

PARTS OF THE HUMAN BODY

BIG IDEA 14: ORGANIZATION AND DEVELOPMENT OF LIVING ORGANISMS

BENCHMARKS AND TASK ANALYSES

SC.2.L.14.1 Distinguish human body parts (brain, heart, lungs, stomach, muscles, and skeleton) and their basic function.

The student:

- identifies and labels the human body parts (brain, heart, lungs, stomach, and muscles, skeleton) on a model.
- explains the basic functions of specified body parts.

SC.2.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.

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KEY QUESTION

What are the jobs of our body parts, like the brain, heart, lungs, stomach, bones, and muscles?

TEACHER BACKGROUND INFORMATION

LUNGS

When air is inhaled, the diaphragm contracts and drops down to enlarge the chest cavity. At the same time, rib muscles contract and lift the ribs upward and outward. Air rushes in to fill the space. When air is exhaled, the diaphragm relaxes back into its up position, and the ribs settle down. The space shrinks and air is squeezed out of the lungs. Lung volume is the amount of air that can be held inside the lungs.

The size of the lungs can be compared to about the size of a pair of footballs. Air passes in through the windpipe, which divides into two branches, called the bronchial tubes. These divide into smaller tubes called bronchioles. These open into little air sacs called alveoli. You have about 600 million of these spongy sacs. Our breathing system allows us to take in air, remove oxygen from it, and exhale a body waste product called carbon dioxide. One's rate of breathing is controlled automatically in the brain.

HEART

During an average lifetime, your heart, an organ the size of your fist, will beat almost 3 billion times. The heart is the strongest muscle in the human body. The heart is located in the center of the chest between the lungs and just under the breastbone.

The heart has four chambers through which blood passes. Both sides of the heart are divided into two chambers. The upper chamber is called the atrium, and the lower chamber is called the ventricle. Blood passes through the right atrium and the right ventricle and then to the lungs, where it picks up oxygen. This oxygen-rich blood is then pumped through the left atrium and the

left ventricle and out to the body through the aorta.

SKELETON AND MUSCLES

Bones form your body's framework, but they can't move by themselves; they need extra help. Every time a bone moves, there is a muscle to move it. There are more than 600 muscles and more than 200 bones in the human body. Every moving bone has at least two muscles attached to it. Muscles work in teams because they can move in only one direction; they only pull (contract). One muscle contracts and pulls a bone to get you into a certain position. Then its partner must contract to pull the bone back and get you out of the position. A muscle can perform just one single motion. A muscle can make itself shorter by contracting. When it's not doing that, it relaxes. Tendons are the ties that bind muscles to your bones. The joints of the bones are connected by strong, fibrous tissue called ligaments.

A muscle receives an electric command from the brain through the nerves. The neurons (nerve cells) get their instructions from the brain on which muscle to move and then the electric stimulus to that muscle stimulates the muscle movement or "reflex" action.

There are three types of muscles. Skeletal muscles are the muscles that move your bones and other parts of your body, such as your eyes. They are voluntary muscles that operate on command from your brain. Smooth muscles work automatically. They are involuntary muscles, such as the muscles that control the movement of food in our stomach. They are found in the internal organs like the stomach, heart, and lungs. Cardiac muscle is muscle found only in the heart.

STOMACH

The digestive tract is the body's passageway through which food moves and digests. The digestive tract includes the mouth, esophagus, stomach, small intestine, large intestine, and the anus.

The digestive system physically and chemically breaks down food to supply the body with its energy and nutrient needs for growth and repair. The teeth physically break the food into smaller pieces. The tongue moves the food particles into a ball that is swallowed. The food moves down the throat into the esophagus, the food tube that is lined with muscles that help to mix the food and push it down toward the stomach. The stomach, which can hold two to four liters of food, kneads the food, breaking it down more. The stomach also adds chemicals to the food, turning it into a soupy liquid. The food then passes into the small intestine, a narrow tube and the longest part of the digestive tract. The food is then broken down into particles small enough to be absorbed into the bloodstream.

The digestive tract is a continuous muscular tube that runs from the mouth to the anus. An adult's digestive tract is approximately nine meters (30 ft.) in length – about five times the adult's height.

BRAIN

The nervous system is made up of the brain (the major command center), the spinal cord (the

nerve highway), and the neurons (nerve cells). The basic job of the nervous system is to assist the body as it reacts to changes in the environment and adjust to any necessary changes. It does this by split-second reactions that transfer electrical impulses via neurons along the spinal cord and then transfer this energy to the muscles and internal organs. When the nervous system is working properly, it coordinates the normal work of your trillions of cells. It monitors your internal operations as well as what goes on in the world outside your body. It senses changes in the environment and makes the necessary adjustments. It keeps things running smoothly and on course. There are, however, times when things can go wrong with the nervous system.

MATERIALS

Teacher

The Magic School Bus: Inside the Human Body by Joanna Cole and Bruce Degen
Signs for bus stops (see attached)
Pictures/models of the brain, heart, lungs, stomach, bones, muscles (optional)
Paper towels for spills/clean-up

Per group

zip-top plastic bag
saltine cracker
cardboard toilet paper tubes

Per student

die-cut school bus
one 9- or 10-inch round balloon
science notebook

Per class

pitcher of water
jigsaw puzzle (approx. 12 pieces)
2 timers
jump rope

SAFETY

- Instruct students never to taste or place in their mouths any substances used in the science laboratory setting.
- Instruct students not to touch materials without specific instructions.
- It is unsafe to touch their faces, mouths, eyes, and other parts of their body when working with different chemicals or liquids, until they have washed their hands.
- Ask students to report all accidents immediately.
- Never mix chemicals or liquids just to see what happens.

TEACHING TIPS

- Set up the six “bus stops,” or stations, with signs and pictures or models of the different organs. Also, place enough materials for each group/student at each station.
- Before going to the different stations, you may want to have students set up their notebook by folding their paper into six equal parts (one section for each station) and labeling each part.

ENGAGE

1. Read the book or show video of *The Magic School Bus: Inside the Human Body*.
2. Give each student their school bus die-cut and explain that they are going to take a trip to learn about the parts of the human body and their different jobs. They will stop at each of the six “bus stops” to learn more about the heart, brain, lungs, stomach, muscles, and bones in our bodies.
3. Instruct students to keep notes of their data and observations for each station.

EXPLORE

Station 1: The Brain

Time one student doing the jigsaw puzzle and record the score. Have the same person do the puzzle two more times, timing her/him each time. Ask: *Are the times different?* Explain.

Time #1	Time #2	Time #3

Station 2: The Heart

Pair up and listen to your partner’s heartbeat by placing the tube over the heart. Count the number of beats per 30 seconds. Add this number together twice to find out how many times per minute the person’s heart beats. Have one partner run in place, then listen again. Write down what you hear and calculate the new beats per minute. Ask: *Are the numbers the same?* Explain.

Number of heart beats/minute (before exercise)	Number of heart beats\minute (after exercise)

Station 3: The Lungs

Each student should take a balloon and stretch it until it is ready to blow up. Take a deep breath and blow up the balloon as much as they can with one breath. Pinch the opening of the balloon tightly so air cannot escape, and look at the size of the balloon. Compare the size of the balloons in your group. Ask: *Are the balloons the same size?* Explain. Order the size of your group’s balloons from smallest to largest.

Station 4: The Stomach

Put one saltine cracker and a small amount of water into a bag. Seal the bag tightly. Take turns gently massaging the outside of the bag with your fingers. Ask: *How did the cracker change?* Explain.

Food (before)	Food (after)

Station 5: Bones

Work in pairs to observe each other jumping rope. Pay attention to all the ways the body moves in order to jump rope. Ask: *Do your bones move when you jump? Where are your bones? How can you tell where your bones are?* Record your observations while the other person jumps rope. Change places and repeat.

Station 6: Muscles

Complete the following list of tasks. Decide whether or not you can control these tasks and put them in the correct place on the T-chart.

1. Stand up
2. Turn a page in a book
3. Sneeze
4. Walk
5. Get goose bumps on your arms
6. Raise a hand
7. Make your blood stop pumping
8. Make your stomach growl

Voluntary Actions (use muscles you can control)	Involuntary Actions (use muscles you cannot control)

EXPLAIN

Station 1: The Brain

Ask: *How are the person's times different? Did they improve the more times the person did the puzzle?* If the answer is yes, it means the puzzle doer's brain learned how to do the task. If the answer is no, her/his brain is still learning and needs to keep trying. Remember, what is easy for one person may be difficult for another.

The more frequently we do a certain task, the easier the task becomes. This is because our brain learns by doing. Each time we repeat a task, connections in our brains are strengthened. This means that the brain doesn't have to figure out a problem from the beginning each time because it has already learned how to get to the answer.

Station 2: The Heart

Over 170 years ago, a man named Laennec invented the first stethoscope. It was a wooden tube about 1 inch in diameter and about 10 inches long. In this activity, you used a cardboard tube as a simple stethoscope to listen to your heartbeat before and after exercise. Ask: *How did your heartbeat change?* The heart beats faster after the exercise in order to pump more blood



(oxygen) to the working muscles.

Station 3: The Lungs

Discuss the difference in the sizes of the balloons and why that might be. The balloons show your lung capacity, or how much air your lungs are capable of holding. Measuring your lung capacity helps you determine the amount of physical stamina you have available to run races, swim, blow a musical instrument, hold a note, etc. Many factors can cause differences in lung capacity. Ask: *Was there a difference between boys and girls? Was there a difference between taller and shorter people? Did anyone have a cold, allergy, or other illness? Is anyone an athlete? Is air pollution a problem for anyone? Does anyone play a wind instrument?*

Station 4: The Stomach

Ask: *How did the cracker change from before it was placed in the bag to after it was mixed with water in the bag? What do you think the cracker in this activity represents? The bag? The water?* The bag represents the stomach, the water represents digestive juices, and the hand movements represent the action of the muscles in the outer layer of the stomach. Ask: *Why are these important?*

Station 5: Bones

Have a class discussion on what the students observed while they were jumping. List all of the ways that the body moved in order to successfully jump rope. Ask: *What was allowing your bodies to move in those ways?* Lead them to the discovery of bones and muscles working together to allow those movements. Ask: *Do your bones move when you jump? Where are your bones? How can you tell where your bones are?* Have students feel for the bones inside their bodies. The skeleton is a system of bones in the human body. It is the framework that supports and protects the body. It also works with our muscles to move our body. We have 206 bones in the adult skeleton.

Station 6: Muscles

Ask: *Which of the tasks could you control? Which couldn't you control?* Muscles can be classified by how they are controlled. Discuss voluntary and involuntary muscles. Explain that tasks you can control use voluntary muscles. Explain that tasks we were not able to do use involuntary muscles. Most skeletal muscles are voluntary muscles, which allow us to easily move our bones. Heart and stomach muscles are mostly involuntary muscles.

EXTEND AND APPLY

On butcher paper, have students work in groups to outline their bodies, draw and label the organs, and describe the function of each organ. Present this information to others.

ASSESSMENT

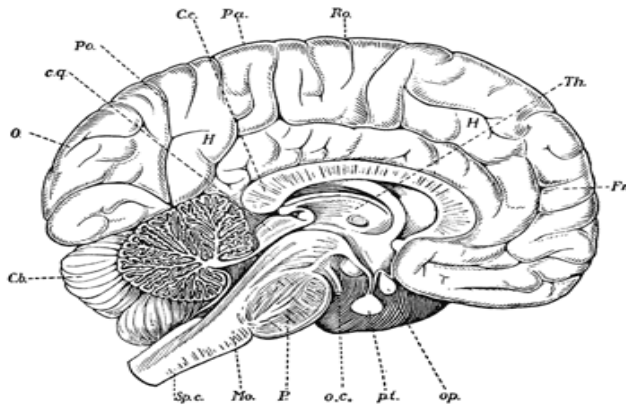
Assess student learning through class discussions and science notebook entries. The following three-point rubric may be adapted to evaluate students' work during these lessons:

3 points: Students are highly engaged in class discussions; were able to demonstrate a clear understanding of the vocabulary; give correct examples appropriate to the lesson.

2 points: Students participate in class discussions; were able to demonstrate a basic

understanding of the vocabulary; give mostly correct examples; drew pictures that were somewhat appropriate to the lesson.

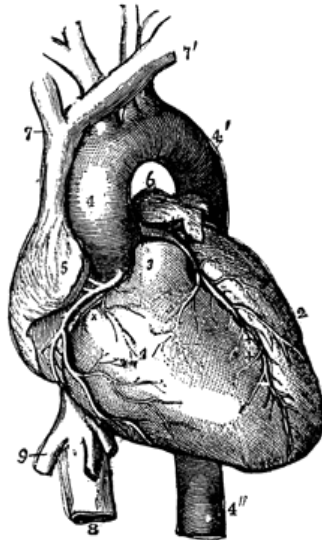
1 point: Students participate minimally in class discussions; unable to demonstrate a basic understanding of the vocabulary; could not give examples of the lesson. Pictures were incomplete and/or did not clearly identify lesson objectives.



BUS STOP #1:

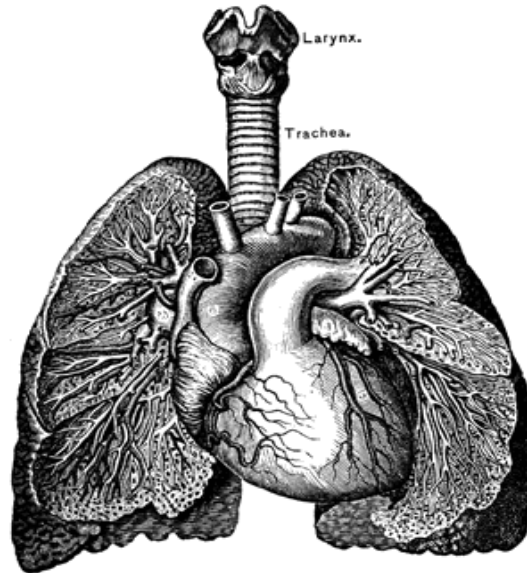
THE BRAIN

BUS STOP #2:

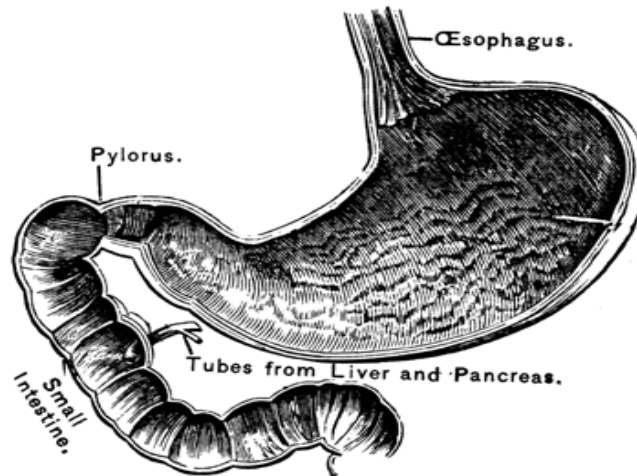


THE HEART

BUS STOP #3:



THE LUNGS



BUS STOP #4:

THE STOMACH

BUS STOP #5:



THE BONES



BUS STOP #6:

THE MUSCLES