Heart to Heart - STEAM Activity

Purpose:
The main objective of this exercise is to introduce how the human heart works. This lesson will be divided into four different lessons, including an introduction to heart anatomy, heart beats and pulses, and the circulatory system. We will be using coloring activities, stethoscopes, and handmade pumps to reinforce the concepts seen in this lesson.

Vocabulary
- **Artery**: A blood vessel that carries blood high in oxygen content away from the heart to the farthest reaches of the body.
- **Vein**: A blood vessel that carries blood low in oxygen content from the body back to the heart.
- **Atrium**: One of the two upper cavities of the heart that passes blood to the ventricles.
- **Ventricles**: One of the two lower chambers of the heart that receives blood from the atria.
- **Valves**: Tissue-paper thin membranes attached to the heart wall that constantly open and close to regulate blood flow.
- **Pulse**: A rhythmical, mechanical throbbing of the arteries as blood pumps through them.
- **Heart Rate**: The number of times per minute that the heart contracts - the number of heart beats per minute (bpm).
- **Taquicardia**: A high resting heart rate that is usually higher than 100 beats per minute.
- **Bradycardia**: A low resting heart rate that is usually lower than 60 beats per minute.
- **Circulation**: The movement of blood through the vessels of the body by the pumping action of the heart. It distributes nutrients and oxygen and removes waste products from all parts of the body.
- **Pulmonary Circulation**: The portion of the circulatory system that carries deoxygenated blood from the heart to the lungs and oxygenated blood back to the heart.
• **Systemic Circulation:** Portion of the circulatory system that carries oxygenated blood from the heart throughout the body and deoxygenated blood back to the heart.

**Part One: Heart Anatomy**

**Materials**
- “Heart Coloring Activity” Printouts - See below
- Colored Pencils, Markers and/or Crayons

The heart is a pump, usually beating about 60 to 100 times per minute. Every time it beats, the heart sends blood throughout our bodies, carrying oxygen to every cell. After delivering the oxygen, the blood returns to the heart. The heart then sends the blood to the lungs to pick up more oxygen. This cycle repeats over and over again.

**Important Structures of the Heart:**
The heart has four chambers — two on top and two on bottom:

- The two bottom chambers are the **right ventricle** and the **left ventricle**. These pump blood out of the heart.
- The two top chambers are the **right atrium** and the **left atrium**. They receive the blood entering the heart.

The atria are separated from the ventricles by the atroventricular valves:
- The **tricuspid valve** separates the right atrium from the right ventricle.
- The **mitral valve** separates the left atrium from the left ventricle.

Two valves also separate the ventricles from the large blood vessels that carry blood leaving the heart:
- The **pulmonic valve** is between the right ventricle and the **pulmonary artery**, which carries blood to the lungs.
- The **aortic valve** is between the left ventricle and the **aorta**, which carries blood to the body.
Heart Coloring Activity

This drawing shows how blood flows through the heart.

**Color Me:**
The areas of the heart with more oxygen are labeled with an “R”. Color these areas RED.

The areas of the heart with less oxygen are labeled with a “B”. Color these areas BLUE.
Part Two: Heart Beats and Pulses

For this portion of the activity, we will be feeling your pulses. We will also identify the most common spots to feel our pulse. We will measure our heart rate, do some math, and find out how our heart changes depending on what we are doing.

Materials

- Stopwatch
- An open space
- Pencil
- Lab Notebook

This figure shows the most common spots where you can a pulse in the human body.

Directions:

1. Locate a strong pulse at a pulse point (usually carotid or radial)
2. Using a stopwatch, count how many pulses you feel in 10 seconds.
3. Write the number down and multiply by 6
4. Compare your result to the table of values below
5. Find a safe, open space to do 20 jumping jacks
6. Repeat steps 1 to 3.
7. Wait 5 minutes.
8. Repeat steps 1 to 3.
Your pulse is the rhythmic and mechanical throbbing of the arteries as blood pumps through them. It's different from your heart Rate which is the number of times per minute that the heart contracts - the number of heart beats per minute (bpm). Keep in mind that your pulse is what you feel over an artery as the pressure inside increases following each heart beat. The average pulse rate is between 60 and 100 beats per minute. Many factors will affect the pulse rate both in health and illness. The most obvious is during exercise when the pulse rises. However, athletes in training may have slower than average pulse rates at rest. Disease may affect the pulse rate either up or down.

<table>
<thead>
<tr>
<th>Bradycardia</th>
<th>Normal</th>
<th>Tachycardia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 60 bpm</td>
<td>60 to 100 bpm</td>
<td>More than 100 bpm</td>
</tr>
</tbody>
</table>

**Part Three: DIY Stethoscope**

When you go for a checkup, your doctor uses a stethoscope to listen carefully to your heart. A healthy heart makes a lub-dub sound with each beat. This sound comes from the valves shutting on the blood inside the heart.

The first sound (the lub) happens when the mitral and tricuspid valves close. The next sound (the dub) happens when the aortic and pulmonary valves close after the blood has been squeezed out of the heart. Next time you go to the doctor, ask if you can listen to the lub-dub, too.

**Materials**

- Two Small Funnels (One a bit larger than the other)
- 2 Ft of Clear Plastic Tubing
- Balloons
- Electrical Tape
- Scissors

**Directions**

1. Snip the end off of the balloon.
2. Pull the balloon over the end of the funnel and secure it with electrical tape. Be sure the balloon is pulled tight and flat.
3. Place both ends of the tubing onto the funnels.
4. Tape the tubing to the funnels if needed to secure the ends.
5. Be sure the room is quiet. Place the balloon end over your heart.
6. Listen in the other end. If the sound is too faint to hear, try running around and getting your heart going. Then listen again.

Note: You can use a smaller funnel for the listening end, and this helped us hear the sound better than using the larger funnel.

Part Four: The Circulatory System

For this portion of the activity, we will see how different structures play a role in how blood flows through hearts, lungs and the body lungs and body.

Materials

- Cups (see through cups work best)
- Plastic tubing
- Water
- Red and Blue food coloring
- Pencils

What Does the Circulatory System Do?
The circulatory system is made up of blood vessels that carry blood away from and towards the heart. Arteries carry blood away from the heart and veins carry blood back to the heart.

**What Are the Parts of the Circulatory System?**

Two pathways come from the heart:

- The **pulmonary circulation** is a short loop from the heart to the lungs and back again.
- The **systemic circulation** carries blood from the heart to all the other parts of the body and back again.

The diagram above illustrates the heart playing a central role in both pulmonary and systemic circulation.

**Directions**

1. Obtain 4 see-thru cups and 2 balloons. Label the cups 1 to 4.
2. Cut the stem off the 2 balloons, leaving the bulb only.
3. Add water to cups 1 to 3.
4. Place 2 drops of red food coloring to cups 2 and 3.
5. Place 2 drops of blue food coloring to cups 1 and 4.
6. Add water to cup 1 about ¾ full.
7. Place a bulb of a balloon over the rim of cup 2 and 3.
8. Once cups 2 and 3 are covered, skewer 2 holes in each of the balloon covers.
9. Carefully insert a plastic tube into each hole. Make sure each end touches the bottom of the cup.
10. If done correctly your layout should look like the following:

11. Push down on the balloon cover of cup 2.
   a. What do you notice?
12. Next, push down on the balloon cover of cup 3.
   a. What do you notice?

Quick Review:

Word Bank: (Ventricles, Atriums, Lungs, Body)

Cup 1 most closely resembles: ____________________
Cup 2 most closely resembles: ____________________
Cup 3 most closely resembles: ____________________
Cup 4 most closely resembles: ____________________
How Can I Help Keep My Heart Healthy?

To help keep your heart healthy:

- Get plenty of exercise.
- Eat a healthy and balanced diet.
- Reach and keep a healthy weight.
- DON’T EVER SMOKE!
- Go for regular medical checkups.
- Tell the doctor about any family history of heart problems.

References
