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The Circulatory System:

Curriculum Unit 80.05.02
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OBJECTIVES

This unit is constructed as a study of the circulatory system for grade seven students. I've found that in recent years this system of the body seemed to be more interesting and motivating of all human biology topics, but there are many important facts and basic skills needed to better understand the circulatory system. Too often we see facts and memorization as the key tool to the learning process. This unit is designated to get away from this process by stimulating the student's potential through "hands-on" activities. Using creative, divergent, convergent processes, students will be able to better understand general concepts, goals, objectives and strategies. This unit is divided into six learning areas:

1. History and Discoveries (William Harvey)
 2. Blood and its Parts
 3. Blood Vessels (Types and Functions)
 4. Heart (Its parts, function, blood flow)
 5. Diseases of the heart and blood (Myocardial Infraction, Stroke, Atherosclerosis, Hypertension)

 6. The Hazards of Smoking in Relation to the Circulatory System Each specific area will provide the reader with a concept, factual information and a method of teaching this information in a creative way.
- Each learning area is described in detail for the teacher. A sample lesson plan is given for each area. The plans use creative thought and analysis for students to comprehend.

STRATEGIES

You can start this unit by evaluating your students' skills; to determine how much information your students either know or remember from past experiences, a pre-test or questionnaire can be used. For example:

1. What is the Circulatory System?

2. Name the main parts of the system.

3. What is blood?

4. How is blood pumped through the body? These types of answers can be reviewed by the teacher and a final analysis can be made to determine the amount of information you need to cover for each specific class.

I. History and Discoveries

Concept:

Ancient myths revealed stories of bloodletting, a process of cutting a vein to drain out some of the evil spirits which have stricken the body with illness.

You can begin by reading some of these ancient myths about the circulatory system to your class. In ancient Greece, people believed that a person became ill when the evil spirits entered the body, and there was no way for these spirits to leave unless some type of cut was made. Sick people were brought to the local barber, who would cut a vein and let some of the person's blood drain into a pan to let some of the "bad blood" out. This "bad blood" was enriched with the evil spirit and when the barber thought enough blood was let out, he would patch up the wound and send the patient off. This process, termed "blood-letting" caused many people to bleed to death and to die from infections.

At this point a discussion about bloodletting can encourage the students to reach conclusions about the dangers of the process. See if the students can answer, "Why was this process dangerous?" Other discussions can lead to the term "bad blood" which is still used today in regards to "bad blood between families". Talk about the role that the barber played as a surgeon. In conclusion, as a homework assignment, have students go to a local barber and ask what the red, white, and blue stripes mean on the barber pole. They should learn to identify the red with blood, blue with vein and white for bandages. Students at this age love to listen to myths. They can get an idea of the foolish ideas medicine had in those days. It can also show in their minds the progress science and medicine have made from that time period to now.

Concept:

The heart, by repeated contraction, produces a continuous flow of blood throughout the body which continually returns to the heart in one complete cycle.

Acquire William Harvey's best written novels or pieces of work that he developed around 1625. Read to your class some of Harvey's discoveries he made about the heart and blood. Describe to your students the time, classroom settings and equipment that Harvey used and worked by. Explain how his discoveries were so important and how they became the basis for modern physiology. Also, explain how Harvey could have gotten

killed for publishing his work. After completing the readings try and receive some feedback from the students by setting up the following activity:

Lesson : (Writing assignment, listening skills) “Close your eyes and pretend that you are sitting in William Harvey’s classroom back in 1628. You are one of Mr. Harvey’s students. Answer these questions, first in your mind, then in story form on a piece of paper.”

1. What kind of clothes are you and your classmates wearing?

2. Describe your classroom to me.

3. What kind of lab equipment are you using?

4. What are some of the lectures Mr. Harvey gave to your class?

5. Draw a portrait of Mr. Harvey (what do you think he looked like?) You now have the basis or foundation of your unit. Your class has their feet wet. They understand a little history of the circulatory system and they had fun building their foundation.

II. Blood and its Parts

Concept:

Blood is the fluid of the circulatory system. It is essential to life. It consists of a solid part, the cells, and the liquid part, plasma. Blood carries oxygen and food substances to the cells.

A. Functions of Blood

1. Transports oxygen from the lungs to the cells. 2. Carries carbon dioxide, a waste product of cell metabolism, to the lungs where we breath it out. 3. Transfers digested food materials and minerals. 4. Transmits heat, regulates body temperature. 5. Fights off diseases and infections.

B. Blood Parts

1. *Plasma* The liquid part of the blood. About 90% of the plasma is water. The other 10% of plasma is made up of such items as proteins, fats, carbohydrates, and mineral salts. These parts of plasma are responsible for growth (body tissues) and energy.

2. **Red Blood Cells** The solid part of the blood. The red blood cells are the most numerous of the three types of cells. The function of the red blood cells is to carry oxygen from the lungs to different body tissues and to transport the carbon dioxide away from the tissues. Red cells contain a chemical called hemoglobin which absorbs oxygen and gives blood its red color. Blood which returns to the heart is a darkened red color due to the lack of oxygen.

3. **White Blood Cells** White cells, also known as leukocytes, also make up the solid part of the blood. These cells serve a major purpose. They help fight off diseases by wrapping themselves around any dangerous microbe and engulfing it. White cells are not white but are of a colorless nature.

Antibodies, which are blood proteins also aid in helping to fight off foreign invaders such as viruses. Antibodies also maintain the body's immunity to disease by reacting to foreign substances before a disease can occur.

4. **Platelets** They are tiny living colorless particles in the solid part of the blood that help form blood clots. Drops of blood coming out of a cut begin to thicken. They cling together. Instead of being liquid, the blood turns to a jelly that fills the cut completely. This jelly hardens, forming a seal which prevents blood from leaking out and prevents bacteria from creeping in. From the above information, students can see why blood is so important and so vital for life. The responsibility of the blood for transporting O_2 and CO_2 to all areas of the body is essential otherwise damage to cells and tissues can occur.

Students might have problems memorizing these facts about the four main parts of the blood. Therefore, prepared slides of each type of blood cell can be viewed under the microscope. Students can draw, color and label each cell and give one function below each diagram. Once they become familiar with the terms then a noncompetitive game can be played in the room.

Lesson-(Hands on Activity)

Have the class make signs with paper and markers. These signs will include words, phrases or sentences that relate to the blood and its structure.

1. Carries Oxygen 3. Proteins

2. Hemoglobin 4. Leukocytes

Divide the class into four groups. Have each group select the specific part of the blood that they want to be. Next, each group must work on and come up with a costume that best fits and describes that part. For example, the group that picked being a red blood cell might make a red costume out of red painted sheets or bags. Being a platelet might be hard but since a platelet has no color clear plastic bags from laundry mats might work. When the costumes are done, each group selects a student to wear the costume. You now have a red cell, white cell, platelet and plasma (yellowish). The students proceed to sit in their seats with their signs (tape on the back of each sign). Students may make more than one sign but no more than three. Start the game by sending each blood part down each aisle very slowly. When a student with a sign sees the right part of the blood that will match or is related to his or her sign then they can tape it on. Once each part of the blood has been taped on by each student, the teacher and students then go through each sign and see if they are in the right category. (Prizes can be given to the best costumes)

Students have fun working together on this game. They make all the tools and equipment necessary for the game. No one loses and vocabulary and spelling skills have been taught. Also, word association between the sign and blood part enables the students to learn by visual experiences. The learning process becomes fun, at the same time helpful.

III. Blood Vessels (Types and Functions) *Concept* : Blood vessels are the structures responsible for carrying and transporting blood throughout the body. They include arteries, veins, and capillaries.

A. Function of the Vessels

1. Transport oxygen-rich blood away from the heart to tissues. They have thick, elastic muscular walls. They do not contain valves.

2. Veins Veins are thin, non-elastic vessels which carry oxygen-poor blood from tissues back to the heart. Veins contain valves.

3. *Capillaries* Capillaries are a thin layer of cells which connect arteries and veins. Exchange of materials between blood and body cells occurs through it. Capillaries do not contain valves.

C. Some Important Arteries and Veins

1. *Aorta* Largest artery in the body located at the top of the heart muscle. It contains three openings or branches that take blood through the body.

2. *Coronary arteries* They supply the heart cells with blood and nourishment. They lie over the walls of the heart.

3. *Inferior Vena Cava* Discharges blood from the trunk and legs and is located on the right.

4. *Superior Vena Cava* Carries blood from the head and arms. It is also located on the right.

5. *Pulmonary artery* Carries blood from the lungs and is located below the aorta.

6. *Pulmonary vein* Carries blood to the heart and lungs and is located just beneath the pulmonary artery on the left side of the heart.

Lesson Creative Writing

This activity can be done in class or at home. You have introduced the blood vessels to the students. As a review of the above lesson, have the students create a story on “If I were a drop of blood”. They can pretend

to be a drop of blood traveling through the vessels of the body in a complete circuit. They can first describe what a drop of blood looks like then describe what a drop of blood looks like and then describe what it looks like do be traveling through arteries, veins and capillaries. The students can even draw diagrams or make believe they took pictures of the inside walls of the vessels. Suggestions can be made by the teacher in regards to specific points in the story. At the end of the assignment, papers can be read and shared and put on the bulletin board. Students have now acquired more knowledge about the carrier of blood through the eyes of blood itself.

IV. The Heart (Structure, Function, Flow) *Concept:* The heart is a muscle that pumps blood throughout the body by contracting.

A. Structure of the Heart

1. The heart is the size of a fist.
2. It's made of a very strong muscle.
3. The heart is divided into four chambers: right auricle, right ventricle, left auricle, left ventricle.
4. A series of valves open to allow bloodflow from one chamber to the next.
5. A muscle wall called the septum separates the left and right side of the heart.

B. Function of the *Heart*

1. It contracts sending oxygen-rich blood tissues and oxygen-poor blood to the lungs.
2. The nervous system controls heart beat and tissue known as the pacemaker also controls heart beat.

C. Blood Flow

1. Blood returning to the heart from all parts of the body enters the right auricle.
2. This auricle contracts, squeezing the blood through the tricuspid valve into the right ventricle.

(The valve prevents the blood from flowing backwards.)

3. This blood is a dull red color for it has come from the body tissues and it contains CO₂. Thus the blood must be sent to the lungs to get rid of the CO₂.

4. The right ventricle pushes this blood into special arteries known as the “pulmonary arteries”. These arteries carry the blood to the lungs.

5. In the lungs, the blood picks up oxygen and gets rid of carbon dioxide. The blood is now bright red, rich with oxygen and is ready to be sent back to the heart through the pulmonary veins.

6. From these veins, the blood enters the left side of the heart into the top chamber known as the left auricle.

7. The left auricle squeezes the blood through the mitral valve and into the left ventricle.

8. The left ventricle pushed the blood out of the heart through the largest artery in the body, the aorta. It branches into smaller arteries which branch throughout the body. To me, this part of the unit can get complicated. There is an abundance of words and terms, and the order in which the blood flows through the heart is hard to learn for the students cannot see this process work in front of them. We must supplement this with activities that can make the student visualize the order.

Lesson I Learning the Parts

Having posters or diagrams of the heart pinned up somewhere in the classroom is a good start in learning the main parts of the heart. Having students draw diagrams or make a nice colored poster of the heart and its parts is also a good project or homework assignment. The student is drawing and coloring but at the same time learning where parts are located.

Lesson II

I still believe however, that students want to see the real thing. An excellent lab for the students would be to work on and compare a calves' heart with a fetal pig, frog and chicken heart. Students can actually see the different sizes and shapes of each heart. They can feel and touch and observe the coronary arteries, the outside muscles, the aorta, pulmonary vein and artery and feel the weights of the hearts without opening up the heart. Students can be asked to identify the outside part of the first. You can open up each heart and compare and identify the chambers, septum and the valves. You can discuss the differences between each animal's heart. I think you would be surprised at the reaction of your students just to be able to see real hearts.

Lesson III

I would make this a two day lab. You can put your hearts in a cold place over night and use them again the next day to show how the blood flows.

But first, I would have the students use their heart posters that they made for homework to do a simple activity. On a piece of scrap paper they can draw several blue arrows with their pens. Have them cut the arrows out and paste them on their heart poster according to the correct flow of this bluish-red blood. They must be placed so that the flow is in one direction and passes through every correct part of the right side of the heart. Next, have them draw red arrows to show the oxygen-rich blood. These arrows can also be pasted on the left side of the heart in correct order. (To avoid cutting and pasting they can just draw the arrows in; however, mistakes can lead to a messy paper)

Once they have completed the above activity then they can use their knowledge on a real heart. The students can take a piece of coil or rope about one foot long and apply it to the calves' heart. The rope can be placed carefully through each heart. This again strengthens and supports their understanding of how blood flows through the heart.

V. Diseases of the *Heart and Blood Concept* The four diseases, Atherosclerosis, Hypertension, Stroke and Heart Attack (Myocardial Infarction) are the main causes of death in the United States. They all have common risk factors in getting the disease.

A. Types of Diseases

1. *Atherosclerosis* (Hardening of the arteries) This is a disease in which the arterial walls begin to cause a blockage to the blood flow. The blockage can be caused by a build up of fats, cholesterol and calcium on the wall itself. The arteries become very narrow and will eventually lead to heart attack and stroke.

a. *Risk Factors* These factors that can account for atherosclerosis include a high fat diet, diabetes, obesity, smoking and high blood pressure. A good lesson with your students would be to discuss how these risk factors can cause atherosclerosis and what we can do to prevent these problems from happening.

2. *Strokes* A stroke is a disruption of blood supply to the brain. They are one of the major causes of death in the United States. There are different types of strokes;

- a. Blood clot in the artery to the head.
- b. Deposits which block arteries in the neck.
- c. Cerebral hemorrhage in which an artery is ruptured causing internal bleeding.

d. Brain tumor pressuring an artery. The end result of a stroke is usually the same, lack of oxygen and blood supply to the affected part of the brain. Some of the warning signs of stroke include a sudden weakness or numbness of limbs, face. There can be a sudden loss of vision or a case of double vision. Headaches, dizziness and temporary loss of speech can also be signs of stroke. Consulting a physician immediately can

diagnose warnings of a possible stroke. Risk factors for stroke are the same as atherosclerosis.

3. Myocardial Infarction

(Heart Attack) This disease can be caused by blocked coronary artery which is not supplying the heart with an adequate supply of oxygen. Atherosclerosis can cause this type of blockage to those coronary arteries.

Heart attacks can be fatal. They are the leading cause of death in the United States. Tissue of the heart muscle is destroyed and the heart stops pumping.

4. Hypertension

Hypertension is one of the most common diseases today. It is the result of high blood pressure damaging the arteries. It is a serious disease but can be treated. It occurs in all races and ages. Doctors can maintain and regulate blood pressure by adjusting the plasma level.

Extensive damage can be caused by prolonged high blood pressure.

a. Risk Factors

1. High Salt Diet
2. Genetics
3. Obesity
4. Diabetes

5. Smoking At this point each disease can be discussed with your students. Each disease can be compared and risk factors can be discussed.

Lesson I (Diet)

In comparing risk factors of each disease mentioned, diet seem to be the one risk factor that can be controlled by us. A good lesson for the students might be to keep a record for three days of each breakfast, lunch and dinner they have. They can write down the kinds of foods and quantity intake. The students can then evaluate their diets by using cholesterol charts or calorie charts. They can now judge for themselves the kind of diet they need and can just read their intake. You can even have students write out a well-balanced diet.

Lesson II (Blood Pressure Count)

Most students at this level, seventh grade, have had their blood pressure taken by their family doctors. Ask your school nurse to come into your class and plan a lesson on blood pressure. The nurse can go over systolic and diastolic pressure. She can discuss the various facts that lead to high blood pressure. The equipment can be shown and finally, a couple of volunteers can have their blood pressure taken and the end result can be discussed.

Lesson III (Pulse Rate and Exercise)

The rate of your heartbeat changes according to your emotions, activities, and what happens around you. In this lesson you can investigate the effect of exercise on your heart rate. A more detailed plan will be made and used as a sample lesson plan towards the end of the unit.

VI. Hazards of Smoking in Relation to the Circulatory System Concept :

Smoking can cause lung disease and some cancers. It can lead to stroke, atherosclerosis, heart attack and can aggravate blood pressure. Smoking has many cons so why then do people smoke?

Introduction : The desire among young people today to begin smoking cigarettes is seen throughout the United States. Most youngsters try to show their maturity by turning to cigarettes. Peer pressure also encourages smoking. But scientists have been gathering enough scientific evidence to show that cigarette smoking is a serious health hazard. Agencies have begun to make young people aware of the hazards of smoking before it's too late.

A. Circulatory System

We already know how important the heart, blood and vessels are in the responsibility of life. Let's see how cigarette smoking can affect this system:

When we inhale, smoke and air pass through our bronchial tubes until they reach the tiny air sacs of the lung called alveoli. During the time when blood releases carbon dioxide and absorbs oxygen, nicotine and carbon monoxide that are present are absorbed into the blood.

Also, the tiny capillary tubes in the walls of the alveoli can rupture and be destroyed. As a result, more pressure is needed to push blood through capillaries, resulting in an increased work load for the heart. Also, you are reducing the supply of oxygen that the heart requires. Nicotine can also increase the heart rate, straining vessels and causing high blood pressure.

Lesson I

You can spend a class period discussing or writing the cons on cigarette smoking. Students can just social and economic reasons why smoking is not a good habit. Students can also list how smoking plays a role in each cardiovascular disease that I mentioned in earlier pages. Finally, a debate can be developed over the hazards of smoking.

Conclusion

This unit has covered six major areas of the Circulatory System. I could have gone into much greater detail but I think at this level I've covered the general but major areas of the system. Hopefully, I can implement some of my ideas into my classroom. It's important that you take your time with this unit. There are many important areas such as heart, blood and vessels. But each section has at least one simple lesson that a student can do either at home or in the classroom. Some of the lessons are not only covering science skills but also reading skills, writing skills and art skills. Creativity is the key to learning. I've seen many students turned

off to subjects that can be interesting. We must start motivating our students. Once you've turned them on to something you can watch and let them do the rest.

SAMPLE CLASSROOM LESSONS

Pre-Test

Directions:

This is an evaluation to determine the kinds of skills you obtained from past experiences on the Circulatory System. Answer as many questions as you can to the best of your ability.

Part 1

If the statement is true, write true in the space to the left. If the statement is false, write the word false in the space to the left and write the word needed above the underlined word or words to correct the statement.

1. The pulse rate *slows down* when a person is active.
2. Blood carries carbon dioxide, digested food, and water to all all cells of the body.
3. The average person's body contains about *five liters* of blood.
4. Blood usually contains *more* white blood cells than red.
5. Plasma is mostly made up of water.
6. *White blood cells* are the body's first line defense against-disease.
7. *Plateletes* are tiny colorless bodies that help control breathing.
8. In humans, blood from the left side of the heart *cannot* mix with blood from the right side.
9. Red Blood cells are made in the marrow of bones.
10. The blood does its work in the arteries.
11. A *transfusion* is the body's resistance—to disease.
12. Blood in the heart flows from *ventricle to auricle* .
13. Hemoglobin gives red blood cells their red color and carries oxygen to the body cells.
14. Most antibodies are made when the foreign substances enter the blood.
15. The aorta is the largest *vein* in the body.
16. The lub-dub sound of the heart beat is made by the closing of the valves in the heart.
17. Blood type is determined by a special protein on the surface of the *red blood cells* .

Part 2

All of the terms except one in each exercise are related in some way. Underline the terms that do not belong, and choose one of the terms from each list to title the relationship. See the example.

1. Whole Blood 2.

red cells	arteries
red cells	blood vessels
white cells	veins
whole blood	heart
platelets	aorta
alveoli	capillaries

3. 4.

A ventricles

B valves

C lungs

AB auricles

blood types double pump

0 heart

5. 6.

heartbeat	bloodletting
lub-dub	sound transfusions
pulse	save lives
respiratory system	match blood types
valves closing	patient
pacemaker	donors

7. 8.

sickle cell anemia ventricles

immunity valves

blood disorders lunge

hemophelia auricles

leukemia double pump

anemia heart

9. 10.

bright red left side of heart

dull red right side of heart

C02 blood flow

oxygen-poor blood antibodies

from body tissues lungs

pumped to lunge body systems

Lesson: *Who Was William Harvey*

Directions

You have just heard about the works of Scientist William Harvey. Close your eyes and pretend that you are sitting in William Harvey's classroom back in 1628. Pretend you are one of Mr. Harvey's students. Answer these questions, first in your mind, then in story form on a piece of paper.

1. What year does the story take place?
2. What are the people like?
3. Do you speak a language different than English?
4. What kind of clothes are you and your classmates wearing?
5. Describe your classroom to me.
6. Draw diagrams of the equipment Mr. Harvey is using.
7. Describe one of Mr. Harvey's lectures.
8. Draw a portrait of Mr. Harvey. (What do you think he looks like?)

Lesson: *Blood*

Information: Figure A. Particles found in blood.

A.

Red Blood Cells

1. 5,000 per cubic millimeter
2. Carry oxygen and carbon dioxide
3. manufactured in bone marrow

B.

White Blood Cells

1. 6,000 per cubic millimeter
2. Destroy bacteria
3. Manufactured in lymph nodes
- C.

Blood Platelets

1. 300,000 per cubic millimeter
2. Help blood clotting

3. Formed from bones in bone marrow (A cubic millimeter is approximately the size of two pin heads)

Student Activity

1. From Figure A identify the following:
 - a. help fight infection
 - b. most numerous of cells
 - c. release CO₂ in lungs
 - d. gives blood its red color
 - e. help form a network of fibers near wounds————
 - f. liquid part of the blood
 - g. formed in lymph tissue——
 - h. smallest of blood particles——

Lab Materials:

water, red food coloring, piece of cardboard, aluminum foil, tape, scissors

A. Obtain the above materials. The following hints will help you make the aluminum foil model.

B. Cover your piece of cardboard with aluminum foil so that water will not soak into the cardboard. Build your model using the illustration provided and the following hints.

1. Fold the aluminum foil so that the walls of your model are sturdy enough to hold water.
2. Make sure all seams and connections are taped so that they will not leak.
3. Cut and fold the foil as needed to make curves (making sure there are no holes that will leak)
4. Design the valves so that they will not allow much blood to flow backward.
5. Insert the labels LUNGS and BODY SYSTEMS in the proper places.

How are the structures of this model different from those of a living heart?

C. Once you have built your model, you can see if it works. Fill the right auricle with water colored with red food coloring. Tip the model so that the “blood” flows into the right ventricle. Continue to tip the model in the directions that will force the “blood” through the proper blood vessels and chambers. If your model does not work as well as you would like it, try to improve it. How is the “blood” flow in this model different from that in an actual heart?

Lesson: Comparing Hearts

Materials : calve’s heart, frog’s heart, dissecting pan, scalpel, scissors

Directions:

- A. Place the calve’s heart in your hand.
 1. Guess what it weighs.
 2. Describe the texture of the heart.
 3. Give me the general size and shape of the heart.
 4. locate the following parts; Give one function for each.
 - a. Aorta
 - b. Pulmonary Aorta
 - c. Pulmonary Vein
 - d. Coronary arteries and veins
 - e. Superior Vena Cava

B. Next, place the frog's heart in your hand. Answer the above questions using the frog's heart. Make a list of differences between the outside of each heart for comparison. C. You are now ready to cut open your calve's heart. Turn the heart sideways. Make a small cut down the middle starting from the top part near the aorta down to the bottom tip with your scalpel. You have just cut through some muscle. Next, take your scissors and continue to cut through the incision you made until the heart opens into two halves.

1. Locate the following parts and give one function for each.

- a. Right Auricle
- b. Tricuspid Valve
- c. Right Ventricle
- d. Septum
- e. Pulmonary artery and vein
- f. Semilunar valve
- g. Mitral Valve
- h. left Auricle
- i. Left Ventricle

D. Your frog's heart is much smaller. You must be very careful when you make your cuts. Following the same cutting patterns as the calves. When you open up the frog's heart, you'll notice differences right away.

1. How many chambers do you see?
2. Does the frog's heart contain a septum?
3. What does this tell you about the frog's circulatory system?
4. How many auricles does it contain?
5. How many ventricles?
6. Draw a diagram of the frog's heart and show the flow of blood by using arrows.

LAB: Pulse Rate and Exercise

Concept : The rate of your heartbeat changes according to your emotions, your activities and what happens around you.

Objectives : Students will be able to:

- a. Measure a heartbeat by taking a pulse.
- b. Explain the relationship of pulse rate to heart beat.
- c. Demonstrate the effect of exercise on pulse rate.
- d. Explain why the pulse rate changes with different situations.

Materials : a clock with a second hand or a watch

Directions:

A. (Work in pairs) locate your own pulse by placing your fingers on your wrist. When you have felt a throb you have located your pulse. (Do not use your thumb) Locate your partner's pulse and vice versa.

1. Why shouldn't you use your thumb to check your pulse?

B. Find your partner's pulse rate at "rest". Do this by relaxing quietly for about three minutes. During the last minute, your partner will count your pulse rate and record the number at "rest".

C. Next, you will find your pulse rate "after exercise". For the next three minutes, exercise vigorously. Do any exercise that you want to but be careful. After three minutes quickly sit down. Now have your partner take your pulse rate and record "after exercise".

D. Repeat procedures B-C. This time you will be finding your partner's pulse rate.

Was your at "rest" pulse rate the same as your partners? Should everyone have the same pulse rate? Why or Why Not? How did exercising effect your pulse rate?

How did it effect your partner's pulse rate?

What is the relationship between heart beat and pulse rate?

What happens to the number of heart beats as your pulse increases?

Is the heart pumping more or less blood?

Why does your pulse rate change when you exercise?
Would your pulse rate change again after you stopped exercising?

If so, how would it change and why?

Bibliography for Teachers

Abramson, David. *Circulation in the Extremities* . New York and London: Academic Press, 1967. Shows the different patterns of blood vessels.

Fishman, Alfred P. and Richard W. Dickinson. *Circulation of the Blood Men and Ideas*. New York: Oxford University Press 1964. It was a time for change.

Harvey, William. *The Circulation of the Blood* . New York: London Everymans Library, 1962. The blood moves through contractions.

Jokl, Ernst. *Heart and Sport* . Springfield, Illinois: Charles C. Thomas Publisher, 1964. Explains how exercising produces a strong healthy heart.

Seeman, Bernard. *The River of life* . New York: WW. Norton and Company, Inc. 1st ed. 1961. Shows how the blood flows freely through the body.

Singer, Charles. *The Discovery of the Circulation of Blood* . London: Wm. Dawson and Sons LTD., 1965. Explains how William Harvey went beyond his limitations for modern man.

Uroman, Lee. *Blood* . New York: The Natural History Press, 1967. It is the essential of life.

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