



Design Your Own Muscular System – David Little

Purpose

The main goal of this lab is to get students thinking less like a student and more like a scientist. Rather than passively absorbing data as is often asked of students, scientists have to be critical and ask questions about what they observe. A second, important goal of this exercise is to help students review the various muscle groups they have learned in class and to learn something about the purpose and function of various muscles.

Overview

The lesson begins with an introduction of the lab to students. Students break into groups and fill out a worksheet. They design muscles for one body part and then compare these muscles to the actual muscular system. The lesson concludes with a follow-up where the teacher can evaluate the lesson and students can tell the class about their designs.

Student Outcomes

- Students will think about why muscles are constructed the way they are in the body
- Students will have a chance to review key muscle groups
- Students will learn the function of various muscles
- Students will be able to describe how thinking about how they would design a system can be used to gain insight about how nature designed a system.
- Students will be able to identify the key differences of critical scientific observation, and passive observation of data.

Standards:

- 11.B.4b – Develop working visualization of the proposed solution designs.
- 11.B.5a – Identify a design problem that has practical applications and propose possible solutions, considering such constraints as available tools materials, time and costs.
- 11.A.5a – Formulate hypotheses reference prior research and knowledge.
- 12.A.4b – Describe the structures and organization of cells and tissues that underlie basic life functions including nutrition, respiration, cellular transport, biosynthesis and reproduction.

Time

This activity will take roughly 80 minutes to complete.

Level

Junior/Senior level Anatomy & Physiology or Biology



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Materials and Tools

Handouts for the lesson are included as separate documents:

- [Design your own Muscular System Activity](#)
- [Arm, back, leg](#) and [skull](#) worksheets

Prerequisites

Students should be familiar with the anatomy of the muscular system and the physiology of joints before beginning this lab.

Background

In this lab you will design a muscular system of your own and then compare it to your knowledge of the actual human body.

Teaching Notes

The lesson should begin with an introduction of the lesson objectives as described in the instructions. The main thing here is to emphasize the difference between simply absorbing information and the job of a scientist, which requires skepticism, curiosity, and creativity in the analysis of said data. Walking through an example of making up a muscle is also useful.

Part of the goal of the lab should be to illicit some of the important lessons and conclusions of the lab from students during follow up. Students might reach these while they fill out the worksheet or during a follow-up discussion where the teacher asks appropriate questions.

Assessment

Concept	1	2	3
Muscle Anatomy	Worksheet includes true muscle groups.	Selected true muscle groups are clearly identified.	Clearly and accurately identifies selected true muscle groups with inserts and origins.
Muscle Physiology	Worksheet includes true muscle physiology.	Muscle physiology is clearly identified.	True muscle physiology is accurate and clearly identified.
Curiosity/Critical Thinking	Students meaningfully compare their own design to the true muscle design.	Students actively question the true muscle physiology after comparing it to their own design.	Students question muscle physiology and develop hypotheses.
How design is useful	Students can identify design as a method for scientists to study the natural world.	Students can explain how making their own design can help a scientist study the natural world.	Students can explain how making a design is useful to scientists, and its relationship to critical thinking.
Scientific observation	Students relate the lesson to scientific observation.	Students can identify some key elements of scientific observation from the lesson.	Students can explain the differences between scientific observation and passive observation.