Anatomy Unit 2: Support and Movement - Skin, Skeletal, and Muscular

Content Area: **Science**
Course(s): **Anatomy and Physiology**
Time Period: **MP2**
Length: **45 days**
Status: **Published**

NJSLS - Science

SCI.HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
SCI.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
SCI.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
SCI.HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Science and Engineering Practices

Developing and Using Models

Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4)

Planning and Carrying Out Investigations

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

Constructing Explanations and Designing Solutions

Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)

Scientific Investigations Use a Variety of Methods

Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness,

objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)

Disciplinary Core Ideas

LS1.A: Structure and Function

Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)

All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1)

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

LS1.B: Growth and Development of Organisms

In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

Crosscutting Concepts

Systems and System Models

Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)

Structure and Function

Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

Stability and Change

Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

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Rationale and Transfer Goals

The musculoskeletal system allows the body to move, provides support, and maintains stability. It is made up of the skeletal system which comprises 206 bones and cartilage. In addition to the locomotive functions previously described the skeletal system protects internal organs, stores essential minerals and produces blood cells. The muscular system is composed of smooth, striated, and cardiac tissue which allows movement of the skeleton by synergistic contraction of the various muscle groups. The nervous system correlates this movement to allow for the wide range of motion that may be accomplished by the human body.

Skin is a protective organ made of 3 layers that covers the body, helps regulate body temperature, slows water loss, houses sensory receptors, synthesis of various biochemicals and excretes waste. Individual bones are the organs of the skeletal system, and the skeleton is divided into axial and appendicular parts. Bone contains living tissue that can be reshaped, and bone structure reflects its function. Bones of the axial skeleton include the skull, vertebral column and ribs. The appendicular skeleton includes bones of the arms, legs, hands and feet. Bones connect at areas called joints, and moveable joints allow for joint movements of the skeletal muscles. There are 3 types of muscle, cardiac, smooth and skeletal. Muscles are the organs of the muscular system. Muscle movement is a result of the sliding movement of actin and myosin. Energy for muscle

movement is supplied by ATP during aerobic cellular respiration. The major skeletal muscles of the body are named by shape, size, location or the movement that they initiate at the joints.

Enduring Understandings

The muscular and skeletal systems are separate entities that work in unison to accomplish locomotion.

The skeletal system is extremely flexible and can endure extreme amounts of pressure.

Each component in the skeletal and muscular system has a specialized function which is facilitated by its anatomical structure.

Exocrine and endocrine function impacts the physiology of the skeletal and muscular systems.

Aging or pathology of this system can impact movement and can limit the available resources to the rest of the body.

Bone formation is a dynamic process that is a cyclic creation and destruction of osteocytes which allows for the continuation lateral growth and repair.

Bone is a living tissue that is responsible for the storage of essential minerals and the formation of blood components.

Muscle can be made from one of three muscle tissue types and may be under voluntary or involuntary control.

Pathology of the musculoskeletal system may include congenital factors, infections, hormonal fluctuations, malignancies, and immune system disorders.

Essential Questions

What are the major functions and structures of the skeletal, muscular and integumentary systems?

How do the skeletal, muscular and integumentary systems work together to allow for movement of the human body?

What types of disease and deficiencies affect the skeletal, muscular and integumentary systems?

What can a person do to prevent diseases and disorders that affect the skeletal, muscular and integumentary systems?

Content - What will students know?

- The general functions of the skin.
- The major structures in the 3 layers of skin.
- Factors that determine skin color.
- The skin regulates body temperature.
- Wound healing, and calculating burns with the rule of 9's.
- The major functions of bones.
- Bone histology.
- How bones are classified.
- The 3 types of joints.
- The types of movements at the synovial joints.
- The structure of muscle.
- The events and energy for muscle contraction.
- The names, location and function of the major external skeletal muscles.
- The relationship between homeostatic imbalance and disease.

Skills - What will students be able to do?

- Students will be able to draw and label the major structures in skin and the 3 layers of skin
- Students will be able to explain how genetics and environment can affect skin color
- Students will be able to ID the parts of the skin that aid in temperature regulation
- Students will be able to observe compact and spongy bone under the microscope and label major structures
- Students will be able to classify bones as long, short, flat or irregular, and can also ID anatomical features of bone that aid in their function. (EX: foramen)
- Students will be able to ID and label the major bones of the appendicular and axial skeleton
- Students will be able to label the 3 types of joints
- Students will be able to model the major movements at the synovial joints (EX: flexion)
- Students will examine a working synovial model with the chicken wing
- Students will model the structure of muscle
- Students will label and ID the major muscles by location(face, trunk, legs, and arms)
- Students will be able to describe the sliding-filament theory and the role of ATP in supplying energy
- Students will test the impact of exercise on muscle fatigue
- Students will diagnose case studies related to the skin, muscle and bone.

Activities - How will we teach the content and skills?

- Ch. 6 notes CH.6 guided notes from book
- Ch.7 notes Chap07studyoutline-skeletal system
- Ch. 8 notes Chap08 guided notes- muscular system
- Intro to Muscle Groups and Naming-dimartine
- Literacy: the evolution of skin color
- The Rule of 9s for skin burns using anatomical model rule of 9s image.png
- Chicken wing lab https://www2.nau.edu/lrm22/lessons/chicken_wing/wing.html

- Vocab key terms for each section Vocab template
- Concept map review concept map review template
- Ck12 review concepts (free online text that all teachers can access and use)
- Edpuzzle videos to reinforce concepts (all teachers have access to LHS)
- Lab stations
- Case study appropriate to the body system being covered (Scleroderma, Page'ts, Duchenne MD)

Evidence/Assessments - How will we know what students have learned?

- Quizzes/test Test-skin-chapter 6.docx TEST-ch 7 skeletal system.docx Muscle ID test
- Kahoot scores
- Literacy rubrics
- Anatomy Benchmark #2

Spiraling for Mastery

Content or Skill for this Unit	Spiral Focus from Previous Unit	Instructional Activity
• Describing the relationships within multicellular organisms, where cells perform specialized functions as parts of subsystems (e.g., tissues, organs, and organ systems), which work together to maintain optimum conditions for the benefit of the whole organism. • Recognizing that living systems require a continuous input of energy to maintain their chemical and physical organizations and also understanding that	• In multicellular organisms, the body is a system of multiple, interacting subsystems. • Organs are groups of tissues that work together to perform a particular body function. • Systems interact with other systems.	• Pre-unit vocabulary • Microscope slides • Lab exercises • Notes and group work • literacy • Labeling and online practice

with death (the cessation of energy input), living systems rapidly disintegrate. • Analyzing and explaining how cells carry out a variety of chemical transformations that allow conversion of energy from one form to another, the breakdown of molecules into smaller units, and the building of larger molecules from smaller ones.		

21st Century Life and Careers

WRK.9.2.12.CAP.2	Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
WRK.9.2.12.CAP.8	Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.

Career Readiness, Life Literacies, & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CT.1	Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
TECH.9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.TL.1	Identify the basic features of a digital tool and explain the purpose of the tool (e.g., 8.2.2.ED.1).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.
TECH.9.4.2.TL.4	Navigate a virtual space to build context and describe the visual content.
TECH.9.4.2.IML.2	Represent data in a visual format to tell a story about the data (e.g., 2.MD.D.10).
TECH.9.4.2.IML.3	Use a variety of sources including multimedia sources to find information about topics such as climate change, with guidance and support from adults (e.g., 6.3.2.GeoGI.2, 6.1.2.HistorySE.3, W.2.6, 1-LSI-2).
TECH.9.4.2.IML.4	Compare and contrast the way information is shared in a variety of contexts (e.g., social, academic, athletic) (e.g., 2.2.2.MSC.5, RL.2.9).

Interdisciplinary Connections/Companion Standards

MA.K-12.4	Model with mathematics.
MA.F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
LA.RST.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
MA.F-BF.A.1	Write a function that describes a relationship between two quantities.
LA.WHST.11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LA.WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
LA.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.