

Unit 3: Musculo-Skeletal System

Content Area: **Science**
 Course(s): **Anatomy and Physiology**
 Time Period: **Second Marking period**
 Length: **3 Weeks**
 Status: **Published**

Unit Overview

This chapter begins with an overview of the many functions of Bones and Muscles. The features of the skeletal bones and the muscular system that contribute to body function, structural support and protection are discussed here. The components of the muscular and skeletal system that provide support and protection for tissues and function to make movements possible and maintain homeostasis is discussed further.

STAGE 1- DESIRED RESULTS

Standards- 2020 New Jersey Student Learning Standards- Science

SCI.9-12.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
SCI.9-12.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Science and Engineering Practices

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Planning and Carrying Out Information

Cross Cutting Concepts

- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Structure and Functions

Disciplinary Core Ideas

Physical Sciences

Life Sciences

- LS1A: Structure and Functions
- LS1B: Growth and Development of Organisms
- LS1D: Information Processing
- LS3A: Inheritance of Traits
- LS3B: Variation of traits

Earth and Space Sciences

Engineering. Technology. and Applications of Science

- ETS1A: Defining and Delimiting an Engineering Problem
- ETS1B: Developing Possible Solutions
- ETS1C: Optimizing the Design Solution

Essential Questions

- What are the features of the skeletal bone that contribute to body function ?
- How does bone formation contribute to structural support and protection?
- How do well-known skeletal disorders effect homeostasis and bone function?

- How do articulations provide for different body movements ?
- How are muscles structurally organized that allow for body movement?
- How do muscles contract ?
- What are the types of muscular movements?
- How do notable muscle disorders affect homeostasis and movement ?

Enduring Understanding

- The skeletal system is instrumental in the support, movement and protection of the human body.
- Bones are dynamic organs that interact and support other systems of the body.
- The muscular system plays a major role in movement, support and homeostasis of the human organism.
- The state of an organism is maintained by the dynamic interaction of the systems that comprise it.

Students will know...

Definitions:

Axial skeleton, Appendicular skeleton, Long bone, Short bone, Structure of a Bone, Bone Formation, Growth and Remodeling, Vertebral Column, Types of Joints, Types of Muscles, Anatomy of a Muscle, The Sliding Filament Theory, Types of Body Movements, Muscles in the Human Body.

Misconceptions:

Students will realize that movements in the human body are controlled not only by skeleton, but also by muscles.

Students will also be made aware that muscles, bones and joints work together to form movements.

Students will realize that movements are not the only function of the Musculo-Skeletal system.

Students will be able to...

- Compare and contrast the major types of bones. (e.g., long, short, flat, irregular)
- Evaluate the importance of bone markings in understanding the function of the skeletal system.
- Analyze the bones of the skull, cranium, bony thorax, vertebral column, arm, forearm, hand, leg and discuss their structure and function.

- Compare and contrast skeletal, cardiac, and smooth muscle tissue by their structure and function.
- Distinguish between aerobic endurance and anaerobic endurance.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment

- Analogy Prompt
- Choral Response
- Exit Card / Ticket
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments

Students will articulate a human skeleton.

Students will interpret x-rays which will include identification of fractures, joints, and their appropriate bone locations.

Students will analyze muscle tissue specimens under the microscope. They will sketch and interpret their findings as well as answer questions.

Students will create a model of the muscle demonstrating the macroscopic structures and layers.

Muscle Fatigue Lab. The purpose of the experiment is to determine which factors influence muscle fatigue. Students design and conduct an experiment to test their hypothesis, record and interpret data and draw

conclusions.

Chicken wing dissection demonstrating tendons, ligaments and muscle movements.

Other Assessments:

Laboratory observations and follow-up.

Laboratory reports with diagram assessment.

Homework (readings, questions).

Student class participation.

Laboratory observations and follow-up.

Benchmark Assessments

Chapter Test on Skeletal system.

Chapter Test on Muscular System.

Unit test on Musculo-skeletal system.

STAGE 3- LEARNING PLAN

Instructional Map

- Use an articulated skeleton to (a) indicate the protective and supportive aspects of bones, (b) identify individual bones, (c) identify the security aspects of various body joints, and (d) show how bones fit together at joints.
- Use a disarticulated skull to demonstrate more clearly the individual skull bones and to show the fragile internal structure of bones containing sinuses (e.g., ethmoid, sphenoid, etc.). Discuss the function of the sinuses and illustrate complementarity of structure and function (e.g., sinuses as resonating chambers similar to an empty room). Relate these bones in an articulated skull.
- Obtain X rays of comparative anatomy (i.e., an arm of a child and an arm of an adult) to illustrate the growth plate in the child versus none in the adult. A simple, relevant video can be found here: <http://www.natgeoeducationvideo.com/film/1087/bone-growth>
- Obtain X rays of the abnormal spinal curvatures lordosis (lateral view), scoliosis (posterior view), and kyphosis. Demonstrate the body position represented by the X ray. Explain the position that each abnormal curvature can be viewed from and the basic scoliosis examination provided by most school nurses.
- Obtain X rays of different fracture types so that students can better visualize these injuries. Use real-world examples to show how different fractures can occur: for example, take a young branch of a tree and create a greenstick fracture and contrast it to bending a brittle branch from the ground.
- Divide the class into small groups. Have students demonstrate to each other the differences between various types of body movements, such as flexion, extension, abduction, and adduction. Be sure that they try these movements with different groups of muscles, including muscles of the hands, arms, and legs.
- Call out an action and ask students to provide the name of the muscle or muscles responsible for that action. Students can also be challenged to identify the antagonists and synergists when given the name of a muscle. This can be made into a game, with the use of a spinner to point to different muscles or movements to be done, or cards with the muscle or action written on one side.
- Call out muscle names and have students point to the appropriate muscle on a torso model, as well as to the area on their own body. Muscle actions can also be called out and students can point to the appropriate muscle on the torso model.

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content

- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-

subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge

- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Cooperative Grouping
- Extended Time

- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-direct
- Repeated Drill and Practice
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

Differentiation Strategies

High Preparation

- Alternative Assessments
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Literature Circles
- Multiple Texts
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation

- Choice of Book / Activity
- Flexible Grouping
- Homework Options
- Jigsaw
- Mini Workshops to Re-teach or Extend Skills

- Open-ended Activities
- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Intergration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

In grade 6, students complete a unit on "Diversity of Life". This leads into "Populations and Ecosystems" in grade 7. In grade 8 students study "Human Systems Interactions" and "Heredity and Adaptations." In freshman year, students study Biology, a full year required course, and in sophomore year take Chemistry. After that, students have taken Anatomy and Physiology. This course will continue to focus on having students gain a deeper understanding of the Performance Expectations outlined in the NGSS, particularly in Life Sciences and Engineering Design. After this, students will be able to chose from Physics, Human Impact on the Environment, Forensics and Zoology.

Additional Materials

Online Resources:

Have students discuss human bipedalism and connect concepts from the chapter to an article from PBS Nova entitled "Our Improbable Ability to Walk," which can be found online at: <http://www.pbs.org/wgbh/nova/body/our-ability-to-walk.html>.

www.whack-a-bone.com

www.anatomyarcade.com - poke a muscle

visible body app to drag and drop various bones and muscles to assemble the complete skeletal and muscular system

www.apchute.com

<http://kidshealth.org/kid/htbw/MSquiz.html>

short video, body to label, easy quiz

<http://studyjams.scholastic.com/studyjams/jams/science/human-body/muscular-system.htm>

video

http://www.time4learning.com/demos/skeletal_system/nobones.swf

http://www.bbc.co.uk/science/humanbody/body/interactives/3djigsaw_02/index.shtml?skeletonhttp://www.softschools.com/science/human_body/skeletal_system/
www.sciencekids.co.nz/moving_growing.swf

<http://archive.fossweb.com/modules3-6/HumanBody/activities/mrbones.html>