Texas Heart® Institute
at St. Luke's Episcopal Hospital

Project Heart
Activities for the Classroom

Grade 6: Lesson Plan 1

Anatomy: How Does The Cardiovascular System Work?

Goals

- Students will understand the basic anatomy and functions of the cardiovascular system.
- Students will understand the function of the blood within the circulatory system.
- Students will identify parts of the cardiovascular system according to the levels of organization

Instructional objectives

Students will be able to

1. Describe the basic functions of the heart and circulatory system that make up the cardiovascular system.
2. Describe the anatomy and function of the blood.
3. Trace the path of a blood cell through the cardiovascular system.
4. Discuss how to keep the cardiovascular system healthy.

Background information

The Cardiovascular (CV) System

Your heart and circulatory system make up the cardiovascular system. The walls of the heart are a special muscle known as cardiac muscle. The conduction system causes that cardiac muscle to beat, pumping blood to the organs, tissues, and cells of your body.

The one-way circulatory system carries blood to all parts of your body. Blood delivers oxygen and nutrients to every cell and removes carbon dioxide and waste products. Blood is carried from your heart to the rest of your body and back again through a complex network of vessels (arteries and veins). Arteries carry oxygen-rich blood away from your heart and veins carry oxygen-poor blood back to your heart. (In pulmonary circulation, though, the roles are reversed. It is the pulmonary artery that brings oxygen-poor blood into your lungs and the pulmonary vein that brings oxygen-rich blood back to your heart.) Twenty major arteries branch into smaller vessels called arterioles. Arterioles further branch into capillaries. Most capillaries are thinner than a hair, so tiny that only one blood cell can move through them at a time. Once the capillaries deliver oxygen and nutrients and pick up carbon dioxide and other waste, they move the blood back through wider vessels called venules. The venules join to form veins, which deliver the blood back to your heart, and sends the blood to the lungs to pick up oxygen.

The Blood

Blood is actually a tissue made of about 80% liquid. Plasma is the yellowish liquid in the blood that carries the blood cells. Plasma is mostly water, but it also contains proteins, salts, sugar (glucose), and other substances. Proteins in plasma carry important nutrients to the body's cells and strengthen the body's immune system so it can fight off infection. The solids in the blood are cells. Each of the three main types of blood cells circulates within the plasma:

- Platelets (also called thrombocytes) help the blood to clot (thicken and stop flowing).
- Red blood cells (also called erythrocytes) carry oxygen and are the most plentiful.
- White blood cells (also called leukocytes) ward off infection. When the body is fighting infection, it makes them in ever-increasing numbers (an important part of the immune system at work). Still, most healthy adults have about 700 times as many red blood cells as white ones.

Grade 6: Lesson Plan 1

Anatomy: How Does The Cardiovascular System Work?

Blood carries oxygen from the lungs and nutrients from the digestive tract to the body's cells. It also carries away carbon dioxide and all of the waste products that the body does not need. (The kidneys filter and clean the blood.) Blood also

- Helps keep your body at the right temperature
- Carries hormones to the body's cells
- Sends antibodies to fight infection
- Contains clotting factors to help the blood to clot and the body's tissues to heal

Materials

1. Illustration: The City Map (Activity 6–A)
2. Illustrations: Heart Anatomy
   (for review: PDFs from *Look: Heart Anatomy*)
3. Illustrations: The Circulatory System
   (PDFs from *Look: Circulatory System*)
4. Illustration: The Blood
   (PDF from *Look: Circulatory System*)
5. Worksheet: "The Body Map" (Activity 6–B)
6. Worksheet: "The Blood Cells" (Activity 6–C)
7. Worksheet: "Why I Don't Smoke" Extension
   (Activity 6–D)
8. Optional: Classroom computer with Internet access
   – Project Heart, Look, Circulatory System, *Blood Vessels of the Heart: Coronary Arteries (Flash)*
   – Project Heart, Listen, Heartbeats

Introduction

Place illustrations of *The City Map* and *The Circulatory System* at the front of the room. If you have Internet access, display *The Circulatory System* found under the *Look* tab of the Project Heart website. Begin your discussion by asking students if they have ever helped their family or friends use a road map to travel in and out of the city. Referring to *The City Map* illustration, explain that all traffic moves in and out of the city by way of the roadways, and that many of those roadways are one-way streets. Vehicles travel into town to pick up fuel and groceries (nutrients), and take them home to use. Explain to students downtown is often called the "heart of the city" because it is the center of activity.

Discussion points

- How do people travel?
- Is every roadway the same size?
- Why do people need to travel into town?
- What fuel or nutrients do people need to pick up?

Lesson procedures/activities

1. Begin the lesson by comparing the city map to the circulatory system. Blood cells (like vehicles) travel one-way paths called veins (roadways) to the heart and lungs, where they drop off waste (like recycling), and pick up oxygen and nutrients (like fuel and food). When the nutrient- and oxygen-rich blood travels back out to the cells (home), it goes by way of another set of one-way paths called arteries (roadways). To help students relate to the concept, point out that the state department of transportation calls major city streets arteries. Ask students for some other examples of heart-related terms used to refer to something other than the cardiovascular system.

   Explain that the cardiovascular system is made up of the heart and the circulatory system. If necessary, review the basic anatomy of the heart and circulatory system. Refer back to *The City Map* illustration, explain the heart's role as traffic director in the pick up and delivery system.

2. Ask students to compare the anatomy and function of veins and arteries by having them discuss the role of each in the circulatory system. As independent practice, have students write and illustrate a 1-page report reviewing both types of blood vessels. (Students should discover that arteries are stronger, have thicker walls, and do not have valves like veins do.)

3. Discuss the anatomy of the blood and the role it plays in the body. The blood moves through the cardiovascular system delivering fuel and nutrients to, and removing waste from, every cell in the body. As independent practice, have students complete the worksheet "The Body Map" (Activity 6–B).

   Review 3 types of blood cells (red, white, and platelets) and discuss each cell's role in the health of the body. Refer to the illustration, *The Blood* (PDF in Project Heart, Look, Circulatory System). Ask students to complete the worksheet "The Blood Cells" (Activity 6-C).

   Review the levels of organization: cell—tissue—muscle—organ—organ system—organism—population. Use the

Grade 6: Lesson Plan 1

Anatomy: How Does The Cardiovascular System Work?

heart as your organ. This will be a good review of the cardiovascular system and help students understand the levels of organization in the body and in their community. The concept of circulation is repeated at every level from cell to solar system.

Guided Practice

Break the students into groups and assign each group a specific type of blood cell. Ask them to research the following questions:

a) What is the function of this specific type of cell?
b) How many of this specific cell type are in the body?
c) What is the relative size of this specific blood cell type?
d) How is this specific blood cell type different from others?
e) How long does this specific type of blood cell live?

Ask the groups to draw the blood cell and list all its characteristics and functions. Guide students in thinking about the cell as it relates to keeping a body healthy (specifically the heart). Posters can be used to present materials to the class. If the classroom has a mini-computer lab, students may want to develop PowerPoint presentations, using materials they find online at the Project Heart website. Be sure to check out the "Look" section for resources and the "Suggested Links" page for additional research sites.

Adaptations

Students who have difficulty with writing may have their assignments adapted by allowing them to verbalize, demonstrate, or illustrate their responses.

Extensions

1. Provide a list of terms from this lesson plan. Ask students to make their own crossword puzzles by defining the terms and using the definitions as clues. Remind students to design the puzzle layout so that each term crosses at least 2 other terms.

2. Ask students to research how smoking affects the heart and blood vessels. Point out that smoking increases the risk of heart and peripheral vascular disease (PVD). Nicotine and other chemicals in cigarettes narrow the blood vessels, can create irregularities in the timing of heartbeats, and can lead to a buildup of fatty plaque that clogs the arteries. (Plaque is a buildup of substances such as cholesterol and calcium on the blood vessel walls. Plaque eventually causes the inside of the artery to narrow, making it difficult for blood to flow through.) In addition, smoking interferes with the blood cell's ability to deliver oxygen to the heart and other organs. All these effects cause the heart to work too hard. Using the worksheet "Why I Don't Smoke" (Activity 6–D) as a basis, ask students to create posters addressing the risks of smoking. Share the posters with other students and other classrooms. This is an excellent opportunity for you to correlate cardiovascular system anatomy with health issues in the school community and beyond.

Assessment

You may use observations of students during class activities and responses for written activities to determine their understanding of the lesson objectives.

Objective	Demonstrated lesson objective	Partially demonstrated lesson objective	Did not demonstrate understanding of the objective
Describe the basic function of the circulatory system.	**X**		
Describe the basic function of the cardiovascular system.		**X**	
Describe the anatomy and function of the blood.		**X**	
Trace the path of a blood cell through the cardiovascular system.			**X**
Discuss how to keep the cardiovascular system healthy.	**X**		