

# My Heart - A Pumping Machine

*Students connect their awareness of the health of their hearts with the mechanics of how a pump works. Whenever the content areas are integrated, learning is reinforced. The students exhibit increased engagement when the relevance of the science concepts to their own lives is clear.*

## Curriculum/State Standard

Science 3.1 and 4.1 Plan and conduct investigations;

Science 3.2 and 4.2 Simple and Complex Machines;

P.E. 3.1 and 4.1 Understand how the heart works and demonstrate cardiorespiratory endurance

## Overview

Students used models of the heart and of a blocked artery, as well as created a model of a blocked artery in learning about a healthy heart. They investigated the connection between aerobic activity and pulse. They used hydraulic power to operate simple and complex machines that they designed themselves.

## Objectives

- The student will understand that the heart is a pump.
- The student will demonstrate that blockage of vessels makes the heart work harder and less efficiently.
- The student will improve heart fitness as measured by active and resting heart rates through aerobic exercise.
- The student will explore the force made by water under pressure.
- The student will design and build a machine that uses hydraulic force.

## Materials

Heart model, artery model, heart-rate monitor, stair step, tubing, syringes, tubing connectors, found and collected materials, including plastic jugs, straws, boxes, tubes, dowels, etc.

*Continued on the back...*

# 3-4

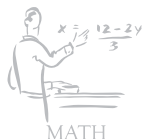
GRADE LEVEL



ARTS



LANGUAGE



MATH

# Misc

MISCELLANEOUS



SCIENCE



HISTORY



SOCIAL STUDIES

# 10-12

SESSIONS

# \$1000

TOTAL BUDGET



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# *“My Heart - A Pumping Machine” project continued...*

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## **Readiness Activity**

Students use the heart rate monitor to check their resting heart rate. They exercise using the stair step or doing jumping-jacks for two minutes, then check their (elevated) heart rate.

## **Strategies/Activities**

Using model, identify parts of the heart and their functions.

Examine model of blocked artery and discuss causes and effects.

In small groups, create a model of blocked arteries. Insert straws into holes in the side of a plastic jug. Seal holes around the straw with clay or hot glue. Put water colored red into the jug and squeeze gently. Water should flow through straws freely. Now dip the straws into butter so that the straws become partially blocked. Squeeze again. Observe blocked "arteries".

Investigate connection between aerobic activity and pulse using stair stepper, jumping jacks, and other activities, and measure pulse on heart rate monitors. Keep records of heart rates and intentional aerobic activity over six weeks for assessment at end of project.

Experiment with forces created by water pressure using syringes and tubing.

Design and construct machines that operate using hydraulic power. When possible, measure the distance that things are moved (or other resulting effects).

Analyze the data from heart rate records over time and from the work done by hydraulic machines that the students created. Make graphs and draw conclusions.

## **Culminating Activity**

Students present their results in a "scientists' meeting". demonstrating their machines and sharing their data. Then, weather permitting, a squirt gun party could celebrate the fun side of hydraulic power.

## **Evaluation**

- oral/pencil and paper test on parts of heart and their functions.
- oral description and demonstration using student-created blocked artery models.
- student data records of heart rate measurements in different aerobic states over time.
- design portfolio of machine
- class presentation of machine