

Class: Grade 11 Biology

Lesson Title: Three Muscle TypesClass Size: 20
Time: 60 mins**Curriculum Outcomes:***The Muscular System:*

- Describe the structure and functions of the muscular system.
- Explain how muscles work.
- Identify some problems of the muscular system.

Learning Objectives:

1. Students will become familiar with the three different muscle types.
2. Students will understand common problems for each muscle type.
3. Students will understand involuntary from voluntary muscles.

Materials:

- Name tags (lungs, body/organs)
- Double sided cards that are red on one side and blue on the other
- Small handheld fan
- Tape
- Metronome soundtrack (for cardiac muscles activity to keep beat)
- Pool noodles or paper towel rolls, anything tubular for the skeletal muscle activity

Preparation beforehand:

1. Tape out a space on the floor that looks like the 4 squares in figure 1 representing the circulatory system (see activity #2). If you watch the video, you can see that the classroom had lab benches and the lanes between the benches were used as the pathways for students to follow. If your classroom allows chairs and tables to be moved, you will have to tape out the circulatory pathway.
2. Prepare name tags, labels and double sided red-blue tags for student roles

Introduction:

1. Introduce the topic. Possible prompt questions include:
 - a. What do you know about muscles? Are there different kinds? (three types – cardiac, smooth, skeletal; made of long muscle fibers; contract and relax; involuntary and voluntary muscles)
 - b. What types of problems are common to muscles? (Charlie horse, seizing, heart attacks, A/V-phib, MS, cancers, blockages, fatigue)
2. Explain what a kinulation is (broken up into kinesthetic and simulation). Tell them that these are used to help students learn difficult concepts that are otherwise difficult to picture. It allows students to become part of the demonstration, and therefore easier to remember and learn. Ask students if they would like to try one.

Activity #1 – Smooth Muscles (Involuntary) Kinulation:

1. Begin a discussion about smooth muscles. What are they involved in? (Digestive system)
 - a. What does the digestion process involve? What is the first step? (chewing)
 - b. Have students continue to explain the steps in digestion (swallowing—is it voluntary or involuntary?, goes through the esophagus, into the stomach)
 - c. Do you ever eat in positions other than sitting straight up? Gravity takes food down but what if you aren't sitting straight up?
 - d. Has anyone heard of peristalsis?
 - e. Ask the students if the esophagus is made of muscles? What about the stomach? Can you control these muscles? (involuntary)
2. Tell students that they are going to kinulate the digestive system and the muscles involved in the system.

- a. Have all students of the students form the esophagus (line up in two lines to make a tube like structure)
 - b. You need to establish the mouth end and the stomach end of the tube
 - c. Tell them they are going to show how the smooth muscles of the esophagus work
3. How do the smooth muscles of the esophagus help a piece of food get from the esophagus to the stomach? (tighten, squeeze the food down)
4. Ask for a volunteer to be a piece of food (what type of food do you want to be?)
 - a. The first two people at the opening of the esophagus (across from each other) are going to move in and squeeze the piece of food and push him forward, the next two people will do the same and continue down the entire esophagus (kind of like a wave)
 - b. Tell the piece of food to not move until the esophagus moves him
 5. Next, ask students to throw-up the food. Ask students to let the food get about half way down the esophagus and then push him the other way, back out the mouth.
 - a. There is so much pressure that the food comes flying out.
 6. Recap: smooth muscles, involuntary, they are all working together, like a tube of toothpaste pushing to the end.
 7. What can cause vomiting to happen? What can cause someone to gag? (bad food, the flu, viruses, bacteria, alcohol, when someone makes you laugh)

Activity #2 – Cardiac Muscles Kinulation (Involuntary) :

1. Ask students where you would find cardiac muscle?
 - a. Is it voluntary or involuntary muscle?
 - b. What do you know about cardiac muscle? (pumps blood all around our body)
 - c. What do you know about blood travelling through the chambers of the heart? (You may need to draw a basic diagram for students to see what the heart looks like. Show the four chambers and their names, where the valves are, ventricles, atria, where the blood picks up oxygen and gives it away).
2. Tell students that they are going to kinulate the blood flowing through the heart and the parts of the heart working together to pass blood to the body and then they are going to show what would occur if the muscles were not working properly.

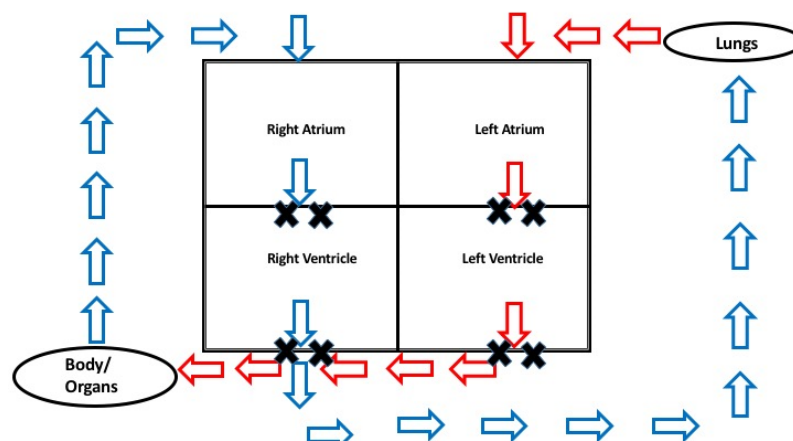


Figure 1

3. Have 1 student represent the lungs, and one student represent "the rest of the body" positioned as shown in the diagram. Explain that the lungs' job is to provide the cells with oxygen and the body's job is to use the oxygen from the blood (power the muscles, brain, all of the organs in the body).
 - a. The person who is the lungs can use a handheld fan to show they are passing oxygen to the blood cells.
 - b. Give the student playing the role of the lungs the "lungs" nametag and the student playing the role of the body the "body/organs" nametag.
4. Choose 8 students to be valves in the heart. They will be standing in the positions indicated by "X" in figure 1.
 - a. Their role is to stop and start the flow of blood through the heart.
 - b. They can stand facing each other (open) or shoulder to shoulder (closed)
5. Give the rest of the students the double-sided red/blue nametags.
 - a. They are going to be blood cells and either be oxygenated (red) or deoxygenated (blue) depending where they are in the body.
6. Have all of the blood cell students start at the right atrium. They should have their cards turned to blue as they do not have oxygen yet.
 - a. Use a metronome beat be the indicator of the valves to open and close. When the beat clicks they will push the cell through into the next chamber or the next spot (right atrium→right ventricle→lungs→left atrium→left ventricle→body/organs→right atrium...)
7. Play the metronome and have the blood cells go through the heart.
 - a. Let the students circulate and observe if they are changing their colours from blue to red or red to blue at the correct times.
8. Ask students what are ways in which the cardiac muscles could have problems? (heart attack, irregular heart beats)
 - a. Have students kinulate a chamber malfunction in one of the chambers. The valve at the top of the chamber are going to keep letting everyone go through as fast as possible and the valve at the bottom wont be letting the cells out. This will show the blood cells pooling in one chamber and what can occur if bood flow isn't regulated.
 - b. Ask the body how it is feeling...it is not receiving any oxygen.
 - c. What do we do in this situation? (defibrillation)
 - d. Get students to circulate like normal again

Activity #3 – Skeletal Muscles Kinulation (Voluntary):

1. Ask students what they know about skeletal muscles?
 - a. Can you name any? Are there any that you work out when you go to the gym?
 - b. Biceps, triceps, quads, hamstrings, etc.
 - c. How do they work as muscle pairs? Get students to flex their biceps/triceps. Ask them if they can feel how one side is balled up and the other side is longer. Have them do the same to their quads/hamstrings.
2. Tell students that they are going to kinulate pairs of muscles (biceps, triceps).
 - a. Use pool noodles/tubular prop to be the bone in the arm
 - b. Ask for volunteers to be the pairs of muscles to make the arm bone move back and forth
 - c. Have a person stand in the middle to hold the bone. Have two people stand on each side of the person controlling the bone.
 - d. One pair standing on one side will be the triceps and the other side will be the biceps
 - e. To move the arm towards the biceps, that muscle has to be balled up and short, while the triceps has to get longer (ask students how they could show this...they can stand close together and then hold hands and be farther apart).
 - f. The bone in the middle will point towards the muscle that is balled up. Have the students who are the muslces move closer and farther apart to get the bone to move back and forth

3. Get the rest of the class to form groups of 5 (2 pairs of muscles and 1 bone) to kinulate the movement of skeletal muscles
4. After they have tried the biceps and triceps movement, have them pretend they are the leg muscles (hamstrings and quadriceps)

Conclusion – Possible wrap-up questions:

1. What types of muscles did we see today that you could control (voluntary) or not control (involuntary)?
2. What types of muscular problems can occur in these different types of muscles?