Heart Valve Lesson Plan
Biomedical Engineering

Objective

- Introduce students to biomedical engineering
- Demonstrate practical applications of biology, anatomy, and physics
- Develop abstract thinking skills

Standards and Objectives

- 7th Grade Standard 3, Objective 2
- Biology Standard 3, Objective 1

Learning Outcomes

- Students will understand the role and function of heart valves.
- Students will learn creative problem solving skills, and learn how to make a one-way valve out of common materials.

Essential Questions

- How does biology and anatomy relate to engineering?
- What do biomedical engineers do?
- How does a heart valve work?
- Why do we need to replace heart valves?

Time Required (Itemized)

- Lecture & activity description – 50 minutes
- 1 – 2 additional class periods for construction (students can work on heart valves at home)

Assessments

- Students will test their heart valve design. Teacher will identify successful designs and describe how/why the design works well. The teacher will use the less successful designs as a teaching tool by identifying ways the student can improve the design.
- Students should be allowed improve their design to incorporate teacher suggestions.

Materials

- Rubber tubing (as large as can be found at hardware store) – cut into 5 inch sections
- Electrical tape
- Tin foil
- Tarp – cut into small pieces
- Cardboard/Cardstock

- Small gauge wire
- Modeling clay
- Crazy glue
- Razor blades
- Syringe
- Vegetable oil
- Clear plastic cups

Lesson Description

Heart valves are located in the heart. The heart contains four heart valves that ensure unidirectional blood flow through the heart. If a heart valve leaks, then blood can flow in the wrong direction and decrease circulatory efficiency. Symptoms of a leaking heart valve include fatigue, dizziness, swollen feet or ankles, and shortness of breath. Leaking heart valves can restrict a person's ability to be active and move around. Replacing leaking heart valves can give the patient a higher quality of life.

Questions to ask students:

- What does a heart valve do?
- What health problems are associated with leaking heart valves?
- Why is it so important to replace a leaking heart valve?

Biomedical engineers create artificial heart valves that can replace leaking human heart valves. Biomedical engineers must create a heart valve that can open and close with the pumping of the recipient's heart. Additionally, artificial heart valves must maintain unidirectional flow. Engineers have created a variety of different types of heart valves. Many heart valves resemble our own human heart valves, or some engineers have designed artificial heart valves to work like some water valves that regulate flow. *The attached presentation contains images of different valves to show students.*

Questions to ask students:

- How can you design an artificial heart valve to allow flow in one direction and restrict flow in the opposite direction?