



## Lesson: (Heart) Beat the Clock

### Objective:

Students will understand the function of the circulatory system and the role of the heart in pumping blood through the body. They will recognize the pumping power of the human heart by attempting to move 5 liters of water in one minute using a 1/4 measuring cup. In addition, students will compare the pumping capacity of a human heart to that of a giraffe by attempting to move 5 liters of water in one minute using a tablespoon.

### Competencies Covered:

- Make observations in familiar or unfamiliar contexts
- Make predictions about the findings of their inquiry
- Observe, measure, and record data, using appropriate tools, including digital technologies
- Use equipment and materials safely, identifying potential risks
- Identify patterns and connections in data
- Demonstrate an understanding and appreciation of evidence
- Transfer and apply learning to new situations
- Communicate ideas, explanations, and processes in a variety of ways

### Materials:

- 2 large dishpans, buckets, or bowls per pair of students
- 1 gallon (1.3 gallons) of water per pair of students
- 1/4 cup measuring cup per student
- Tablespoon per student competitor
- Watch or timer
- Whiteboard or chart paper
- Markers

### Background Information:

#### *The Circulatory System:*

The circulatory system is a vital part of the human body responsible for delivering essential substances, such as oxygen and nutrients, to all cells and tissues while removing waste products like carbon dioxide. It consists of the heart, blood vessels, and blood. The heart acts as a powerful pump, pushing blood through a network of blood vessels that run throughout the body.

### *The Heart:*

The heart is a muscular organ located slightly to the left of the center of the chest. It is responsible for pumping blood throughout the body continuously, ensuring that all organs and tissues receive the necessary oxygen and nutrients. On average, an adult's heart beats about 60 to 100 times per minute, but it can increase during physical activity or in response to various situations.

### *Blood Vessels:*

Blood vessels are like a vast network of highways that transport blood to every part of the body. There are three main types of blood vessels: arteries, veins, and capillaries. Arteries carry oxygen-rich blood away from the heart, while veins carry oxygen-depleted blood back to the heart. Capillaries are tiny, thin-walled vessels that connect arteries and veins, allowing for the exchange of nutrients and waste products between blood and body tissues.

### *Blood:*

Blood is a complex fluid that carries out several crucial functions in the body. It consists of plasma, red blood cells, white blood cells, and platelets. Plasma is a yellowish liquid that carries the blood cells and other substances throughout the body. Red blood cells contain hemoglobin, a molecule that binds to oxygen and transports it to the body's tissues. White blood cells are part of the body's immune system, defending against infections and diseases. Platelets play a crucial role in blood clotting to stop bleeding when there's an injury.

### *Heart Rate:*

The heart rate is the number of times the heart beats per minute. It varies depending on factors like age, physical activity, and emotions. For example, children typically have higher resting heart rates than adults due to their smaller bodies and faster metabolism.

### *Comparing Human Heart to Other Animals:*

The human heart is powerful, but some animals have even more impressive circulatory systems. For instance, giraffes, like many other large animals, need an extraordinary amount of blood pumping to reach all parts of their bodies, given their immense height. They have a large heart and specialized adaptations in their blood vessels to cope with the unique challenges of pumping blood to their brains and extremities.

By understanding how the circulatory system works, including the heart's role as a pump and the significance of blood vessels and blood components, students can appreciate the complexity of the human body and the importance of keeping their hearts healthy through proper nutrition and physical activity. The

"Beating the Clock" activity is designed to give students a hands-on experience of the heart's pumping power, helping them grasp the concept of blood circulation in a fun and engaging way.

### Procedure:

#### *Introduction (15 minutes):*

- Begin the lesson by briefly reviewing the circulatory system and the role of the heart in pumping blood throughout the body. Use diagrams or illustrations to help visualize the process.
- Explain that today's activity will involve a fun challenge to help students understand the pumping power of the human heart and compare it to other animals.

#### *Activity 1: Beating the Clock with a 1/4 Measuring Cup (20 minutes):*

- Divide the students into pairs and distribute the materials for the activity.
- Instruct each pair to fill one dishpan with 5 liters of water (4.9 liters if available) and place it next to an empty dishpan.
- Provide each student with a 1/4 measuring cup and set a watch or timer for 1 minute.
- Challenge the students to try to move all the water (5 liters) from one dishpan to the other in one minute using only the 1/4 measuring cup as a scoop.
- Allow two students at a time to compete in "beating the clock." If no one succeeds, encourage other pairs to attempt the activity.
- After the activity, gather the students and discuss their experiences. Ask them why it was challenging to move all the water in just one minute.

#### *Activity 2: Comparing to a Giraffe with a Tablespoon (20 minutes):*

- Repeat the setup as in Activity 1, but this time give each student a tablespoon instead of a 1/4 measuring cup.
- Set the timer for 1 minute and challenge the students to move all the water (5 liters) from one dishpan to the other using the tablespoon as a scoop.
- After the activity, gather the students and discuss their experiences. Ask them if they found it easier or harder than the previous activity and why.
- Explain to the students that a giraffe can pump up to 60 liters of blood through their body in under a minute, which is approximately 5 times the amount a human heart can pump in the same time frame.

#### *Conclusion (5 minutes):*

- Summarize the activities and the key points learned during the lesson about the circulatory system and the pumping capacity of the heart.
- Have a short discussion about the importance of a healthy heart and ways to take care of it, such as eating a balanced diet, staying physically active, and avoiding harmful substances.
- Encourage students to appreciate the incredible work their hearts do to keep their bodies functioning.

*Assessment:*

During the activities, observe students' engagement and understanding. Use questioning during the conclusion to assess their grasp of the lesson's concepts. Additionally, you can assign a follow-up worksheet or a creative project where students illustrate and explain the process of blood circulation in the human body and compare it to other animals.