, this is how hard it is for someone to breathe who smokes. Talk about how difficult it would be to exercise, run, or play sports while only breathing through the straw.

This demonstration should give the students an idea of the capacity of their **lung**. It should also impress upon them the importance of keeping very healthy **lungs**.

### Demo 3: Create lung out of plastic bottle (PREPARATION REQUIRED)

#### Preparation:

Before hand, collect a plastic bottle for every student in the class (around 30). The plastic bottles that work well here are the small Gatorade bottles. The flimsy Crystal Geyser bottles do not work! The key here is a bottle with a pretty rigid plastic because a balloon will be stretched over the bottom of the bottle. The next step is then to cut a small hole at the bottom of each bottle, so that the incision is already made for the students to just cut around the bottle. Each student will get two balloons, so put two large-sized balloons in each bottle.

In this demo, students will get to make a model of their lung. This demo also requires the use of scissors and balloons or rubber gloves. First, show the premade lung bottle, so the kids know what they will be making. Then, have the students cut the bottom off of their bottle. Then fit one of the rubber gloves or balloons into the bottle lid. Cut off the open end of the other balloon and fit the balloon around the cut open end of the bottle.

After each student has built a model, demonstrate that if you pull on the balloon at the cut off end of the bottle, the balloon inside the bottle inflates. Show that if you push the, balloon deflates. This is kind of a more complicated concept, but tell the students that this is how the **lungs** work. Ask the students if they have heard of their diaphragm? Tell them that the balloon you are pulling on is their diaphragm. When you breathe in, your diaphragm pushes down in your body to bring in air, and pushes up to push air out. If time, and if the demonstrator wants to take on the challenge, explain the reason why this happens (the pressure difference between the air in the fixed chamber and the atmosphere).

This demo should give the students an understanding on how their body is set up to allow the intake of air. It should also give them something cool to take home and show to their parents.

### 3. Wrap-up: Sharing Experiences

\_\_\_\_\_ **10** \_\_\_\_\_ **Minutes**

*Putting the pieces together – how will students share learning, interpret experience, build vocabulary?*



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Talk about each of the demos and what they learned from each of the demonstrations. Like the introduction, write these down on a board in the classroom.

Discuss the systems of the body presented and how they function in order to keep us alive.

Reiterate the importance of keeping these systems healthy and working well. Exercise, food intake, not smoking, etc.

#### 4. **Connections & Close:** \_\_\_\_\_ **5** \_\_\_\_\_ **Minutes**

*What else might kids relate this to from their real-life experience? How can they learn more? Thanks and good-bye! Clean-up.*

They should understand why the heart and lungs work harder during exercise.  
They should understand why it is important to keep the body healthy.

**Total 60 – 70 Minutes**

### **Follow-up – After Presentation**

*Suggest students write a letter explaining “How we learned about \_\_\_\_\_?”*

*List or attach examples of activities, websites, connections for additional learning.*

*Attach worksheets, hand-outs, visuals used in classroom presentation.*

Kids will be able to take their lung model home. Just having this will be good follow up for the kids. They can show the parents and siblings what they did in class and reinforce some of the concepts learned. Also, if the kids have science journals, have them write in their science journals what they have learned.

Other resources for teachers

Write a letter to the guest scientists about what they learned (Send mail to Community Resources for Science, see footer for address).

More bioengineering lessons:

[https://www.teachengineering.org/view\\_subjectarea.php?url=collection/wpi /subject\\_areas/wpi\\_biology/biology.xml](https://www.teachengineering.org/view_subjectarea.php?url=collection/wpi /subject_areas/wpi_biology/biology.xml)

Fun activities and information for kids about the human body: <http://kidshealth.org/kid/htbw/>



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