Lesson Title	Movement, it's FUN-damental!
Length of Lesson	45 minutes – 1 hour
Created By	Lucas Pounders/ Michael Hamilton
Subject	Human Anatomy & Physiology
Grade Level	9^{Th} - 12^{th}
State Standards	1e; 2a,d; 3a,c,e,o
DOK Level	1,2,3,4
DOK Application	Identify, Show, Hypothesize, Connect
National Standards	9-12 Science as Inquiry, Life Sciences
Graduate Research Element	Muscular System

Student Learning Goal:
This lesson is designed to help students to understand how muscles work with movement of the body and fatigue rates. It is also designed to aid in the review of key terms used for muscle use.

State Standards

1. Apply inquiry-based and problem-solving processes and skills to scientific investigations.
    e. Evaluate procedures, data, and conclusions to critique the scientific validity of research.
2. Demonstrate an understanding of the basic organization of the body.
    a. Apply and relate appropriate anatomical terms to the body in anatomical position.
    d. Categorize the relationship of the cell and its functions to the more complex levels of organization within the body.
3. Demonstrate an understanding of the structure, functions, and relationships of the body systems.
    a. Identify structures and explain functions of the components of the Integumentary system.
    c. Compare the structure and functions of the skeletal system with its relationship to movement.
    e. Compare the functions and structures of the muscular system with its relationship to movement.
        • Major components and functions of skeletal muscle fiber
        • Major skeletal muscles and the process of contraction
        • Three types of muscles in the body
    o. Demonstrate an understanding of the structures and functions of the circulatory system and their role in maintaining homeostasis.
        • Pulmonary and systemic circulation
        • Systolic and diastolic pressures in relationship to cardiovascular health

National Standards
LEVELS 9-12

Abilities necessary to do scientific inquiry

Understanding about scientific inquiry

Materials Needed (supplies, hand-outs, resources):
Paper
Pen or Pencil
Stopwatch
Weights or Water Bottles in bags or other
Chicken Wings
Scapulas
Forceps

Optional:
Handouts of Key Terms associated with Muscles
Graphing Paper for plotting times

Lesson Performance Task/Assessment:
Start the lesson by asking the students what they believe causes fatigue and soreness in muscles. Now ask them if they believe that men or women tend to become fatigued more easily than the other. This will, most certainly, cause a major discussion that you should be ready to control quickly. After settling the students tell them that we are going to solve this discussion scientifically. Introduce the students to the materials that are to be used in the lesson. Explain to them that in order to understand how fatigue occurs in muscles they must first understand how a muscular system works. This is to be completed by letting the students dissect the chicken wing.
Step 1:
Students will peel back the skin layer from the wing and observe the fat layer and capillaries.
Step 2:
Move the wing back and forth taking note of the different muscle movements.
Step 3:
Cut through the tendons at the end of the wing and observe the different muscle groups.

Step 4:
Cut through the wing joint and observe the cartilage caps and ligaments (tough white sheets).
Step 5:
As they further dissect the wing, they need to sketch the different muscle groups and dissect them separately.

Then describe to them that they will be using the following static positions to test fatigue limits in different genders. These positions will be described as follows:

Position 1:
Sending ATP to your phalanges to hold the weights in a manner of opposition and stand in the following position for as long as you can:
Arms - Adduction and Pronation
Legs - Plantar Flexion

Position 2:
Sending ATP to your phalanges to hold the weights in a manner of opposition and stand in the following position for as long as you can:
Arms: Biceps Contracted in a state of Abduction
Legs: Adducted with Eversion
Other: Contract Temporalis and Zygomaticus

Allow the students to use these two positions in the exercise of timing their abilities to hold the positions in a static manner. The students should also take note of things such as which muscles fatigue the fastest, breathing and possibly even heart rate if there is access to a heart rate monitor. When the students have graphed average time for the group vs. position they will compare the graphs that they have created and a winning group will be announced. If time permits at the end of the class period the groups can assemble their own static positions and have the other groups perform the positions for further review of the muscles and their uses.

Lesson Relevance to Performance Task and Students:
Students must know this information for upcoming examinations and quizzes. The topics covered in this lesson also allow the students to understand how the muscles in the body move, use energy and fatigue in these simple exercises.

Anticipatory Set/Capture Interest:
This lesson will capture the interest of the students in three ways. The first is the interest in competition if you would like to enhance this interest it may be a good idea to place all girls or all guys in specific groups. The second way is that the students will have to know the terms in order to execute the positions used in the exercise. Lastly, the main way that the interest of the students will be captured is in the dissection of the chicken wings.

Guided Practice:
After the exercises there will be a guided discussion about the groups' findings in the different areas of observation along with any extra observations that the students might have made. If time permits the students will be required to design their own positions and turn them into word problems for the other students.

Independent Practice:

Students will make graphs plotting time vs. position used for each group.

Remediation and/or Enrichment:
Follow student IEP. Groups will make their own positions if time permits.

Check(s) for Understanding:
How many different muscle groups were found in the chicken wings?
When the muscles are contracted are the wings extended or not?
(This is a Trick Question to get them thinking.)
Who fatigued faster and what are some possible reasons why?
Did you have fun?

Other:
If the students can come up positions and correctly label them this is also a good indication that they have an understanding of the subject.

Closure:
Closure comes in the form of class discussion where the answer to questions asked for understanding can be left somewhat open ended or have a correct and definite answer.

Possible Alternate Subject Integrations:
General Science, Biology, Ecology, Mathematics,

Teacher Notes:
Always be sure to know the material that you are presenting and make a dry run through your lectures and lab before trying to attempt them in class. Do not be afraid to substitute and improvise as needed.