Science Unit: ***Human Anatomy – How Do We Move?***

Lesson 2: ***The Muscular System***

School year:	2007/2008
Developed for:	Henderson Annex Elementary School, Vancouver School District
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Grade level:	Presented to grades 3-5; suitable for 3-7 with age-appropriate modifications but optimally matches Grade 5 curriculum.
Duration of lesson:	1 hour and 15 minutes

Objectives

1. Learn about the muscular system
2. Observe muscles when they are working and when they are at rest.

Background Information

This is the second in a six-part series of "Human Anatomy" activities that all focus around the question: "How Do We Move?" The first session focused on the skeletal system. Subsequent sessions will focus on the circulatory system (getting needed supplies (nutrients, oxygen) to the working muscles), respiratory system (providing oxygen needed for, and getting rid of carbon dioxide created by, physical activity), digestive system (providing the energy we need to undertake physical activity), and the nervous system (the system that coordinates the activity).

In the first session, students draw out life sized bones of either the leg (femur + tibia) or the arm (humerus + radius). In this session, they will attach those bones to form a joint (the knee or the elbow) and learn about how muscles are used to move those bones.

Vocabulary

Word:	
muscle	type of tissue that moves your skeleton
tendon	type of tissue that attaches muscles to bone
ligament	type of tissues that attaches one bone to another bone

Materials

- "bones" drawn in last session
- brass fasteners
- string

In the Classroom

Introductory Discussion

1. Last week, we learned about bones. We learned that our body is made up of 206 bones and those bones have a few purposes: (1) to protect us (e.g., our skull protects our brain), (2) to give our body

structure (so we aren't just a big blob!), (3) to make blood cells. This week we are going to learn about how we move that skeleton of ours around!

- How do we move our skeleton around? What system are we using?
    - Answer: the muscular system. Our muscles are attached to our bones.
- How do muscles work?
    - Answer: Muscles work by contracting (i.e., getting smaller). Because they are attached to our bones, when they contract, they "pull" the bone to move it. Muscles can only "pull", they can't push.
- Ask the students to find their calf muscle (the technical name for this muscle is the gastrocnemius!). What happens if you point your toes upward? (The muscle gets hard – that means it's working – it's pulling on the bones to move your foot). What happens to that muscle if you relax your leg (The muscle gets soft again – that means it's not working right now, it's relaxing).
- Ask the students to feel just above their heel. The stretchy, rope like thing that they feel is called the "Achilles tendon." A tendon is what attaches muscle to bone.
- If muscles can't push, how can we move our bones back and forth (demonstrate extending and flexing your arm or leg)?
    - Answer: Muscles work in partners! One muscle on each side of the bone, one to pull it in each direction.
    - You could demonstrate this by tying a string to your wrist – now attach the other end of the string to the front of your humerus. If you pull the string, it will flex your arm at the elbow. But if the string is tied to your wrist on one end and to the back of your humerus, when you pull the string it will extend your arm out.
    - [Note that there is more than one muscle involved in each of these actions (e.g., there are 4 muscles that are involved in flexing the arm), but demonstrating one muscle gets the idea across]
- Ask the students to bend their arm at the elbow and "make a muscle." What is happening here? (The muscle gets hard because it's working, it's getting shorter and pulling the bone to move it). This muscle is called the biceps. Its partner is called the triceps and the triceps is the muscle on the back of the arm, the one you use to unbend your arm (feel your triceps will you upbend your arm).
- Ask students to feel their faces while they make different expressions (happy, sad, angry, etc.). Can they feel the muscles in their face move?

2. Fun facts about muscles.
    - We have more than 630 muscles in our body.
    - More than 30 of our muscles are in our face – that's how we can make different expressions (happy, sad), talk and move our eyes around!
    - Scientists estimate that our eye muscles move more than 100,000 times a day!
    - There are two different kinds of muscle: (1) **voluntary muscles** are ones that work when you tell them to (e.g., if you decide to put up your hand, or run and kick a soccer ball, you make these movements using voluntary muscles), (2) **involuntary muscles** are ones that work without you

having to tell them to (e.g., you blink, you breath, your heart beats – all on their own, without you having to think about it. Yup, your heart is a muscle!)

3. The activity today is to make the arm or leg we built last week move!
    - We are going to attach our two bones together using a brass fastener to represent the joint, and then add some string to represent the muscles.

Science Activity/Experiment

Activity Title: Make Your Skeleton Move!

Purpose of Activity: To demonstrate how muscles work in pairs to move bones.

Methods and Instructions:

Set-up prior to experiment: Students will have two bones from last session (either a femur & a tibia, or a humerus & a radius).

Brief description of how students will work in groups or pairs.

1. Students will punch a hole in their bones and use a brass fastener to form a joint between their two bones.
2. Students will tie string to the bones to use to pull the bones so that they move. It is important that students tie on two strings – one on each side of the bone – to illustrate that muscles work in pairs, one pulling in each direction to move the bone.

Closure Discussion

1. How do muscles move bones?
2. Why do muscles usually work in pairs?

References

Bones and Muscles http://www.cstone.net/~bcp/3/3NSci.htm . Baltimore Curriculum Project. Accessed 5 February 2008.

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Extension of Lesson Plan

1. If students built an entire skeleton instead of just an arm or a leg, they could construct a number of joints and move the skeleton around.