

# Have a Heart

**Grades:** 5<sup>th</sup>-12<sup>th</sup>

**Duration:** 60 Minutes

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## **Program Description**

The heart is a beating muscle that pumps oxygen-rich blood to the body through a network of arteries. Students are the subjects in these experiments to learn about the human circulatory system. Use a digital data logger attached to a non-invasive heart sensor to measure how heart rate responds to various levels of physical activity. The students will also learn basic heart anatomy and physiology and monitor changes in heart rate with a stethoscope.

## **Louisiana GLE:**

### **Science:**

#### **Grades 5-8 Science as Inquiry**

1. Generate testable questions about objects, organisms, and events that can be answered through scientific investigation (SI-M-A1)
2. Identify problems, factors, and questions that must be considered in a scientific investigation (SI-M-A1)
3. Use a variety of sources to answer questions (SI-M-A1)
4. Design, predict outcomes, and conduct experiments to answer guiding questions (SI-M-A2)
6. Select and use appropriate equipment, technology, tools, and metric system units of measurement to make observations (SI-M-A3)
8. Use consistency and precision in data collection, analysis, and reporting (SI-M-A3)
9. Use computers and/or calculators to analyze and interpret quantitative data (SI-M-A3)
11. Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4)
23. Use relevant safety procedures and equipment to conduct scientific investigations (SI-M-A8)
24. Provide appropriate care and utilize safe practices and ethical treatment when animals are involved in scientific field and laboratory research (SI-M-A8)
26. Use and describe alternate methods for investigating different types of testable questions (SI-M-B1)
29. Explain how technology can expand the senses and contribute to the increase and/or modification of scientific knowledge (SI-M-B3)
30. Describe why all questions cannot be answered with present technologies (SI-M-B3)
37. Critique and analyze their own inquiries and the inquiries of others (SI-M-B5)
38. Explain that, through the use of scientific processes and knowledge, people can solve problems, make decisions, and form new ideas (SI-M-B6)
39. Identify areas in which technology has changed human lives (e.g., transportation, communication, geographic information systems, DNA fingerprinting) (SI-M-B7)

40. Evaluate the impact of research on scientific thought, society, and the environment (SI-M-B7)

## Grade 5

### Science as Inquiry

1. Generate testable questions about objects, organisms, and events that can be answered through scientific investigation (SI-M-A1)
3. Use a variety of sources to answer questions (SI-M-A1)
9. Use computers and/or calculators to analyze and interpret quantitative data (SI-M-A3)
11. Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4)
26. Use and describe alternate methods for investigating different types of testable questions (SI-M-B1)
27. Recognize that science uses processes that involve a logical and empirical, but flexible, approach to problem solving (SI-M-B1)
28. Recognize that investigations generally begin with a review of the work of others (SI-M-B2)
29. Explain how technology can expand the senses and contribute to the increase and/or modification of scientific knowledge (SI-M-B3)
30. Describe why all questions cannot be answered with present technologies (SI-M-B3)
31. Recognize that there is an acceptable range of variation in collected data (SI-M-B3)

## 7th Grade

2. Compare the basic structures and functions of different types of cells (LS-M-A1)
9. Relate structural features of organs to their functions in major systems (LS-M-A5)
10. Describe the way major organ systems in the human body interact to sustain life (LS-M-A5)

## 9-12th Grade

6. Use technology when appropriate to enhance laboratory investigations and presentations of findings (SI-H-A3)

### Key Terms:

**Auscultation:** (**aw-skuhl-tey-shuhn**) An examination by listening either directly with the ear (immediate auscultation) applied to parts of the body, as the abdomen; or with the stethoscope (mediate auscultation), in order to distinguish sounds recognized as a sign of health or of disease.

**Aortic Valve:** A semilunar valve between the left ventricle and the aorta; prevents blood from flowing from the aorta back into the heart

**Atria.** The two upper chambers in the heart, which receive blood from the veins and push it into the ventricles.

**Circulatory System:** The bodily system consisting of the heart, blood vessels, and blood that circulates blood throughout the body, delivers nutrients and other essential materials to cells, and removes waste products. Also called cardiovascular system.

**Formaldehyde:** A colorless, potentially carcinogenic gas having a sharp, suffocating odor. It is used in making plastics and, when dissolved in a solution of water and methanol, to preserve biological specimens. Chemical formula: CH<sub>2</sub>O.

**Formalin:** A 10% solution of formaldehyde in water; used as a disinfectant or to preserve biological specimens

**Heart:** The chambered muscular organ in vertebrates that pumps blood received from the veins into the arteries, thereby maintaining the flow of blood through the entire circulatory system.

**Mitral Valve:** A valve of the heart, composed of two triangular flaps, that is located between the left atrium and left ventricle and regulates blood flow between these chambers. Also called bicuspid valve, left atrioventricular valve.

**Pulmonary Valve:** A semilunar valve between the right ventricle and the pulmonary artery; prevents blood from flowing from the artery back into the heart

**Tricuspid Valve:** The valve between the right atrium and the right ventricle Also called right atrioventricular valve.

**Ventricles:** The two lower chambers of the heart, which receive blood from the atria and pump it into the arteries.

### **Connections to Permanent Exhibits:**

**Blood Pressure:** Check your blood pressure

**Blood Pressure:** Find your blood pressure with this exhibit.

**Beating Heart:** Grasp the two electrodes of a pulse sensor and a realistic rubber heart starts beating synchronously.

**Build a Skeleton:** Take apart a colorful layered puzzle of the human body and replace the organs, bones, and muscles one layer at a time.

### **Web Resources:**

**Heart Anatomy: Interior View:** When you point to any structure on the photograph, that region or structure will be highlighted in the smaller image to the left to help you locate it. If you click your left mouse button, the name of that structure will appear to identify it.

<http://www.gwc.maricopa.edu/class/bio202/cyberheart/hartint0.htm>

**CardioTutorials:** Use these tutorials if you need to review basic heart anatomy, physiology and EKGs. Use the Cyberheart Tutorial to learn about various factors that act on the heart.

<http://www.gwc.maricopa.edu/class/bio202/cyberheart/cardio.htm>

**HEART ANATOMY:** Use these tutorials to review basic heart anatomy.

<http://www.cardiovasculardocs.com/heart1.htm>

### **Pre-Visit Activities**

**Question:** What does the heart look like? Is it shaped like a valentine heart? Preview a virtual heart on the web. Have students draw pictures of the heart. Give students a Heart word search.

#### **Design a Poster Quick Activity**

Have students work individually, in pairs or in small groups to create a poster that encourages others to take care of their hearts for the sake of their health. Suggest that students think of a slogan or other phrase to use on the poster.

Distribute poster board and allow students time to plan and complete their work. After the posters are created, arrange for a place where they can be displayed, perhaps in school hallways or in the lunchroom.

### **Post-Visit Activities**

1. Compare the heart rates of students in the class. Are the heart rates the same or different?
2. What is the average heart rate of all the students? The average heart rate can be found by adding up the column of numbers of all the heart rates listed and dividing this number by the total number of students.
3. Have the students collect pulse rates from various adults and list this on another graph. Calculate the average heart rate for adults. How does this compare with the students' average heart rate?
4. Have students keep a record of their heart rates for one week by taking their pulse a few times a day. Note time of day and activity at the time.

### **Integration with Other Subject Areas:**

- Math - Students will calculate how many times your heart beats per minute. Hour? Day? Year?
- Health - Students will keep a record of heart rate for a period of two weeks to find their average. They will also create a healthy diet plan.
- History - Students will research the first heart transplant.
- Language Arts - Students will write a letter to their heart and tell what they will do to keep it healthy.
- Art - Students will create a poster with a message relating to the heart.

### Have students do the Heart Word Game

<http://www.americanheart.org/presenter.jhtml?identifier=3003353>

### What Does the Heart Do? Lesson Idea 3-5

#### Objective

- Explain that blood is pumped through the body in a closed system and that after it supplies nutrients and oxygen to the cells, it returns to the heart.

#### Prepare

- Download and print [Heart Word Game](#) Activity Sheet for class distribution.
- Set up several deep basins of water.

#### Materials

- “[Heart Word Game](#)” Activity Sheet, basin of water for each group of four or five students, drawing paper, pencils and crayons, chart paper, markers, two sheets of construction paper per student

#### Explore

1. Have students draw a picture of the heart. Ask them to color their drawings and then compare them with those of their classmates
2. Exactly where is your heart located? (Slightly left of the middle of the chest, between the two lungs. The tip at the bottom of the heart touches the front wall of the chest.) The heart is a pump. What is it made of? (Muscle) How do you think your heart is different from other muscles in your body; such as your arm muscles? (It works by itself, all the time. You cannot control it.) Point out that a muscle that a person does not control is called an involuntary muscle, while a muscle that a person can control is called a voluntary muscle.
3. Have students demonstrate that the heart is an involuntary muscle. Ask students to stand up. Tell them to use their arm muscles to reach over their heads. Then tell them to use their leg and foot muscles to hop on one foot and then the other. Tell them to use their muscles to run in place. Then tell them to use their heart muscle. Can you make your heart beat whenever you want it to? (No) Does your heart beat whether you think about it or not? (Yes) How is your heart different from some of the other muscles in your body? (It works whether we think about it or not; we cannot control it.)
4. Use one basin of water and your hands to demonstrate the heart's pumping action. Model the activity by putting your hands one inside the other to form a cup. Put your cupped hands under the surface of the water in a basin. Close your thumbs together so that the opening of the "cup" is only about a quarter-inch wide. Quickly squeeze your hands together, but don't close the opening at the top of your hands. Water will spurt out of your hands. Explain that this is similar to the pumping action of the heart. Let groups of four or five students use the basins of water to try the pumping activity.
5. Explain that the heart pumps blood. When it pumps, the blood does not spurt out all over the place like the water in the demonstration did. The blood flows into blood vessels, which

transport it around the body. The blood's job is to carry oxygen from the lungs and other nutrients throughout the body.

6. Demonstrate to students how to take their pulse. Using a watch with a second hand, students should sit quietly, take a one-minute pulse and record the number. Then have students stand up and do jumping jacks or run in place for one minute. Have them take a second one-minute pulse and record the number. How did your pulse rate change when you exercised? (It increased.) Why do you think this happened? Encourage students to make hypotheses.
7. Help students conclude that our hearts are always beating. They pump the blood that carries oxygen and other nutrients to all parts of our bodies. When we are sitting quietly, our hearts beat slowly. When we perform physical activity, the body's need for oxygen and other nutrients increases. For example, our leg muscles use up much more oxygen to produce the energy they need to perform vigorous exercise, so our hearts must beat faster to supply that needed oxygen. This action is reflected in an increased pulse rate.
8. Ask students to take their pulses again after sitting quietly for a few minutes. How has your pulse changed now? Why? (It has slowed down again. The muscles no longer need an increased oxygen supply.)
9. Ask students to complete Heart Word Game Activity Sheet ([link above](#)).