

Delaware Science Coalition



Grade 3 Human Body Unit Template



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Preface: This unit has been created as a model for teachers in their designing or redesigning of course curricula. It is by no means intended to be inclusive; rather it is meant to be a springboard for teacher thought and creativity. The information we have included represents one possibility for developing a unit based on the Delaware content standards and the Understanding by Design framework and philosophy.

Brief Summary of Unit

The Human Body unit consists of four investigations whereby students learn about their skeleton, joints, muscles and stimulus response. Each session employs activities where students learn about the function and structure of the different parts of the human body.

Stage 1: Desired Results **Delaware Science Content Standards**

Delaware Science Content Standards

This course focuses on the Delaware Science Content Standards and Grade Level Expectations in Standards 1 and 6 found on the following web site: http://www.doe.k12.de.us/programs/ci/content_areas/science.shtml

Standard 1: Nature and Application of Science and Technology

Understandings and Abilities of Scientific Inquiry

Students should know and be able to:

1. Understand that: Scientific investigations, whether conducted by students or scientists, involve asking a question about the natural world.
 - Be able to: Generate questions and predictions using observations and exploration about the natural world.
3. Understand that: The purpose of accurate observations and data collection is to provide evidence. Scientists use tools to enhance their senses in order to obtain more evidence.
 - Be able to: Collect data using observations, simple tools and equipment. Record data in tables, charts, and bar graphs. Compare data with others to examine and question results.
4. Understand that: Scientists use observations from investigations and knowledge that is already known to develop an explanation.
 - Be able to: Construct a simple explanation by analyzing observational data. Revise the explanation when given new evidence or information gained from other resources or from further investigation.
5. Understand that: The purpose of communicating with others is to share evidence and conclusions. Scientists communicate the results of their investigations to others.
 - Be able to: Share simple plans, data, and explanations with an audience and justify the results using the evidence from the investigation.

6. Understand that: The use of mathematics, reading, writing, and technology are important in conducting scientific inquiries.
- Be able to: Use mathematics, reading, writing, and technology when conducting an investigation and communicating the results.

Science, Technology, and Society

Students should know that:

1. People have invented new technologies to solve problems.

Students should be able to:

- Recognize that technology extends the sense of sight for observing bones, muscles and joints in greater detail (i.e., X-Rays).

Standard 3: Energy and Its Effects

Forces and the Transfer of Energy

Students should know that:

2. When balanced forces act on an object it will remain at rest, but if unbalanced forces act on the object it will begin to move.

Students should be able to:

- Simulate how bones, muscles, and joints in the human body work to transfer energy to objects, making them move.

Standard 6: Life Processes

Strand: Structure/Function Relationships

Students should know that:

2. Each plant or animal has different structures that serve different functions in growth, survival and reproduction.

Students should be able to:

- Describe how bones, muscles, and joints function together in humans to enable movement, protection and support.

Students should know that:

3. In animals the skeletal-muscular system provides structure, support and enables movement.

Students should be able to:

- Identify the structures of different types of joints (gliding, hinged, ball and socket) and describe the movement enabled by each. Recognize the importance of each type of joint to human movement.
- Compare and contrast the structure and function of the human skeleton to that of other vertebrate animals.

Regulation and Behavior

Students should know that:

1. Senses help humans and other organisms detect internal and external cues.

Students should be able to:

- Recognize that muscles move bones in response to signals from the brain.
2. The brain receives signals from parts of the body via the senses. In response, the brain sends signals to parts of the body to influence reactions.

Students should be able to:

- Conduct simple investigations to determine and describe how different body parts respond to of visual, auditory, and tactile stimuli.

Life Processes and Application

Students should know that:

3. Humans use devices and specialized equipment to ensure safety and to improve their quality of life (e.g., goggles, glasses, hearing aids, and wheelchairs).

Students should be able to:

- Research and report on common diseases or problems of the muscular and skeletal systems. Explain how these systems can be affected by external factors (i.e., bones can be broken and healed, good nutrition leads to strong bones).

Standard 7: Diversity and Continuity of Living Things

Reproduction, Heredity, and Development

Students should know that:

1. The offspring of some plants and animals resemble the parents (i.e., a tree seedling resembles a mature tree).

Students should be able to:

- Observe and describe similarities and differences in the skeleton of an infant to that of an adult human. Recognize that as a human grows and develops the number of bones does not change but the sizes of the bones do change.

Big Ideas

Observation and Evidence (compare various skeletal structures and their corresponding functions)

Reasoning and Explanation (compare movement of the hand with and without the use of joints)

Investigation (the effective practice on response time)

Modeling (model a human finger, arm, and leg)

Structure/Function (working of muscles to move bones)

Systems (Skeletal and muscular systems)

Behavior/Regulation (Stimulus response)

Unit Enduring Understandings

Students will understand that:

Humans and other animals have skeletons that provide support, protections, and movement.

The skeleton of humans and other animals are similar to and different from each other in structure and function.

Scientifically oriented questions lead to collecting evidence, forming explanations, connecting explanations to prior knowledge and theory, and communicating and justifying the explanation.

Living systems, such as the muscular and skeletal systems, demonstrate the complementary nature of structure and function.

The Human Body responds to internal and external cues, which allow them to survive. Stimulus response enables the human body to interpret and react to a given situation.

Unit Essential Question(s)

How do bones, muscles, and joints function together in humans to enable movement, protection and support?

How does the structure of the different types of joints (gliding, hinge, ball and socket) enable the human body to move?

How do models demonstrate how bones, muscles, and joints work in the human body to enable movement, provide support, and demonstrate protection of vital organs?

What are the similarities and differences in structure and function between a human skeleton and other vertebrates?

How do different body parts respond to visual, auditory, and tactile stimuli?

What common diseases or problems of the muscular and skeletal systems affect our bodies?

What are the similarities and differences in the skeleton of an infant to that of an adult human?

How can the structure and function of the skeletal system be used to group vertebrates?

How do muscles move bones in response to signals from the brain?

How do different body parts respond to visual, auditory, and tactile stimuli?

Knowledge & Skills

Knowledge:

- A human body can move in many ways. Movement is aided and limited by bones and joint structures.
- Bones have a variety of forms and functions.
- The skeletal system provides support, movement, and protections.
- The human body has an articulated skeleton.
- The structure of the bone relates to its function.
- The human skeleton has three types of joints: hinge, ball-and socket and gliding joint.
- The main function of muscles is to provide movement.
- Muscle tissue contracts when it works.
- Muscles provide coordination and structure for the body.
- Muscles attach to bones with tissues called tendons.
- The action of bones, muscles, and the central nervous system working together is called coordination.
- A stimulus is an event that triggers a response.
- A response is a reaction to a stimulus.
- Response time is the length of time between a stimulus and a response.

Skills:

- Describe how bones, muscles, and joints function together in humans to enable movement, protection, and support.
- Identify the structure of different types of joints (gliding hinged, and ball-and-socket) and describe the movement enabled by each.
- Recognize the importance of each type of joint to human movement.
- Simulate how bones, muscles, and joints in the human body work to transfer energy to objects, making them move.
- Compare and contrast the structure and function of the human skeleton to that of other vertebrate animals.
- Conduct simple investigations to determine and describe how different body parts respond to visual, auditory, and tactile stimuli.
- Research and report on common disease or problems of the muscular and skeletal systems. Explain how these systems can be affected by external factors.
- Observe and describe similarities and differences in the skeleton of an infant to that of an adult human. Recognize that as a human grows and develops the number of bones does not change, but the sizes of the bones do change.
- Recognize that there are many different kinds of vertebrates in the world. One way to sort or group vertebrates is according to

the structure and function of their skeletons.

Stage 2: Assessment Evidence

Suggested Performance Task(s)

Human Body assessment for grade three can be found at:

http://www.doe.k12.de.us/programs/sci_assess/default.shtml

Key Transfer ideas:

1. Bones, muscles, and joints function as a system allowing vertebrates to move and survive.
2. There are similarities in the structures and functions of bones, muscles, and joints in all vertebrates from infancy to adulthood.
3. Your senses send messages to the brain which in turn sends messages to the skeletal-muscular system to move. This cycle is continuous which allows the vertebrate to survive.

Expectations of Students:

- Identify different types of joints and describe how each helps the body to move.
- List three ways the skeleton helps a person to survive.
- Explain how the bones, muscles, and joints change throughout the human life cycle.
- Examine a picture of an artificial joint, identify the type of joint and how this joint functions.
- Describe similarities and differences between skeletons of other animals.
- Describe how muscles allow bones to move.
- Describe how the bones, muscles, and brain function together.

Rubrics/checklists for Performance Tasks (This should include holistic or analytic-trait rubrics used as a scoring guide to evaluate student products or performances.)

Human Body assessment rubrics for grade three can be found at:

http://www.doe.k12.de.us/programs/sci_assess/default.shtml

Other Evidence

Formative Assessments

Formative Assessment #1 (administer after Inv. 1.2)

Use Student Response Sheet #6 and rubric pg. 6 (found behind Assessment tab).

Formative Assessment #2 (administer after Inv. 2.3)

Use Student Response Sheet #12 and rubric pg. 9.

Formative Assessment #3 (administer after Inv. 3.2)

Have students respond in their Science Journals to the following:

Describe the motions of the muscles that make your knees and fingers bend.

Scoring Guide:

2 – Response states that the muscles work in teams. When one muscle contracts, the other muscle relaxes”

1- Response is partially correct e.g. “Muscles expand and contract” or “Muscles contract” or Muscles relax and puff up.”

0 – Response is incorrect.

Formative Assessment #4 (administer after Inv. 4.2)

Use the scenario as written on Student Response Sheet *20 but use these questions:

1) How did Satoshi know to slap his forehead?

2) Describe the sequence of events that happen to make Satoshi slap the mosquito.

Scoring guide:

3- Response states that Satoshi’s sense of touch tells that a mosquito has landed on his forehead. Satoshi slaps the mosquito because the senses told the brain which in turn told the muscles to move the bones or any other scientifically correct response.

2- Response states senses (touch) .told Satoshi to slap. Sequence of events is out of order but includes that the brain told the hand to move.

1-Response states senses told Satoshi to move but sequence is incorrect or majorly flawed.

0 – Response is totally incorrect.

Complete the “Choose Your Own Project” Part 4 in Investigation 4

Stage 3: Learning Plan

(Design Learning Activities To Align with Goals and Assessments)

Key learning events needed to achieve unit goals

Resource: The Regents of the University of California. **FOSS Human Body.** Delta Education. 2005.

Investigation 1: Bones

Part 1: Students investigate the structure/function of the human skeleton by jumping rope and discussing what parts of the human body is used to perform the task. Students count and communicate the number of bones in the skeleton then research actual models (posters and pictures) to refine their count to 206 total bones.

Read FOSS story: *A Marvelous Machine* and *The Shape of Your Shape* and answer the “After the Stories” questions.

Part 2: Students gather information to assemble a puzzle that forms the human skeleton. Students compare and contrast the model (puzzle) to their skeletal system and other related resources (poster).

Read FOSS story: *The Broken Radius* and answer the “After the Story” questions.

Part 3: Students compare and contrast skeletal systems of a rodent, mole, or bird (derived from an owl pellet) to their own skeletal system. Students compare the structure and function of owl/rodent/mole bones to the human skeleton.

Read FOSS story: *Barn Owls* and answer the “After the Stories” questions.

Complete Interdisciplinary Extensions

Investigation 2: Joints

Part 1: Students observe and investigate articulated joints. Students simulate having no thumb and try to complete everyday tasks.

Read FOSS story: *Your Amazing Opposable Thumb* and answer the “After the Stories” questions.

Part 2: Students gather data and information about immobilized joints while trying to perform given tasks.

Read FOSS story: *Bones on the Outside* and answer the “After the Stories” question.

Part 3: Students investigate the different types of joints, categorize them, and compare and contrast their form to the function.
Read FOSS story: *Comparing Joints* and answer the “After the Story” questions.

Part 4: Students observe and investigate owl pellets to identify the skeletal structure(s) contained in each. Students compare and contrast the form and function of certain bones of the rodent (mole, shrew, bird) to the human skeleton.

Investigation 3: Muscles

Part 1: Students investigate muscles in order to create a working model of the leg. The model demonstrates working tendons and muscles that enable the model to tap its toe and heel, and kick.

Read FOSS story: *Muscles* and *Muscles and Bones: Working Together?* And answer the “After the Stories” questions.

Part 2: Students build a thumb with tendons and ligaments that allow the thumb to move.

Read FOSS story: *Space Race* and answer the “After the Stories” questions.

Part 3: Students build an arm model with bicep muscles that flex when contracted.

Read FOSS story: *The Frozen Man* and answer the “After the Stories” questions.

Investigation 4 Coordination

Part 1: Students use a falling cup on a dowel to investigation reaction time between visual stimulus (cup falling) and a response (moving the hand out of the way).

Part 2: Students investigate how practice affects response time.

Read FOSS story: *Smart Training* and answer the “After the Stories” questions.

Part 3: Students measure response time to the 100th of a second by catching a falling dowel with a scaled timing system (paper strip) taped on the dowel.

Read FOSS story: *The Circulatory System* and answer the “After the Stories” questions.

Part 4: Students select and complete a project from a given list to present to the class.

Resources & Teaching Tips

- **What text/print/media/kit/web resources best support this unit?**

Suggested by third grade science lead teachers:

Title	Author	ISBN
<u>How Your Body Works</u>	Baxter, Nicola	189040943
<u>Incredible Skeleton Secrets</u>	DK Publishing	1564587274
<u>Skeletons! Skeletons! All</u>	Hall, Kathy	0590460765
<u>About Bones</u>		
<u>Bone Poems</u>	Moss, Jeff	076110888x
<u>What's Inside My Body</u>	Royston, Angela	1879431076
<u>Animal Skeletons</u>	Presnall, Judith	0531111601
<u>Body Battles</u>	Gelman, Rita Golden	0590449737
<u>Bones</u>	Sandeeman, Anna	1562946218
<u>Broken Bones</u>	Silverstein, Alvin	0531139689
<u>Discover Bones</u>	Grant, Leslie	0201632372
<u>Fascinating Facts About the</u>	TEC371	1562341146
<u>Human Body</u>		
<u>Grocery Store Zoology:</u>	Rahn, Joan Elma	0689305605
<u>Bones and Muscles</u>		
<u>How and Why? A Kid's</u>	O'Neil, Catherine	0890432317
<u>Book About the Body</u>		
<u>How My Body Moves</u>	Hvass, Ulrik	0670811998
<u>Movers and Shapers: Bones,</u>	Machair, Patricia	0753409666
<u>Muscles, and Joints</u>		
<u>My Bodyworks: Songs about</u>	Schoenberg, Jane	1566565839
<u>Your Bones, Muscles, Hear</u>		
<u>and More</u>		
<u>My Skeleton and Muscles</u>	Moore, Jo E.	1557991014
<u>Outside and Inside You</u>	Markle, Sandra	0590459996
<u>Owl Puke: Book and Owl</u>	Hammerslough, Jane	0761131868
<u>Pellet</u>		
<u>Skeleton: An Inside Look at</u>	Johnson, Jinny	0895776049
<u>Animals</u>		
<u>The Body Book</u>	Silver, Donald M.	059049239X
<u>The Bones Book</u>	Cumbaa, Stephen	0894808605
<u>The Concise Encyclopedia of</u>	Burnie, David	0789402041

the Human Body

The Human Body Berger, Melvin 1567843409

The Human Body Morgan, Sally 0753455013

The Magic School Bus Inside Cole, Joanna 0590414275

the Human Body

The Skeleton and Movement Parker, Steve 0531107094

The Skeleton Inside You Balestrino, Philip 0064450872

Understanding Your Muscles Treays, Rebecca 0794508138

and Bones: Internet Linked

What Am I Made of? Bennett, David 0590459988

What's Inside of Me? My Rau, Dana Meachen 076141777x

Bones and Muscles

Your Muscles and Bones Ganeri, Anita 0836836359

- What tips to teachers of the unit can you offer about likely rough spots/student misunderstandings and performance weaknesses, and how to troubleshoot those issues?
 - During owl pellets use a spray bottle to moisten the pellets prior to and during dissection. Make sure that any child who has asthma takes precautions.
 - During immobilization activities, be aware to skin sensitive students may react to masking tape. Use medical tape instead.
 - Investigation 1: Note that there are not two left hands; one left hand and the other hand (right) shows the thumb facing towards the body which demonstrates how the ulna and radius cross when the palm is facing up.
 - Premark all skeletal pieces (on the back) prior to punching out and placing in zip-lock bags.
 - When making the thumb, arm, and leg models be sure to close the paperclips around the rubber band and the dowel so that the rubber band does not fly off of the model.
 - Do not skip the first activity with jump roping. Each and every Investigation relates to some component of the successful ability of the student to jump the rope. Without the skeleton, joints, muscles, and coordination jumping rope would not be possible.

Accommodation/Differentiation ideas and tips

Trips: Abbott's Mill Nature Center

Ashland Nature Teacher

Differentiation

(Ask Lead Teachers and TAM teachers)