

## Lesson Plan by Ryan Evans

Lesson: The Strength of the Muscular System

Length: 70 minutes

Age or Grade Intended: 7<sup>th</sup> science

### **Academic Standards:**

7.1.4 – describe that different explanations can be given for the same evidence, and it is not always possible to tell which one is correct without further inquiry.

7.7.3 – describe how physical and biological systems tend to change until they reach equilibrium and remain that way unless their surroundings change.

### **Performance Objectives:**

Using the microscope slides and the information presented in class the students will be able to explain the difference between voluntary and involuntary muscles with 100% accuracy. The students will also be able to name the three types of muscle found in the human body (skeletal, cardiac, and smooth) and tell what their function is with 100% accuracy.

### **Advanced Preparation by Teacher:**

In this lesson I need about 10-12 microscopes, slides of cardiac, skeletal, and smooth muscle, milk jugs filled with water, measuring tape, duct tape, bread, paper, pencils, and some clothes pins.

### **Procedure:**

Introduction – I will start off the class by asking this question, “Do bigger muscles make you stronger?” I will call on students for their answers and reasoning. After some brief discussion we will test our hypothesis. The students will pair off. One student in the group will measure the others bicep (bodily kinesthetic). The measurement will be recorded in metric. The student whose bicep was measured will lift up a milk jug filled up with water as many times as he/she can until no more lifts can be completed. The number of lifts completed will be recorded by the partner. After the first student in the group is done, the other will do the experiment. After all the class has gone we will come back as a group and discuss the results and I will ask for reasons why the hypothesis was correct or not (logical/mathematical, visual/spatial, interpersonal, Blooms comprehension).

### **Step by Step Plan**

- After the introduction I will start off by saying that all movement in the human body requires the actions of muscle.

- Then I will state that movement can be divided into involuntary and voluntary movement. Voluntary movement is under our conscious control while involuntary muscles are not under our conscious control (verbal).
- I will then ask the class if they can think of examples of both voluntary and involuntary muscle movements (heartbeat – involuntary, arm movement – voluntary) (verbal, Blooms comprehension)
- Next we will discuss the three types of muscle – cardiac or heart muscle, skeletal muscle, and smooth muscle.
- As we discuss each type of muscle a microscope set up in front of each group will have the selected muscle for examining.
- First up is skeletal muscle. I will explain that skeletal muscles are attached to the bones (thus the name skeletal muscle). They are voluntary and under our direct control. Skeletal muscles are responsible for most of the movement of the body. I will also explain that skeletal muscles can react very quickly as in a reflex. I will ask the class for various examples (visual/spatial, verbal, Blooms comprehension).
- With the microscope slide of skeletal muscle in front of them, I will describe what skeletal muscles look like while they are observing the slide. Skeletal muscles have stripes with alternating light and dark stripes. This enables the muscles to contract and move as the neurons fire. The students will be able to see the nucleus. When I am done talking the students will draw a quick sketch of what they see under the microscope
- Next I will discuss cardiac muscle. Cardiac muscle looks like skeletal muscle. They are both striated. However cardiac muscle is found only in the heart and is involuntary. The cardiac muscle does not get tired like skeletal muscle (which is why it is in the heart). As before the students will examine the cardiac muscle under the microscope and draw a sketch (visual/spatial, verbal, Blooms comprehension).
- Next up is smooth muscle. All smooth muscles are involuntary and control most internal muscles. The muscles involved in digestion (swallowing, moving food in intestines) are all smooth muscles. Unlike cardiac and skeletal muscles, the smooth muscles are not striated. Pictures will be drawn as in the previous muscle discussion (visual/spatial, verbal, Blooms comprehension).
- Next we will discuss how muscles work in pairs. One muscle is always contracting while the other one is relaxed. For this the students will get back with their partner. I will give the pair a sentence to write. The students will alternate letters in the sentence until the sentence is complete. After the practice, the students will have a race to see which “muscle group” has faster reflexes (visual/spatial, bodily/kinesthetic, interpersonal).
- After the class discussion on muscles we will do some activities in which the students get up and move around the room. Three stations will be set up each one corresponding to a different type of muscle. One with some bread to eat (smooth), one with some clothes pins (skeletal), and the other with duct tape lines to jump over (cardiac) (bodily/kinesthetic, visual/spatial).
- At each station the class will answer various questions on worksheets provided (the gifted and talented students will have modified worksheets) (Blooms knowledge, comprehension, application, and analysis).
- After the class is done with the activities we will come back together.

Closure – I will close this lesson by explaining to the students that all this muscle work makes your body tired and you need a way to cool off. I will then tell them that the skin (what we are discussing tomorrow) has mechanisms to keep the body cool. For homework I will have the students research their favorite sport and come up with a list of all the movements involved in that sport.

**Adaptations and Enrichment:**

On top of the assigned homework the gifted and talented students will interview the gym teacher or school nurse and come up with ways to prevent injuries during the sport they have selected. The gifted and talented students will also have different questions to answer on the worksheets.

Work sheets for the stations (gifted and talented modifications in bold)

Station one – eating bread (smooth muscle)

1. Examine the bread and eat a piece that is not too small but not too big.
2. Note the feeling as it goes down your throat and into your stomach and write down your observations.
3. Is smooth muscle voluntary or involuntary? What evidence can you give to support that conclusion
4. **What is the importance of smooth muscle in the digestive tract? Give reasons for your answer**

Station two – clothes pin (skeletal muscle)

1. Pick up clothes pin with the hand you write with and start squeezing the clothes pin as fast as possible for two minutes.
2. Count how many times you squeeze the clothes pin in the two minutes.
3. Rest for one minute and try the experiment again.
4. What were the results of the experiment? Explain in your own words why you could not flex the clothes pin as much the second time around
5. **If this experiment was tried on the other hand, what would expect the outcome to be? Give reasons for your answers.**

Station three – jumping lines (cardiac muscle)

1. Feel your heart for 15 seconds. Notice the rhythm.
2. Start jumping back and forth over the duct tape line on the floor for 45 seconds.
3. Feel your heart again for 15 seconds. What do you notice? Record your results.
4. Why is it so important that the heart does not get tired?
5. What type of muscle is the heart?
6. **Do you think the heart is the strongest muscle in the human body? Explain your reasoning.**