



## Plant Vascular System and Human Cardiovascular System

*Total time ~50 minutes*

### Overview

Students will learn about the human circulatory system and the plant vascular system; and observe how the two systems function.

### Objectives:

After this lesson students will be able to:

- **List** physical/functional similarities of the circulatory/vascular systems of animals and plants.
- **Identify** physical/functional differences of the circulatory/vascular systems of animals and plants.
- **Describe** how water travels through plants.

### Vocabulary:

- Humans
  - Circulatory system
    - a system where the fluid moves in a circle
  - Blood
    - a fluid that transports nutrients and oxygen in the body
  - Heart
    - a muscle that pumps blood through the body to other organs
  - Arteries
    - blood vessels that bring blood away from the heart to other organs
  - Veins
    - blood vessels that bring blood back to the heart
- Plants
  - Xylem
    - Structures where water flows up the plant from the roots
  - Phloem
    - Structures where nutrients flows in both directions through the plant

### Materials

- Celery (with and without leaves)
- Food dye for water
- Beakers or glass cups
- Knife or scissors safe for students

### Preparation

1. Fill beakers or cups about  $\frac{3}{4}$  of the way with water.
2. Add food dye for water and stir until dissolved.
3. Add stalk of celery into the water

**This activity should be done the day before or at least 1 hour before this lesson is taught to achieve the necessary results**

## 1. Human Circulatory System

1. [Human Circulatory System Video](#)
  - a. Note that in the presentation the video has been shortened
    - i. Info in the beginning of the video may be confusing for students
2. At their tables have students discuss what happens to their food after they eat it and how they think the nutrients move to every part of the body.
  - a. **Blood** carries nutrients to every part of the body
3. Veins v. Arteries
  - a. To remember the difference between veins and arteries use “A is for Away” since arteries bring blood away from the heart

## 2. Activity: Human Circulatory System

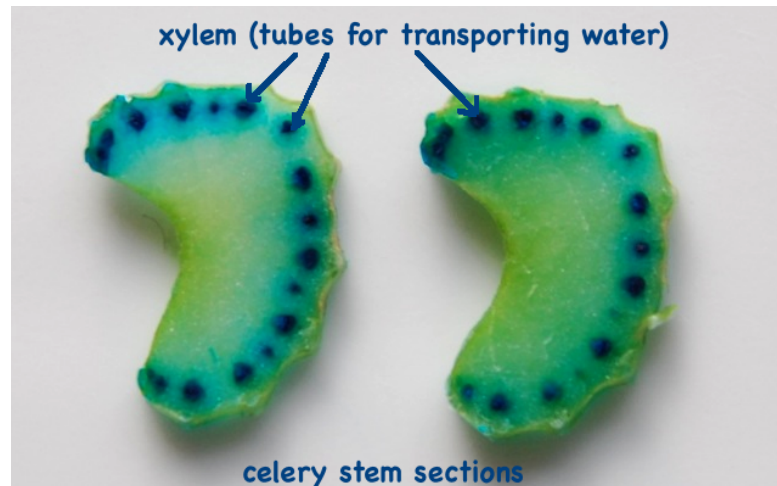
1. Let's observe the contractions of the heart by feeling pulse
  - a. Have one student place forearm and hand, palm up, on the table
  - b. The elbow partner will then place their index and middle finger on the area slightly below the wrist and apply some pressure
  - c. A pulse should be felt, this is the movement of blood pumped by the heart to the hand
  - d. Students couldn't see the arteries, but the pulse they are feeling is blood flowing through the arteries via heart contraction

## 2. Activity: Human Circulatory System

1. [Plant Vascular System Video](#)
2. At their tables have students discuss how nutrients travel through plants. How is this similar and different from humans?
  - a. Nutrients travel through plants via the phloem and are carried by water. In humans nutrients travel through arteries and are carried by blood.
3. How do plants obtain water?
  - a. Answer: plants are watered or they absorb water, water absorption happens via roots and travels through the xylem up the plant to the leaves
4. What is the correct way to water plants?
  - a. Plants must be watered at the roots since the roots are able to absorb water. Watering plants at the leaves does nothing because leaves CANNOT absorb water.
  - b. Leaves actually release water, but this is not necessary to tell students unless they have a question

## 3. Activity: Observe Plant Vascular System in Celery

1. Have students bring the prepared celery to their tables
2. Students will now cut the celery lengthwise and widthwise
3. Have the students look at the cuts
  - a. What do they observe?
4. Ask students what structure did the dye move up the celery and why?
  - a. The dye moved up the xylem of the celery and that is because xylem carries water up the plant to the leaves
  - b. This is what student should observe



### 3. Activity: Observe Plant Vascular System in the Garden

1. For each group find one plant in the garden with a green stem, for example the stem of a flower
2. Be sure that each group has a different plant
3. The stem should be soft and at least 1/4th of an inch thick for easy viewing
4. Cut the stem and bring the cut stem inside the classroom
5. Now cut the plant stem width-wise
6. Look at the cut and view the inside of the stem, use a magnifying glass if necessary
7. Is it hollow or filled? Are there many circles or few? Different sizes of circles?
8. Draw the inside of the plant stem on your handout or journal and the whiteboard
9. Come up with ideas to why the plant stems are different. How tall is the plant? Does it have a lot of leaves? How thick was the stem? Does the plant have fruits? Was the plant supported by anything?
  - a. Each plant will have a unique xylem and phloem structure which helps the plant survive. Students should understand that the plants have different structures because they have different needs. Students may ask questions about the specific pattern in each cut of each plant, unfortunately that is beyond the scope of this lesson.

#### 4. Closing Activity/Snack

Students will be eating swiss chard as the leaves of this vegetable have very clear xylem and phloem and can be identified. The [recipe](#) used will be a simple swiss chard salad.

#### 5. Student Reflection Questions:

1. Humans have the heart to pump blood throughout the human body, but since plants have no heart how does the water and nutrients travel from one part of the plant to the other?
2. Do you think all plants have the xylem and phloem system or is there another method of obtaining water?
3. Does water leave plants in any way or does water stay in the plants forever?

#### 6. Assessment Questions:

1. Which blood vessels bring oxygen to the body?
  - a. **Arteries**
  - b. Veins
2. In what direction does the fluid flow through phloem?
  - a. Same a xylem
  - b. Opposite of xylem
  - c. **In both directions**
  - d. Against gravity

#### 7. Diagrams

Plant Vascular System Diagram

# XYLEM AND PHLOEM

