Unit 4.2 Learning Targets

Preface

To understand how and why heart disease occurs, it is important to learn how the heart works. In this lesson students will use data acquisition software and probes to monitor the function of the heart. Students learn that because of a few episodes of chest pain, Anna Garcia was sent for a full cardiac workup. Students will analyze the results of her tests in this lesson and in the subsequent lessons in the unit.

Students will measure heart rate manually and with the help of computer probes and software. They will then follow the steps of experimental design to plan and conduct an experiment demonstrating the effect of stress (as modeled by extreme temperature), exercise, or position of the body on heart rate.

In the second activity of the lesson, students will work with a partner to measure blood pressure, explore factors that might influence this value, and learn what blood pressure readings indicate about the health of a person. They will use the experimental design process to create a procedure to investigate a factor that might influence blood pressure and write a formal laboratory report for this experiment or the experiment they designed looking at heart rate.

In the final activity of the lesson, students will use the EKG sensor to make a graphical recording of the heart's electrical activity. Medical professionals are trained to study an EKG and use the graphical display to diagnose heart abnormalities such as irregular heartbeat, irregular speed of contractions, angina (chest pain that can indicate tissue damage), or even tissue death (myocardial infarction, also known as a heart attack). Students will identify the different components of the waveforms and use them to determine heart rate. Finally, students will analyze the EKG readings in Anna Garcia's cardiac workup and investigate how the function (or dysfunction) of her heart may have played a role in her death.

Understandings

1. Heart rate, EKG, and blood pressure measurements are indicators of a person's overall cardiac health.
2. Experiments are designed to find answers to testable questions.

Knowledge and Skills

It is expected that students will:

- Recognize that the heartbeat is caused by the contraction of muscle cells and results in the movement of blood from the heart to the arteries and the rest of the body.
- Recognize that heart rate is the number of heart contractions per unit of time, usually per minute.
- Recognize that blood pressure is a measure of the force put on the vascular walls by the blood as it is pushed by the cardiac muscles through the blood vessels.
- Recognize that the electrical activity of the heart can be measured and recorded by an electrocardiogram (EKG or ECG).
- Describe how internal and external factors can affect heart function and can contribute to the development of heart disease.
- Recognize that all external variables in an experiment need to be controlled.
- Measure heart rate and blood pressure manually and with scientific software and probes.
- Design controlled experiments to test the effect of factors such as exercise or body position on heart rate and blood pressure.
- Analyze EKG readings and relate resultant data to heart function.

Essential Questions

1. In what ways can technology be used to collect and analyze cardiovascular data?
2. Why is it important to monitor the rate at which the heart beats?
3. What factors can influence heart rate?
4. What is blood pressure?
5. How do systolic and diastolic blood pressure values relate to the movement of blood in arteries?
6. What factors can influence blood pressure?
7. What is an EKG?
8. How can an EKG be used in the diagnosis and treatment of heart disease?