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Cardiovascular Disease and Fitness: Exploring the Rhythm of Your Pulse

Curriculum Unit 08.06.08
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Introduction

This unit is designed for an eleventh and twelfth grade Human Anatomy and Physiology class. Surprisingly enough twelfth grade students are still questioning the rationale for taking **science** in general and are constantly searching for reasons for taking Human Anatomy and Physiology class. Students strongly believe that only prospective nurses and medical students need to take this class. It is my hope that this unit will awaken their minds and broaden their knowledge about the anatomy and physiology of the human body.

This course is an elective science course and is generally offered to upperclassmen.

Students in this class are very unique and showcase a wide range of academic abilities. Some students are in this class due to scheduling problems, other students who do not need the credit, students who failed chemistry and a few who are motivated to learn. Despite these obstacles I often engage my students with inquiry-based activities, allowing them to express any form of art in their presentations.. Cooperative Arts and Humanities Magnet High School encourages different forms of art and students are encouraged to use their skills to express themselves. Those students who find difficulty say in language arts, writing and /or speaking are given several opportunities to respond in other ways to illustrate their answers. In order to accommodate the needs of those students it is so important to implement varied instructional strategies in order to maximize their skills and improve their academic performance.

Students will have the opportunity to perform hands-on classroom activities, whereby they can visualize and make the connection between human physiology and health issues of the body depicted by actual graphical data. Challenging classroom activities may include creative pamphlets, collages, and laboratory activities, researching reports and participating in panel discussions. The subject matter will then be relevant and student-friendly to each and every student. He or she will become aware of the relationship between preventive measures versus possible health hazards and the potential for greater strength and a healthier life-style. As a result, well-informed students will hopefully act as a ‘change agent’ to further educate their peers and society as a whole in promoting a healthy and enjoyable life-style leading to good health.

High Blood Pressure --“the silent killer”

High blood pressure affects all Americans, on both a community and a personal level. African Americans are most likely to develop high blood pressure than any other racial or ethnic group at a very early age It is said 1 in 3 American adults have high blood pressure and 142 million American adults are overweight or obese which increases their chances of developing high blood pressure. High blood pressure precedes 74 percent of cases of heart failure in the United States.

http://hp2010.nhlbihin.net/mission/abouthbp/abouthbp.htm#top

Blood pressure is the force of blood against the walls of arteries. When the force stays too high, it becomes a life-threatening condition. This makes the heart works too hard, hardens the walls of arteries, can affect the proper functioning of other organs and increases the chances of having a heart attack, a stroke or kidney disease. Blood pressure is recorded in two numbers as millimeters of mercury (mm Hg). Normal blood pressure is about 120 over 80 with the systolic (higher) number is always given first, followed by diastolic (lower) number is given last.

Objectives

At the end of this learning unit students will be able to:

1. Describe reasons why there should be a concern about ‘physical fitness’ in our society.
2. List what things can be done to promote a healthy heart.
3. Identify the structures and functions of the cardio-vascular system.
Demonstrate the path of the flow of blood through the heart and lungs, comparing pulmonary and systemic circulations.
5. Compare and contrast the structures of the walls of arteries, veins and capillaries.
6. Compare systolic, diastolic and cardiac cycles and describe the events of the cardiac cycle.
7. Define pulse and locate pulse sites on body most easily palpated.
8. Define aerobics and distinguish between isotonic and isometric exercises and state advantages of each.
9. Observe the effects of various exercises on blood pressure and heart rate.
10. List examples of cardiovascular diseases and describe their effects on the circulatory system.

Teaching Strategies

Students will respond to pre-assessment questions on the cardio-vascular system to assess their prior knowledge of the subject matter and to clarify any misconceptions.

(See Lesson 1)

This will be followed by class discussion on pre-assessment questions and feed-back noted on chalk-board. Students will record corrected responses in their notebooks.

In small groups students will brain-storm the impact sedentary jobs have on one's physical health and what things could be done to promote a healthy heart. The recorder from each group will share their findings with the whole class. Students may respond by saying that soda and coffee machines on the job is responsible for obesity. Too much sugar intake and an unhealthy diet and no physical exercise can lead to heart attacks.

The next three lessons will be devoted to exploring and learning about the anatomy and physiology of the cardiovascular system. Varied resources will be implemented, including descriptive charts, models, CD-ROM, interactive websites, such as www.interactivephysiology.com with tours and animation about cardio-vascular anatomy and physiology. Students will explore these websites individually and in small teams. After this guided research, students will complete a graphic organizer illustrating blood flow in the heart and will use this information to produce a schematic, labeled drawing of the anatomy of the heart and the pathway of blood circulation. Students may use red and blue markers or crayons to highlight the flow of deoxygenated and oxygenated blood during pulmonary and systemic circulation.

Subsequent lessons will include the dissection of a sheep's heart. Dissection of a sheep's heart is valuable because it is similar in size and structure to the human heart. Also it allows students to view structures in a way not possible with models and diagrams. Students will examine the external surface of the heart, identify the major structures of the heart involved with blood circulation, describe what each structure looks like and the role each play in blood circulation. (See vocabulary below).

Students will view microscope slides showing cross sections of an artery, vein and capillaries. A comparison of these blood vessels will be described in chart form by students. (See vocabulary below).

Students will listen to his or her partner's heart sounds with an ordinary stethoscope, determine body sites where the pulse is most easily palpated, and then accurately determine each other's blood pressure using a sphygmomanometer, with guidance from the school nurse. .At the end of this activity, students will be able to discriminate diastolic from systolic pressure. Students will be provided with an article on 'heart physiology and blood pressure' as an extension of this activity for reinforcement and further understanding of the concepts learned.

Changes in blood pressure and pulse during and after exercise provide a good yardstick for measuring overall cardiovascular fitness. Different kinds of activity affect blood pressure differently. Although blood pressure goes up during any kind of exercise, the changes brought on by exercise vary according to whether the exercise is aerobic or 99isometric. Aerobic exercise involves large muscle groups engaged in rhythmic, repeated movements ex. jogging. Isometric exercise is defined as a sustained contraction of a muscle group ex. weight lifting. Aerobic activities depend mainly on energy derived from consuming oxygen. Thus, they

increase the body's need for oxygen. Because blood delivers oxygen to the body, aerobic activity challenges the heart and circulatory system to meet this increased need. Systolic blood pressure rises progressively, while diastolic blood pressure stays the same or decreases slightly. Pulse rate rises, and blood flow to the muscles increases. Thus, aerobic exercise exerts a volume load on the heart. One way to detect changes in cardiovascular activity and oxygen consumption is to measure your pulse rate before, during and after an activity. Aerobic exercise will increase one's pulse over the course of the exercise, and the more energy demanding, the more one's pulse will increase. When one stops exercising, his or her pulse rate does not immediately return to normal. Instead, it gradually returns to its resting level. The greater one's fitness level, the sooner one's pulse rate will fall.

Students will work in small groups to investigate cardiovascular responses to changes in posture --heart rate sitting quietly, heart rate immediately on standing, heart rate after standing for three minutes and heart rate holding his or her breath. As a result, the heart rate will increase more rapidly by holding one's breath compared to standing or sitting as the heart is pumping faster to supply and compensate for the oxygen which is cut off. One student in each group will act as the subject, another as the examiner and the third student will act as timer and record data.

Extended activities involving parents and/or siblings will include students taking their heart rates and graphing the data based on their ages. Students can then show the correlation between heart rate and body mass. Students will also be required to keep a log for one week on their heart rate in the morning and at night and then construct a graph to show their results. Blood pressure can vary widely. It can rise when one exercises, or

it may become low when one is asleep. However, blood pressure is a little on the high side when a person wakes up in the morning. It remains at these levels during the daytime and decreases during sleep. Therefore, a single reading should not be used to make a diagnosis of high blood pressure.

Students will research cardiovascular diseases and then create a pamphlet or a poster to educate the public about what are some possible solutions to decrease the number of heart attacks and disorders. Examples include modifying school cafeteria menus, banning cigarette smoking in restaurants and public places, banning of the use of Trans fat in restaurants and increase and availability of recreational areas such as gyms, and parks.

I have designed this unit to accommodate the different learning styles and abilities of my students. Students who have difficulty with writing and or verbal expression have the opportunity to demonstrate their artistic talent with their schematic drawing, creating a brochure, inquiry lab. activities and dissection of the sheep's heart. Opportunities for developing and improving their writing and verbal skills are offered in this unit as mastering these skills are crucial for students to become successful.

Unit Background

The Circulatory System

This is one system that students frequently know something about, but they often don't completely

understand the complexity of the system. It is important to discuss the anatomy of the heart, such as its chambers, valves and the vessels through which blood flows in and out of its various regions. The heart is a muscular organ which pumps blood through vast complex blood vessels which bring oxygen and nourishment to the cells of the body. . It has four chambers, an atrium and ventricle on each side. The atria receive blood returning to the heart from the veins and act as reservoirs between contractions of the heart. The ventricles pump blood into the arteries leaving the heart. The right side of the heart receives oxygen-poor blood, returning from the tissues and pumps it into the pulmonary circulation. Pulmonary arteries carry blood to the lungs, where gases are exchanged. Pulmonary veins then return oxygen-rich blood to the left side of the heart.

The left side of the heart pumps oxygen-rich blood into the systemic circulation, the network of blood vessels that serves all the body systems. There are three primary types of blood vessels. The arteries carry blood away from the heart and the vein carry blood toward the heart. Capillaries which interface the arteries and veins permit the exchange of gases, nutrients, waste products and other materials with body tissues. Arteries are under pressure and, therefore their walls are thicker and possess large amounts of elastic fibers. By contrast, most veins are not under significant pressure and, therefore, they are much thinner and less elastic. Capillaries are comprised of simple endothelial tissue that permits the easy movement of materials through these cells. Blood pressure is the force exerted by the blood against the inner wall of the vessel. Although the left side of the heart generates more pressure than the right side, approximately the same volume of blood is ejected from each side per beat. When blood is pumped from either atrium into the corresponding ventricle pressure in the ventricle becomes greater than in the atrium.

When the atrium relaxes, blood must be prevented from flowing backward into it. To prevent such backflow of blood, atrioventricular (AV) valves guards the passageway between each atrium and ventricle. The AV valve between the right atrium and the right ventricle is known as the tricuspid valve and the left AV valve is known as the tricuspid valve commonly called the mitral valve.

The cardiac cycle includes contraction and relaxation phases. During contraction, blood is forced out of the heart and then the heart is filled with blood during the period of relaxation. The period of contraction is known as **systole** and the period of relaxation is **diastole** . Each cardiac cycle begins with a muscle impulse that spreads from the SA node throughout the atria, resulting in the contraction of the atria. As the atria contract, the AV valves are open, and blood is forced from the atria into the ventricles. As this happens, the semilunar valves are closed. As the atria relax, they are filled with blood from the veins. During this time, the AV valves are closed and the ventricles are contracting forcing blood through the semilunar valves into the arteries. Then as the ventricles begin to relax, the semilunar valves close and the AV valves open. Blood flows into the ventricles and the cycle begins again.

Blood flow is a dynamic process. Blood flows through a continuous network of blood vessels that forms a double circuit: the pulmonary circulation which connects heart and lungs and the systemic circulation which connects the heart and all the organs and tissues. The left ventricle pumps blood into the systemic circulation, which brings oxygen-rich blood to all the different organs and tissues. Blood returns to the right atrium of the heart, poor in oxygen but loaded with carbon dioxide wastes. Then the blood is pumped by the right ventricle into the pulmonary circulation, where gases are exchanged. From the pulmonary circulation, blood is returned to the left atrium. It is pumped into the left ventricle, which pumps it back out into the systemic circulation. Therefore, blood flowing through the pulmonary circuit gains oxygen and loses carbon dioxide. Blood flowing through the systemic circuit loses oxygen and picks up carbon dioxide.

Investigating Breathing and Heart Rates in Humans

Cellular respiration is a metabolic process similar to burning fuel. While burning converts almost all of the energy in a fuel to heat, cellular respiration releases much of the energy in food to make ATP. This ATP provides cells with the energy they need to carry out the activities of life. Oxygen in the air you breathe makes the production of ATP more efficient, although some ATP is made without oxygen. Metabolic processes that require oxygen are called aerobic and metabolic processes that do not require oxygen are called anaerobic. Since oxygen is necessary for respiration, cells must receive a continuous supply via the circulatory system from the lungs. Carbon dioxide, a waste product which is released during respiration is transported to the lungs and released from the body. During periods of high ATP usage such as strenuous exercise, breathing and heart rates are accelerated to deliver more oxygen to body cells. On the contrary when ATP is in less demand, example during periods of rest, breathing and heart rates are lower and the oxygen concentration is not usually as high.

Regulation of breathing and heart rates involves the monitoring of blood pH levels. As carbon dioxide levels increases in the blood, more carbonic acid is produced and this tends to lower the pH of blood. The nervous system readily responds to this condition by stimulating cardiac and skeletal muscles to contract more rapidly increasing the rate of breathing and consequently an increase of heart rate. As a result more ATP is produced and more oxygen is delivered to body cells. When there is less demand for oxygen as energy demands decreased, the pH level of blood increases, resulting in a decrease of breathing and heart rate. Other factors such as age, drugs and physical fitness can affect heart and breathing rates and can lead to death.

Classroom Activities

Lesson 1

Pre-assessment on the Cardio-vascular System

The goal of this formative assessment is to assess students' knowledge of the anatomy of the heart and physiology of the cardio-vascular system and help to guide my instruction.

Students will choose the best answer that completes each statement below.

1. Which system transports oxygen and nutrients to body cells?

a. respiratory system
b. excretory system
c. circulatory system
d. digestive system

2. The two upper heart chambers are called

a. ventricles
b. atria
c. aorta
d. valves

3. Oxygen-rich blood from the lungs enters the

a. left atrium
b. right atrium
c. left ventricle
d. right ventricle

4. The heart chamber that works hardest is the

a. right atrium
b. right ventricle
c. left atrium
d. left ventricle

5. The blood vessels that carry blood back to the heart are the

a. arteries
b. veins
c. capillaries
d. ventricles

6. When the ventricles contract, the bicuspid valve prevents blood from flowing from

a. the right ventricle to the right atrium
b. the left ventricle to the left atrium
c. the left atrium to the right atrium
d. the right atrium to the left atrium

7. Which one of the following blood vessels carries oxygenated blood?

a. superior vena cava
b. inferior vena cava
c. pulmonary artery
d. pulmonary vein

8. Pulmonary circulation involves movement of blood between heart and the

a. kidneys
b. lungs
c. brain
d. liver

9. The carotid artery is located in the

a. armpit
b. groin
c. neck
d. leg

10. The smallest and most numerous blood vessels in the body are the

a. veins
b. arteries
c. capillaries
d. pulmonary veins

Closure

At the end of the discussion review with students that arteries carry deoxygenated blood and veins carry oxygenated blood. Arteries are blood vessels that carry blood away from the heart and veins carry blood toward the heart.

Homework

1 Ask students to draw an analogy between the cardiovascular system and a mail delivery system .
2. Open-ended Question: Sometimes babies are born with a hole in the septum between the two atria. Based on what you know about blood flow through the heart, explain why this condition would be harmful to the baby.

Lesson 2

This lesson is a simple activity on breathing and exercise. Students will have the opportunity to locate each others' pulse and compare breathing rates before and after exercise. Students will discuss other factors besides exercise that might have an effect on one's breathing rate.

Objectives

1. Students will be able to locate each others' pulse.
2. Students will be able to count each pulse rate accurately.
3. Students will be able to relate pulse rate to heartbeat.

4. Students will be able to explain why exercise can affect one’s breathing rate.

Materials

Clock or stopwatch
Paper
Pen or pencil

Go over the homework questions with students. Make reference to the open-ended question and why it is not a good thing to lose so much blood. What does the blood transport that is readily needed by body cells?

Procedure

1. Demonstrate to students how to locate a pulse by gently placing the first and middle fingers on the inside of your wrist. Allow students to practice doing this.
2. Tell students to relax, sit quietly and breathe normally for 1 minute.
3. Have each partner locate the other partner’s pulse and count the number of breaths he or she takes in 1 minute. This will be the normal breathing rate and students will record this number in a data table.
4. Have students run or jog for 30 seconds. Then sit down and have each partner count the number of breaths taken in 1 minute by the other student. Record the breathing rate in the data table.
5. Allow time for the student’s breathing rate to return to normal. Have students perform same exercise for 1 minute. Again sit down and have each partner count the number of breaths taken in one minute.
6. Have students graph their results.

OBSERVATIONS

DATA TABLE

ACTIVITY	BREATHS PER MINUTE

Analysis and Conclusions

Have students answer the following questions below to show their understanding of the laboratory activity and the relationship with different activities and breathing rate.

1. Did exercise affect your breathing rate? What evidence is there to support your answer?

_____

_____

2. If yes, how did it affect your breathing rate?

_____

3. Why do you think exercise does or do not affect your breathing rate?

_____

4. Can you think of other factors besides exercise that might influence your normal

breathing rate?

_____ .

5. Did you notice any other way in which your breathing changed with exercise? If

so, give a possible reason for this change in your breathing.

_____

_____

_____

6. What happens to the blood supply to the muscles during exercise (jogging)? How is

this related to the change in pulse rate?

_____

Closure

Have students discuss and share their findings with the whole class.

Homework

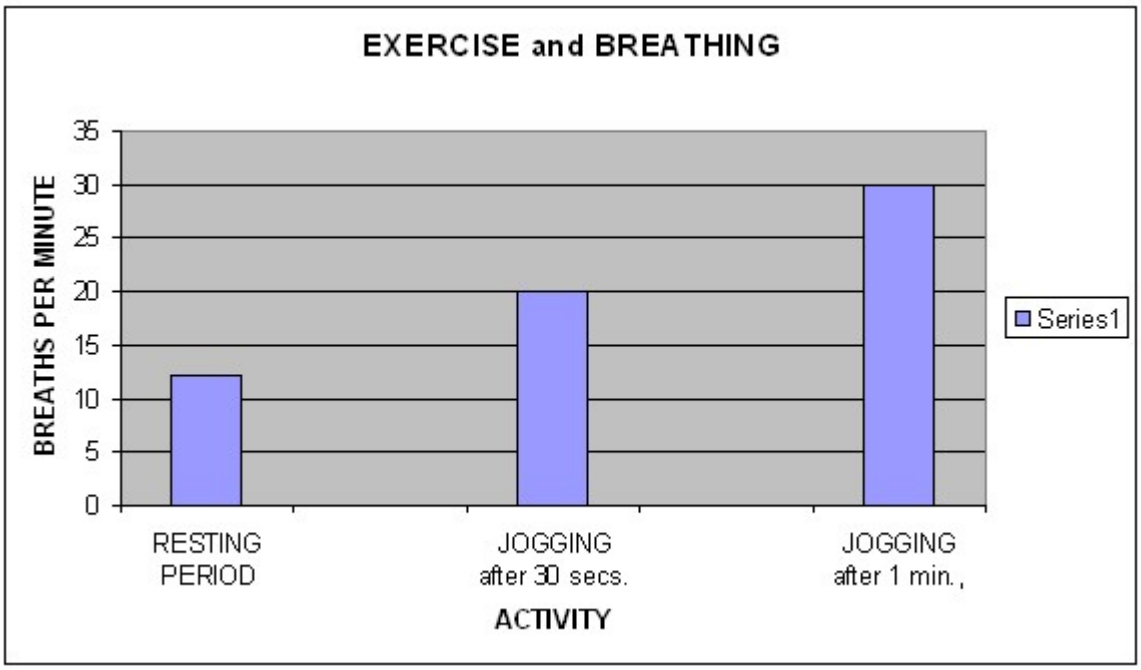
Ask students to take the pulse rate of their parents/guardians and siblings and graph the data. Students will describe their findings and discuss any observable correlation between age and heart rate.

EXTENSION ACTIVITY

Students will keep a log of their heart rate taken in the morning and at night for a week.

They will graph this data and analyze their findings.

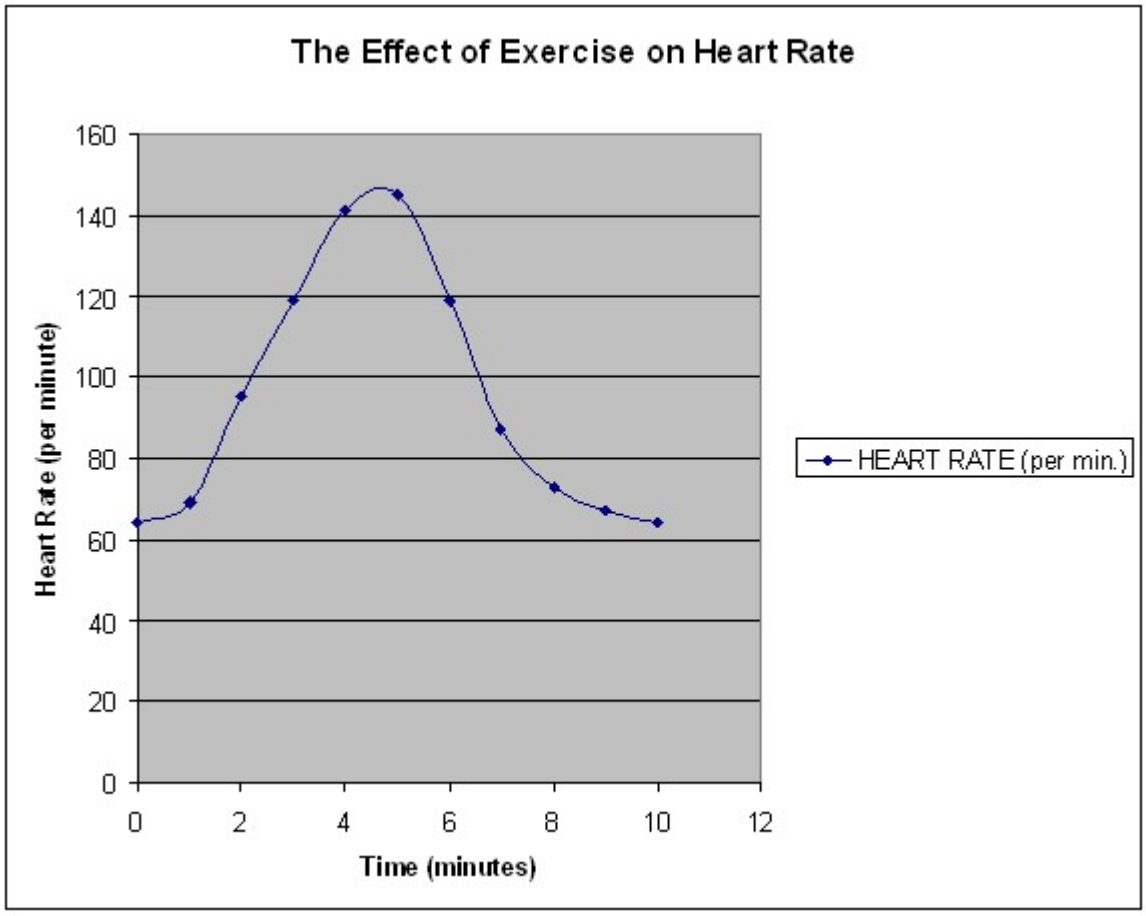
Below is a graph of hypothetical data comparing breathing rate at rest to breathing rate after exercise.



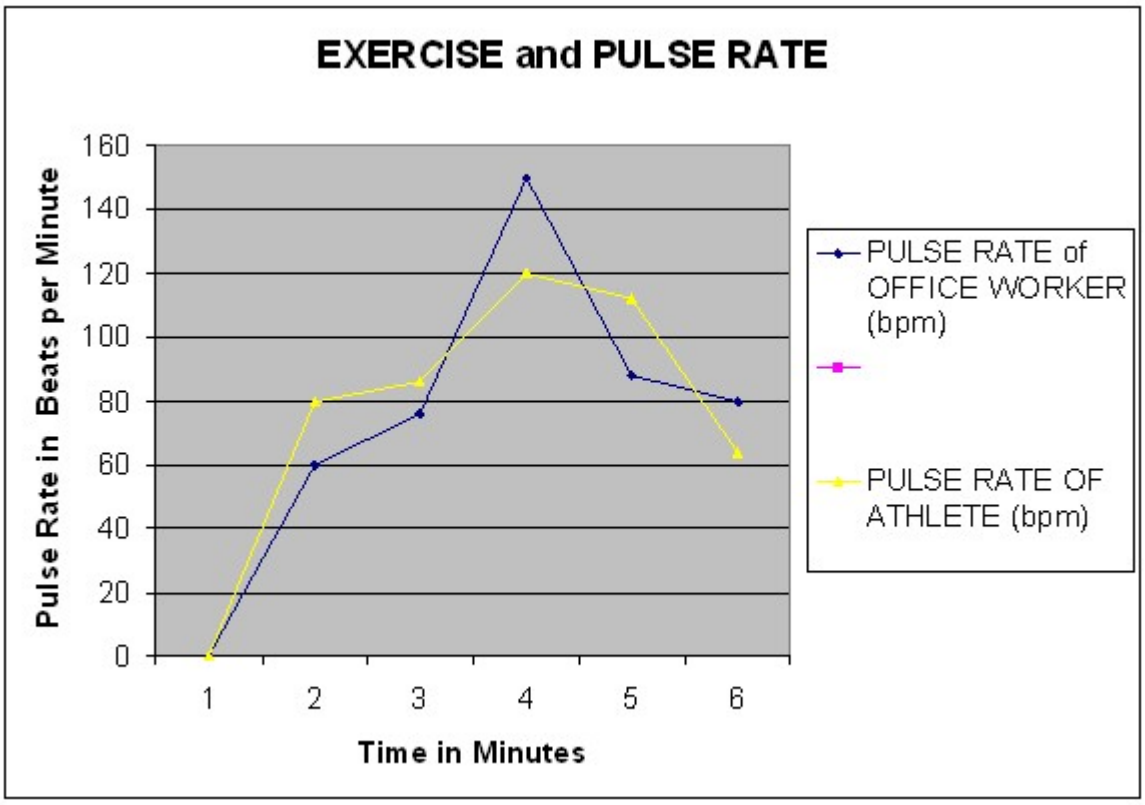
Below are samples of hypothetical data to show the effect of Exercise on Heart Rate and Pulse Rate.

DATA TABLE

TIME (min.)	HEART RATE (per min.)
0	64
1	69
2	95
3	110
4	141
5	145
6	119
7	87
8	73
9	67
10	64



SAMPLE GRAPH



Hypothetical Results:

The graphs above show that the heart rate and pulse rate didn't increase a huge amount for the first minute but then increased very steeply for most of the rest of the exercise. However, during the final minute the heart rate doesn't increase very much. This happened because the supply of oxygen to the muscles decreased, and a lot of energy will be used up as the exercise took place. Anaerobic respiration occurs resulting in the formation of lactic acid and an increase of carbon dioxide levels which contributes to the heart rate rising. The body has to pay back that oxygen back when it is resting. When this is accomplished the body's heart rate returns to the normal resting pulse rate.

Lesson 3

This is an inquiry-based CAPT like lab. investigating heart rate in humans during various activities. Students will work in small groups of two or three to design a laboratory procedure to investigate how holding one's breath and/or jump rope will affect his or her pulse rate and heart rate.

Objectives

Students will work in teams of two and
Students will be able to write a problem statement for the laboratory activity.
Students will be able to identify the dependent variable and the independent variable.
Students will formulate a hypothesis based on prior knowledge.
Students will be able to write a step by step procedure for the laboratory activity so that another person can replicate it.
Students will be able to analyze the lab and make informed decisions about their health.

Materials

Stop watch
Lab. partner
Pen/pencil
Lined paper
Graph paper
Jump rope

Follow-up Questions

1 **.** How was heart rate affected when you held your breath? Explain.

_____

_____

2. Explain the change in heart rate between someone standing versus jumping rope. Why

does this change occur?

_____

Lesson 4

This lesson is designed to motivate more students with diverse abilities to actively participate in doing research and present their findings to the class in creative ways which are non-threatening to their learning styles.

Purpose

Students will identify and research approaches made by the U.S. government to reduce the number of deaths caused by heart attack.

Objectives

Students will be able to describe and give examples of cardiovascular disease
Students will be able to explain causes for cardiovascular diseases
Students will make informed decisions to help prevent heart attacks.

Suggested Methods:

Banning cigarette smoking in public areas
Banning of the use of Trans fat in restaurants
Changes in school cafeteria menus
Advance technology for surgical procedures

SCORING RUBRIC

Category	25-20 points Excellent	19-14 points Fairly good	13-0 points Unsatisfactory
Scientific Information	Current advances and societal issues are fully and clearly addressed, and the pros and cons were supported.	Current advances and societal issues are not clearly addressed and the pros and cons not clearly supported.	No mention of societal issues and the pros and cons were very vague and unsupported.
Presentation	The presentation included visual aides, and was well organized. Good eye contact with audience and communicated the information clearly.	Limited visual aides and eye contact with audience. Communication was somewhat clear.	No visual aides and little eye contact with audience. Communication is unclear and included misconceptions.
Clarity	Very clear and easy to understand Ideas are well organized.	Not quite clear throughout the presentation. Ideas unorganized.	Presentation is unclear and unorganized.
References	3-4 sources cited both internet and other sources	2-3 sources from the internet	Only 1 source cited

Lesson 5

Heart Dissection

Dissection of a sheep heart is valuable because it is similar in size and structure to the human heart. Also, dissection allows students to view and identify structures intact much better than observed in models and

diagrams.

Objective:

Students will be able to locate and identify the structures of the heart.
Students will be able to describe the importance of the structures of the heart.

Materials:

Dissecting tray, a preserved sheep heart, dissecting instruments, gloves

Procedure:

Rinse the sheep heart in cold water and place in dissecting tray.

Observe the texture of the pericardium and find its point of attachment to the heart.

Examine the external surface of the heart and note the accumulation of adipose tissue.

Carefully scrape away some of the fat with a scalpel to expose the coronary blood vessels.

Identify the base and apex of the heart.

Identify the right and left sides of the heart.

Identify the two auricles, earlike flaps of tissue projecting from the chambers of the atria.

Observe the ventricles.

To identify the left ventricle, compress the ventricular chambers exposing coronary blood vessels. The side that feels thicker and more solid is the left ventricle. The right ventricle is much thinner and feels somewhat flabby when compressed.
The difference reflects the greater demand placed on the left ventricle, which must pump blood through the much longer systemic circulation.
Hold the heart in its anatomical position with the anterior surface uppermost. In this position the left ventricle composes the entire apex and the left side of the heart.
Identify the pulmonary trunk and the aorta leaving the superior aspect of the heart. The thickened-walled aorta, which branches almost immediately, is located just beneath the pulmonary trunk.
Cut through the wall of the aorta until you see the aortic valve. Identify the two openings into the coronary arteries just above the valve.
Insert a probe into one of these holes to see if you can follow the course of a coronary artery

across the heart
Turn the heart to view its posterior surface.
Identify the superior and inferior vena cava entering the right atrium.)
Compare the approximate diameter of superior vena cava with that of the aorta.
Find out which one is larger, and which one has thicker walls
Explain why you suppose these differences exist.
Properly dispose of the dissected heart and clean the dissecting tray and tools.

Homework

Students will make a labeled drawing of the sheep heart showing the external and internal structures.

Students will describe the pathway of blood flow throughout the human heart.

Extended Activity --Aerobic Exercise

Objectives:

1. Students will be able to identify the ways in which regular and the type of exercise contributes to the improvement and maintenance of good health.
2. Students will learn personal responsibility for their health and be able to identify those types of activities which will positively affect their health.

Aerobic Exercise is a kind of exercise for building endurance and a healthy heart. To do aerobic exercise, your heart should be beating at a rate that falls within a certain range. For example, the range for some people is 140 to 170 heartbeats per minute. This means that the heart should be beating at least 140 times each minute but not more than 170. The minimum and maximum number depends upon a person’s age.

During exercise, more blood is needed to carry oxygen to the muscles, so blood pressure rises to meet increased demand. The heart pumps faster and pushes out more blood with each beat.

To calculate the minimum and maximum number for teenagers:

1. Subtract the person's age from 220 and multiply the answer by 0.7 (Minimum #)
2. Subtract the person's age from 220 and multiply by 0.85

When doing aerobic exercise, the range of heartbeats defined by the minimum and maximum numbers is called the "target heart rate".

Calculate your target heart rate for doing aerobic exercise.

_____

Explain clearly how to measure your pulse rate.

_____

_____

_____

_____ .

Measure your pulse rate while sitting

_____

_____ .

Measure your pulse rate after doing jumping jacks or jumping rope for 3 minutes.

_____

Was the exercise you perform an aerobic exercise? Explain.

_____

_____

Appendix A

Vocabulary Worksheet

Refer to the chapter on The Circulatory System and complete the meanings of the following terms.

WORD	LOCATION	FUNCTION
ATRIUM		
VENTRICLE		
PULMONARY ARTERY		
PULMONARY VEIN		
SUPERIOR VENA CAVA		

Appendix B

Write the term on the line to the left that best corresponds with each statement.

Blood, Heart, Arteries, Capillaries, Veins

_____ 1. Carry blood to the heart.

_____ 2. Felt to find pulse.

_____ 3. Carries food and oxygen to every cell in the body.

_____ 4. Passes into the atrium from the veins.

_____ 5. Have thin, slightly elastic walls.

_____ 6. Carry blood that is poor in oxygen.

_____7. Carry blood away from the heart.

_____ 8. Tiny vessels connecting arteries and veins.

_____ 9. Have thick, strong elastic walls.

_____10. A hollow muscle the size of a closed fist.

Teacher Reading List

Kapit, W., & Elson, L.M. *The Anatomy Coloring Book, (2002):* Benjamin Cummings

Marieb, Elaine N. (2006). *Essentials of Human Anatomy and Physiology.* Pearson,

Benjamin Cummings

Marieb, Elaine N. (2006). *Essentials of Human Anatomy and Physiology Laboratory*

Manual, Pearson, Benjamin Cummings

Websites

http://www.americanheart.org/presenter.jhtml?identifier=3034814

blood pressure and exercise

http://www.the-aps.org/education/lot/pdfs/physioex/background.PDF

graphical data on page 8 and 9

http://.sjsu.edu/faculty/watkins/longevity.htm

tables of animal blood pressure and heart rate

http://en.wikipedia.org/wiki/Heart.rate

heart rate versus age data

http://en.wikipedia.org/wik/Breathing.rate

respiratory rate versus age

http://science.nhcmccd.edu/BIOL/ap2.html

animations in anatomy and physiology. Includes dissection as well.

www.uh.edu/sibs/tutorial/index/htm

tutorials in anatomy and physiology

www.americanheart.org

anatomy and physiology of the heart; blood pressure and exercise

www.activelivingresearch.org

articles on death rate of cardiovascular diseases

http://hp2010.nhlbihin.net/mission/abouthbp/abouthbp.htm#top

high blood pressure in the United States

Bibliography

Allyn and Bacon, Inc., (1987), *Tune In To Health*

Includes worksheet activities and transparencies

Cooper, K., *The New Aerobics*

Hastings, A.C.; Fadiman, J.G. *Health for the Whole Person,* N.Y. Bantam Books, Inc.(1981)

Moser, M. *High Blood Pressure*

Gives information on common myths and facts of high blood pressure. What constitutes

Hypertension

Selye,H. *The Stress of Life, N.Y. (1976)*

Strughold, H. *Your Body Clock*

Student Reading List

Websites

http://innerbody.com

an informative, educational and interactive website. Shows the anatomy and names of organ systems

http://webschoolsolutions.com/patts/systems/heart.htm

an excellent site with animation and interaction about the cardiovascular system

www.Hypertensionfoundation.org

http://hp2010.nhlbihin.net/mission/partner/c_ideas.htm

resources to improve health and control high blood pressure