

Unit 1: The Human Machine

4th Grade Science

40 Class Meetings

Written July 2024

Essential Questions

- How are our bones and muscles interconnected?
- How do our eyes interact with light and impact our vision?
- How does our brain respond to stimuli in our environment?

Enduring Understandings with Unit Goals

EU 1: Your Muscles and Skeleton

- Identify and name major bones and muscles in the human body, understanding their locations and functions.
- Explore the skeletal system's role in providing structure, protection, and support to the body.
- Understand how muscles work in pairs to move the body, and how muscles contract and relax to enable movement.
- Understand the importance of caring for their bones and muscles through proper nutrition, exercise, and safety.

EU 2: Lights, Eyes, and Vision

- Explore the basic properties of light, including how it travels and how it interacts with different surfaces.
- Investigate how light is necessary for vision and how different light conditions can affect what we see.

EU 3: The Structure and Function of our Eyes

- Identify and describe the main parts of the eye and their functions in the process of vision.
- Understand how the optic nerve transmits visual information from the eye to the brain for interpretation.
- Investigate how the pupil and iris control the amount of light entering the eye, adjusting to different lighting conditions.

EU 4: Our Brain and Nerves and How They Process Information

- Explore how the different parts of the brain (e.g., cerebrum, cerebellum, brainstem) and their roles in controlling various body functions.
- Investigate how the nervous system, including the brain, spinal cord, and nerves, works together to control the body's activities.
- Understand how the brain receives information from the senses and responds by sending signals to different parts of the body.

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Standards

Common Core State and NGSS Standards:

- **4-LS1-1:** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction
- **4-PS4-2:** Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
- **4-LS1-2:** Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
- **CCSS.ELA-Literacy.RI.4.1:** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- **CCSS.ELA-Literacy.RI.4.2:** Determine the main idea of a text and explain how it is supported by key details; summarize the text.
- **CCSS.ELA-Literacy.RI.4.4:** Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.
- **CCSS.ELA-Literacy.RI.4.9:** Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.
- **CCSS.ELA-Literacy.W.4.2:** Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- **CCSS.ELA-Literacy.W.4.2.a:** Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.
- **CCSS.ELA-Literacy.W.4.2.b:** Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.
- **CCSS.ELA-Literacy.W.4.2.c:** Link ideas within categories of information using words and phrases (e.g., *another, for example, also, because*).
- **CCSS.ELA-Literacy.W.4.2.d:** Use precise language and domain-specific vocabulary to inform about or explain the topic.
- **CCSS.ELA-Literacy.W.4.2.e:** Provide a concluding statement or section related to the information or explanation presented.
- **CCSS.ELA-Literacy.W.4.4:** Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience
- **CCSS.ELA-Literacy.W.4.5:** With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.
- **CCSS.ELA-Literacy.W.4.6:** With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.
- **CCSS.ELA-Literacy.W.4.7:** Conduct short research projects that build knowledge through investigation of different aspects of a topic.
- **CCSS.ELA-Literacy.W.4.8:** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information and provide a list of sources.

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- **CCSS.ELA-Literacy.W.4.9:** Draw evidence from literary or informational texts to support analysis, reflection, and research.
- **CCSS.ELA-Literacy.SL.4.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.
- **CCSS.ELA-Literacy.SL.4.1.a:** Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
- **CCSS.ELA-Literacy.SL.4.1.b:** Follow agreed-upon rules for discussions and carry out assigned roles.
- **CCSS.ELA-Literacy.SL.4.1.c:** Pose and respond to specific questions to clarify or follow up on information and make comments that contribute to the discussion and link to the remarks of others.
- **CCSS.ELA-Literacy.SL.4.1.d:** Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.
- **CCSS.ELA-Literacy.SL.4.2:** Paraphrase portions of a text read aloud, or information presented in diverse media and formats, including visually, quantitatively, and orally.
- **CCSS.ELA-Literacy.SL.4.3:** Identify the reasons and evidence a speaker provides to support particular points.
- **CCSS.ELA-Literacy.SL.4.4:** Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

ISAAC Vision of the Graduate Competencies

Competency 1: Write effectively for a variety of purposes.

Competency 2: Speak to diverse audiences in an accountable manner.

Competency 3: Develop the behaviors needed to interact and contribute with others on a team.

Competency 4: Analyze and solve problems independently and collaboratively.

Competency 5: Be responsible, creative, and empathetic members of the community.

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Unit Content Overview

1. Muscles and Skeleton

- Create diagrams or models of the skeleton and major muscle groups, labeling key parts.
- Learn about the skeletal system's role in providing structure, protection, and support to the body.
- Explain how bones protect vital organs and support movement.
- Demonstrate basic muscle movements and explain how muscles and bones work together to facilitate actions.
- Explore how to maintain healthy bones and muscles, such as eating calcium-rich foods, exercising regularly, and practicing safety to prevent injuries.

2. Lights, Eyes, and Vision

- Explore concepts such as reflection, refraction, and the speed of light through simple demonstrations or experiments.
- Evaluate how light enters the eye and how changes in lighting affect visibility.
- Conduct simple experiments to observe how light behaves and affects vision, such as using prisms to see light spectra or exploring how shadows are formed.

3. Structure and Function of the Eyes

- Create and label a diagram of the eye, explaining how each part contributes to seeing.
- Explain how the brain processes signals from the retina to create the images we see.
- Observe and explain how the pupil changes size in response to light, understanding the importance of this function.

4. Brain, Nerves, and Information

- Create and label a diagram of the brain, explaining the primary function of each part.
- Describe how signals travel from the brain through the spinal cord and nerves to control movement and other functions.
- Explain how sensory information (e.g., sight, sound, touch) is processed by the brain and how it leads to responses.

Vocabulary and Key Terms: skeleton, bone, joint, muscle, tendon, ligament, cartilage, skull, spine, femur, light, reflection, refraction, lens, cornea, pupil, iris, retina, optic nerve, vision, brain, cerebrum, cerebellum, brainstem, neurons, spinal cord, reflex, nervous system, memory, stimulus

Interdisciplinary Connection:

- ELA

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Daily Learning Objectives with TWPS

Students will be able to...

- Create diagrams or models of the skeleton and major muscle groups, labeling key parts. **
 - *What are some of the main functions of our skeleton? Why is it important for our body?*
 - *How is our skeleton like the framework of a building? How is it different?*
- Learn about the skeletal system's role in providing structure, protection, and support to the body. ***
 - *Why do we have joints in our skeleton, and how do they help us move?*
 - *Why do some people get broken bones? How do bones heal after they are broken?*
 - *Why do some people need to use crutches or wheelchairs? How do these tools help when bones or muscles are injured?*
- Explain how bones protect vital organs and support movement. ***
 - *How could bones provide protection to vital organs?*
 - *What would happen to a building if it didn't have a strong framework, and how is this like our body?*
 - *What happens to our muscles if we don't use them regularly? Why is exercise important?*
- Demonstrate basic muscle movements and explain how muscles and bones work together to facilitate actions. ***
 - *How do muscles and bones work together to help us move?*
 - *What would happen if we didn't have muscles? How would our body be different?*
 - *Why is it important for muscles to work in pairs? Can you give an example of muscles that work together?*
- Explore how to maintain healthy bones and muscles, such as eating calcium-rich foods, exercising regularly, and practicing safety to prevent injuries. *
 - *How can we keep our bones and muscles healthy and strong?*
- Explore concepts such as reflection, refraction, and the speed of light through simple demonstrations or experiments. *****
 - *How does light travel, and what happens when it hits an object?*
 - *Can you explain what reflection and refraction are and give examples?*
 - *What are shadows, and how are they created? What affects the size and shape of a shadow?*
 - *Why do objects sometimes look different underwater, like a pencil appearing bent in a glass of water?*
- Evaluate how light enters the eye and how changes in lighting affect visibility. **
 - *Why is light important for us to see? What happens if there's no light?*
 - *What causes this bending of light, and how does it affect our vision?*
- Conduct simple experiments to observe how light behaves and affects vision, such as using prisms to see light spectra or exploring how shadows are formed.
 - *Why do we see different colors? How does light affect the colors we see?*
- Create and label a diagram of the eye, explaining how each part contributes to seeing. **
 - *What are the main parts of the eye, and how do they work together to help us see?*
 - *How does the eye change when we look at things up close or far away?*
- Explain how the brain processes signals from the retina to create the images we see. **

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- *Can you describe what happens to your eyes when you walk into a dark room from a bright area?*
- *What are some ways animals' eyes are different from ours, and how do these differences help them survive?*
- Observe and explain how the pupil changes size in response to light, understanding the importance of this function.
 - *What happens to the light after it enters our eyes? How does our brain help us see?*
- Create and label a diagram of the brain, explaining the primary function of each part. **
 - *Can you think of an activity or task that each part of the brain controls?*
 - *Can you give examples of things you do every day that involve using the cerebrum?*
 - *Why is it sometimes hard to remember things, and how can we help our brain remember better?*
- Describe how signals travel from the brain through the spinal cord and nerves to control movement and other functions. **
 - *Why is the brain sometimes called the "control center" of the body?*
 - *How does the brain work with the spinal cord and nerves to help us move and feel?*
- Explain how sensory information (e.g., sight, sound, touch) is processed by the brain and how it leads to responses. ***
 - *How do activities like sleeping well, eating healthy foods, and exercising help our brain work better?*
 - *What are some decisions that require careful thought and how does the brain help with that?*
 - *Can you think of a time when your brain had to use more than one sense at the same time?*

Instructional Strategies/Differentiated Instruction

- Whole group instruction
- Paragraph frames and sentence starters
- Teacher modeling
- Think-write-pair-share and small-group discussions
- Graphic organizers
- Accountable talk
- Homework
- Word walls with visuals (Venn Diagrams)
- Small group instruction
- Visual exemplars with teacher and student critiques
- Text and video chunking
- Spiraling back to guiding questions
- Close reading with text-dependent questions

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EL Differentiation Strategies

- Key vocabulary, Word Banks and Word Walls with visuals
- TWPS (Think, write, pair, share)
- Pre-reading strategies
- Culturally responsive teaching
- Explicit teacher modeling
- Graphic organizers
- Strategic Grouping
- Non-verbal assessments

Assessments

FORMATIVE ASSESSMENTS:

- Do Now
- Academic Discourse
- Exit Slips
- Accountable Talk Discussions
- Completed notes
- Completed graphic organizers
- Homework
- Performance Task -- Body Systems in Action: A Day in the Life of Your Body
 - Teacher's rubric/scoring guide

SUMMATIVE ASSESSMENTS:

- Quiz: Muscles and Skeletons, Eyes, Lights, and Vision, The Brain (EU1, EU2, EU3, and EU4)
- Unit Task: Body Systems in Action: A Day in the Life of Your Body (EU1, EU2 and EU3)

Unit Task

Unit Task Name: Body Systems in Action: A Day in the Life of Your Body

Description: Upon completing the unit, students will work individually to create a detailed poster that demonstrates how the body's systems work together to perform everyday activities. The task will require students to showcase their understanding of how the muscles, skeleton, eyes, vision, and brain interact to complete common tasks, such as playing a sport, riding a bike, or reading a book (EU1, EU2, EU3, and EU4). Students will choose an activity they enjoy or do often then describe how the muscles and skeleton work together to produce movement during the activity, explain how light is necessary for them to see the environment during the activity, and describe how the brain controls the activity. Students will then create a diagram, model, or series of illustrations that show how these systems interact during the chosen activity. They label the major parts of each system (e.g., muscles, bones, eyes, brain) and use arrows or other visual

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cues to show how information and movement flow between them. Finally, students will write a brief narrative that explains how their body's systems work together during the activity.

Evaluation: Teacher's Scoring Guide

Unit Resources

- NewsEla
- Google Slides (Teacher's)
- Student Journals
- Chromebooks
- ReadWorks
- Virtual Fieldtrips
- Google Classroom
- Mystery Science