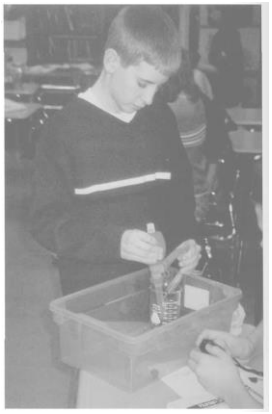
The Heart Meets Resistance

Question – How does a blocked artery affect the heart's ability to pump blood to the body?

Have two of your group members go get materials from the blue table. One person should get the plastic box and another person should get the two cups of water. Use one siphon pump and one cup of water to explore how the pump works.
See picture to the right.



Answer the questions below in your comp book.

1. What makes the water begin to flow through the pump?
2. Through which tube, the stiff one or the flexible one, does water enter the pump?
3. What keeps the water from flowing back through the tube when you release the bulb?
4. Listen closely as you squeeze the bulb. Can you hear any clicking sounds? If so, what seems to be causing them?

Now work with your group to create a "closed" circulatory system. Use both pumps and cups to create your system. You must connect the parts so that water flows continuously through the model. You cannot add water to the cups and approximately the same amount of water must remain in each cup at all times. Once you have a model that you believes works, show your teacher. Draw your model in your comp book once it is approved.

Answer the questions below in your comp book after your teacher checks your model.

1. When you are operating your model heart, you should be able to hear the familiar "lub, dub" sound as well as see what causes it. Explain what causes this sound.
2. Why is the heart considered a double pump?
3. What is the function of the valves in the heart?
4. What do we mean when we say humans have a "closed" circulatory system?

Now we are going to mess with the heart and how it usually pumps blood to the body. Return one of the pumps and one cup of water to the blue table. Get two stoppers, one of each.

Hold one of the siphon pumps in a vertical position. Place the end of the tube that extends straight down from the bulb close to the bottom of the cup. Hold the end of the tube that is attached at the side of the siphon just above the surface of the water in the cup, as seen to the right. Make sure the tube is pointed toward the water. This tube, without a stopper represents a normal artery.

1. Grip the pump between your thumb and first three fingers.
   While your partner times you, see how many times you can squeeze the pump in 15 seconds. Make sure that your thumb and fingers meet each time you squeeze. Let the bulb return to its original position before squeezing again. Record your results in your comp book.
2. Switch roles with your partner and repeat the activity. Find the average and record.
3. Now insert the stopper with the large hole into the end of the tube that is attached to the flexible tube of the siphon. Repeat steps 1 and 2 and record your results.
4. Remove the stopper with the large hole and insert the stopper with the small hole.
5. Repeat steps 1 and 2 and record your results and averages.
6. Empty the water into the sink and return all your materials to the blue table.

Trial	Partner 1 (15 secs)	Partner 2 (15 secs)	Average
No Stopper			
Stopper with large hole			
Stopper with small hole			

Answer the following questions in your comp book.

1. Under what conditions were you able to complete the most squeezes in 15 seconds? Explain.
2. Under what conditions did the model represent the heart pumping into an artery that was heavily lined with plaque?
3. Write down one sentence each describing how your hand felt after completing the exercise under each condition. (So, you should have three sentences in the end)
4. On the basis of how your hand felt during the test with the small-holed stopper, what do you think might happen to your heart if it had to pump blood through an artery which was narrowed by plaque?
5. On the basis of what you have discovered in this lesson, what do you think it means if someone has “high” blood pressure?