Standards:

- The proposed Academic Standards for Health, Safety & Physical Education, state in standard 10.1.6 that Pennsylvania’s public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:
  - B. Identify and describe the structure and function of the major body systems.

- The proposed Academic Standards for Health, Safety & Physical Education, state in standard 10.4.6 that Pennsylvania’s public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:
  - A. Identify and engage in moderate to vigorous physical activities that contribute to physical fitness and health.
  - B. Explain the effects of regular participation in moderate to vigorous physical activities on the body systems.
  - C. Identify and apply ways to monitor and assess the body’s response to moderate to vigorous physical activity.
    - Heart rate monitoring.

- The proposed Academic Standards for Science and Technology, state under Unifying Themes in standard 3.1.7 that Pennsylvania’s public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:
  - A. Explain the parts of a simple system and their relationship to each other.
    - Describe a system as a group of related parts that work together to achieve a desired result (e.g., digestive system).

I. Performance Objectives (Learning Outcomes):

- The student will be able to identify and apply heart rate monitoring to assess the body’s response to moderate to vigorous physical activity with 90% accuracy.

- The student will be able to identify the circulatory system as a group of related parts that work together to achieve a desired result, and locate its major body organs with 95% accuracy.

II. Instructional Materials:

- Slow music from Enya
- Music of the Locomotion
- Fast music
- 5 Cones
• Sticker names for each part of the circulatory system
  o Purple: Vein
  o Orange: Artery
  o Pink: Heart
  o Blue: Lungs
  o Green: Capillaries
• 8 or more hoops
• CD player
• Stopwatch
• 16 Handouts for recording heart rate
• 16 Handouts of graphs
• Display of Cindy the Circulatory System Specialist
• Display of 2-D heart
• 16 colored pencils for graphing

III. Subject Matter:
• Students have an oral understanding of terms such as “cell, microscopic, organs, network, gases, liquids, and values.”
• Students have already been introduced to the circulatory system and it is major characteristics during science class, and are familiar with the book *The Magic School Bus Inside the Human Body*, by Joanna Cole.
• Students have an understanding of the eight fundamental locomotor skills, including walking, running, leaping, hopping, jumping, galloping, sliding, and skipping.

A. The Circulatory System
   a. The circulatory system is a group of organs that transports:
      i. Oxygen to and carbon dioxide from all cells to the body.
      ii. Nutrients to all body cells.
      iii. Infection fighting cells to injured or endangered areas of the body.
   b. The part of the circulatory system we will discuss (pulmonary circulation) carries the blood to and from the lungs.
   c. The circulatory system will be introduced as means of transportation through which a network of billions of tiny streams flow through our blood vessels. In our bodies, these streams can flow downhill and up as well. However, the body needs some kind of pump to keep pushing the blood along in the pipes or streams. That pump is the heart.

B. The Major Body Organs of the Circulatory System
   a. The Blood Vessels (Three Types)
      i. Arteries—Carry blood away from the heart; the main vessel is the aorta. They carry blood quickly to major parts of the body. They divide and branch into smaller vessels as they reach all parts of the body. You feel your pulse in the arteries. They have thick walls to withstand pressure of the heart pumping.
      ii. Veins—Return blood to the heart and lungs. They carry blood toward the heart and have thin walls and values to keep blood flowing in one direction against gravity.
      iii. Capillaries—Are microscopic vessels. This is where the exchange of gases and liquids take place. The capillaries are only one cell wide.
b. **The Heart**—The human heart is a bit larger than the closed fist. It is a hollow muscle with four chambers. The heart muscle is an involuntary muscle. It beats constantly for a lifetime. It beats about 100,000 times a day. It will pump from five quarts (at least) to 30 quarts of blood a minute.

c. **The Lungs**—The human lungs are a pair of organs, located on either side of the heart and occupying a large portion of the chest. Air enters the body through the nose, travels to the chest, and then divides into each lung.

### C. Prescription for a Healthy Heart

a. Get Plenty of exercise  
b. Follow a good diet  
c. Keep your heart clean and drug-free  
d. People who do not follow this prescription often develop some form of heart disease.

### IV. Implementation:

**Introduction (2 min)**— The teacher will have the students sit on the floor of the gym, with a notebook to write upon, and a pencil. The teacher will begin by reviewing the circulatory system with the students. “Boys and girls, we have been learning about body systems. I hope you remember our friend **Cindy the Circulatory System Specialist**. We learned in science class yesterday that the arteries, veins, capillaries, and lungs are all major body organs of the circulatory system. Can someone name the body organ of the circulatory system that I did not mention? *(The heart)* Very good, today we are going to focus on our hearts. Remember that our hearts are about the size of the closed fist. It is a hollow muscle with four chambers, and it is an involuntary muscle. It beats constantly for a lifetime, or about 100,000 times a day. Before we begin our activity for today, we need to learn how to take our pulse rate. Your pulse is taken by touching one of several **pulse points** located on your body. Those points are on your wrist, forearm, and neck.” The teacher will model the correct form to take a pulse. “These spots are areas where the arteries are near enough to the surface of the skin that the movement of blood through them can be felt. Since the artery keeps pace with the heart, doctors can measure heart rate by counting the contractions of the artery. Find the area where you are best able to feel your pulse.”

**Development (7 min)**—At this time, the teacher will hand out the **Pulsating Heart Rate Activity** worksheet to the students, and have them write their names on the sheet. Stickers with group names will be connected to the top of each handout designating them to a particular group. The groups will be named, arteries, veins, capillaries, lungs, and heart. The teacher will tell the students to put the stickers on their shirts. “Boys and girls, I want everyone to find their pulse right now, and when I say go, I want you to count how many times it pulsates.” The teacher will then use a stopwatch, and have the students take their pulse for ten seconds as they are sitting in a resting position. She will have them write that number down on their sheet by **Resting Heart Rate**, then multiply that number by 6 to obtain their pulse number for one minute.

The teacher will tell the class that each group has a designated “home” cone to which they will report to when instructed. Each cone will be color coded according to their stickers for each group.
The teacher will then have the students put their handout and pencils in a safe space on the side of the gym area. Then she will tell the students that they will be walking around the cones in the gym to the pace of some slow soothing music by the artist Enya. They will start by their home cone, and every other cone they walk to, they must stop as a group, and find a way to balance (either individually or together as a group) and hold it for five seconds. They must continue to walk around the cones, and stopping at every other cone. During the activity, the teacher will walk with the students while checking for proper balancing skills. At the end of approximately one and half minutes, the teacher will say, “Freeze and find your pulse.” Immediately the teacher will use the stopwatch and have the students take their pulse for ten seconds. Then the teacher will instruct the students to write their number on their papers by Slow Moving Heart Rate, and then immediately report back to their home cone for further instructions.

After every student is back to their home cone, the teacher will have the music to the “locomotion” playing while the students form a “locomotion line.” However, instead of doing the traditional “hands on waist”, the students will do locomotion skills while holding hands in the locomotion line. The teacher will begin as the leader and model a locomotion skill while passing two cones. At the second cone, the leader breaks off and runs to the back of the line, making the next person in line the leader. The leader chooses the locomotion skill while the rest of the group must follow. During the activity, the teacher will keep pace with the students and provide positive feedback. This activity is repeated for approximately one and half minutes, and then teacher will say, “Freeze and find your pulse.” Immediately the teacher will use the stopwatch and have the students take their pulse for ten seconds. Then the teacher will instruct the students to write their number on their papers by Medium Moving Heart Rate, and then immediately report back to their home cone for further instructions.

The teacher has set out hoops on the floor while the students wrote on their handouts. For the next activity, the students must run as fast as possible around the cones, while jumping with one or two feet in the hoops when they come to them (like hopscotch), and then continue running. The teacher will quickly model the behavior. This is done to a very energetic and fast piece of music. During the activity, the teacher will keep pace with the students and provide positive feedback. This activity is repeated for approximately one and half minutes, and then teacher will say, “Freeze and find your pulse.” Immediately the teacher will use the stopwatch and have the students take their pulse for ten seconds. Then the teacher will instruct the students to write their number on their papers by Fast Moving Heart Rate, and then immediately report back to their home cone for further instructions.

Now it is time to reverse the process of the above explanation and begin to lower the pulse using slower paced music. The teacher will have the students will start by their home cone, and every other cone they walk to, they must stop and stretch for five seconds. They must continue to walk around the cones, and stopping at every other cone, while the slow paced music plays. At the end of approximately one and half minutes, the teacher will say, “Freeze and find your pulse.” Immediately the teacher will use the stopwatch and have the students take their pulse for ten seconds. Then the teacher will instruct the students to write their number on their papers under Reverse Order, Slow Moving Heart Rate, and then find a seat on the gym floor. The Medium Moving Heart Rate, Reverse Order, is skipped in this lesson due to the time constraint.
Closure (1-2 min)—At this time, the teacher will handout the *Graphing Heart Rate* worksheet and colored pencils, and have students read and follow the directions. At the end of approximately one minute, the teacher will say, “Freeze and find your pulse.” Immediately the teacher will use the stopwatch and have the students take their pulse for ten seconds. Then the teacher will instruct the students to write their number on their papers under *Reverse Order, Resting Recovery Heart Rate*.

The teacher will close the lesson by discussing with the students “Why did we do this? What did this demonstrate?” We learned that our heart is strong, and that the average heart contracts and relaxes about 70-80 times per minute without you ever having to think about it. As the heart contracts it pushes blood through your body, and it is regulated by the speed of your muscle contractions. When you run, your heart pumps more quickly. When you sleep, your heart pumps more slowly. However, throughout life your heart needs to be maintained and kept healthy in order to function. One way to keep your heart healthy is through moderate to vigorous physical activities that contribute to physical fitness and health. By getting plenty of exercise, following a good diet, and keeping your heart clean and drug-free, you will have a healthy heart.

If there is time, the students may compare their results from the graph with a friend or classmate.

V. Evaluation of Students:
The students will be evaluated based primarily on informal assessment of the locomotor skills, participation, and completion of the *Pulsating and Graphing* worksheet, to whether they were able to identify and apply heart rate monitoring to assess the body’s response to moderate to vigorous physical activity. In addition, the student will also be assessed for recall of the circulatory system as a group of related parts that work together to achieve a desired result, and be able to locate its major body organs, by oral discussion in class and with *Cindy the Circulatory System Specialist*. 