

Lessons at a Glance

Science Content: Big Ideas

The Human Body in Motion Unit concentrates on the following Big Ideas. Along with the scientific Habits of Mind discussed on pages 6–7, these concepts are reinforced throughout the unit. The lessons in which each Big Idea is introduced or is a major focus are indicated in parentheses.

Lessons

- To move, many parts of our bodies must work together. (Lessons 1–5, 8–10, 12)
- Muscles move our skeletons by pulling on bones that meet at joints. (Lessons 2–3)
- Nerves carry signals to our muscles to move parts of our body. (Lessons 4–5)
- Bones are made of unique cells important to movement. (Lesson 6)
- To produce energy and function properly, all cells need a constant supply of oxygen, nutrients, and water. (Lesson 6)
- Muscles are made of unique cells important to movement. (Lesson 7)
- To produce the energy needed for movement, muscle cells need a constant supply of oxygen, nutrients, and water. (Lesson 7–10)
- The human body is made up of many different types of cells. Each type of cell has unique characteristics for performing a specific “job.” (Lesson 11)

Skill Building Activities

- Paying attention to the way a particular book is laid out can assist reading comprehension. (Skill Building Activity “Reading Science Books”)
- Observation is a powerful tool for learning about something. Detailed and accurate descriptions of your observations help you communicate them to others. (Skill Building Activity “Observing and Describing”)
- Scientists plan and design fair tests so they can determine how the one variable being changed affects the results of an experiment. (Skill Building Activity “Designing a Fair Test”)

Lesson Overviews

The following overviews briefly summarize each lesson in the Human Body in Motion Unit. Suggestions for scheduling and flexible implementation are shown in gray. Asterisks with the lesson title indicate a core lesson.

Lesson 0: Doing Science

Students sharpen their awareness of scientific thinking and become familiar with the “I Wonder” circle as they conduct a self-directed exploration and then reflect on the processes they engaged in. In the context of these experiences, they are introduced to the work of scientists and to the Science Companion “I Wonder” circle, which provides a visual representation of many of the facets of scientific inquiry, exploration, and discovery.

*Lesson 1: How Do We Move?**

In this introduction to the Human Body in Motion Unit, students start out by moving their bodies—participating in a vigorous physical activity and observing its effects on themselves and a partner. Afterwards, they record their ideas about what was happening inside their bodies to account for all the changes they observed. In the process, they begin to appreciate all the different parts of the body involved in movement, which is the focus of this unit.

Teach this lesson in two sessions. Session 2 can be flexibly implemented with a physical education class.

*Lesson 2: Where Do Bones Move?**

Students identify several bones involved in movement as they play a “bone” version of “Simon Says.” During the game, they discover that the skeleton moves at joints—points on the skeleton where two or more bones come together. Afterwards, they work with partners, using clues and moving their bodies, to solve riddles and identify some of the body’s major joints.

*Lesson 3: Moving Our Bones**

Students model the actions of muscles on bones to discover that two muscles are required to bend and straighten the arm—one pulling the bones in one direction and the other pulling them back in the opposite direction. Afterwards, in a second session, they incorporate this understanding as they build a model limb that can bend and straighten.

Teach this lesson in two sessions. The introductory discussion is carried out during the first session. The exploration and the sharing and synthesizing discussions are conducted during the second session.

Lesson 4: How Our Muscles Know When to Move*

Students learn how the nervous system supports movement. They develop and test strategies using different senses to catch a ruler between their fingers. They think about how the brain receives information from the senses, makes decisions based on this information, and sends messages to muscles to bring about an appropriate response.

Lesson 5: Moving Quickly to Prevent Harm*

Students discover that the body has built-in protective mechanisms, called reflexes. They explore this topic in depth by examining two reflexes involving the eyes—how the pupils change size to limit the amount of light that enters them, and how the eyes blink to protect them from harmful substances. They compare these unconscious, involuntary responses to the intentional, voluntary “catch” movements in Lesson 4 and realize that the nervous system is responsible for both kinds of motion in the human body.

Lesson 6: Inside Bones*

Students begin the lesson by comparing two bones—a normal bone and a calcium-depleted bone—and discuss how bones that lack strength and rigidity cannot support the body in movement. They examine and identify different tissues found in a large soup bone and read about the cells that form them. Finally, they discuss how calcium helps to form and maintain bones.

Lesson 7: Working Muscles*

Students experience the effects of muscle fatigue as they perform repetitive exercises with their hands. They discuss what muscles need to produce energy for movement—oxygen, nutrients, and water—and begin to think about how these requirements are met.

Lesson 8: Delivering What Muscles Need*

Students explore how the circulatory system supports movement. They learn to take their pulse and discover that their heart rate increases as exercise intensity increases. They then relate this finding to the increased needs of muscle cells during exercise—realizing that the heart beats faster to deliver more raw materials to active muscle cells and to remove their waste.

Lesson 9: Breathing Hard for Our Muscles*

Students learn how the respiratory system supports movement. They discover how breathing rate increases with exercise and relate this finding to the increased needs for oxygen by their more active muscles. Finally, they breathe through straws of varying

diameters to appreciate how much they depend on a healthy respiratory system to perform even minor physical activities.

Weigh the advantages of teaching this lesson in two sessions. The sensory observation and introductory discussion could be taught in the first session, followed by the exploration in the second session.

Lesson 10: How Our Muscles Get the Nutrients They Need*

Students learn that their muscles—and all the parts of their body—depend on a healthy digestive system to provide the nutrients and water their cells need to produce energy and function. They identify the major organs of the digestive system and discuss how food is broken down and eventually passed on to the blood as it moves through the digestive tract. Afterwards, they experiment to see how digested gelatin passes through a filter easier than undigested gelatin, and relate these findings to the need for food to be digested before it can enter the bloodstream.

This lesson works best if two, back-to-back sessions are devoted to it. Try to arrange for a double period to conduct the entire lesson at once. If this is not possible, consider teaching the introductory discussion in one session, and the exploration and reflective discussion in a second session.

Lesson 11: Building Blocks: Cells Make It All Possible

Students review the unique cell types featured in their student reference book readings. They then imagine a “cool” alien that might exist on a mythical planet and describe one of its organs and the cells that could form it. In the process, they further their understanding of cells as the building blocks of the human body.

Teach this lesson in two sessions. Present the introductory discussion during the first session. Conduct the exploration and the sharing and synthesizing discussion during the second session.

Lesson 12: Poetry in Motion*

In this final lesson, students revisit the unit’s introductory activity—participating in a physical activity to observe the effects of exercise on themselves and a partner and explaining how these effects relate to the needs of active muscle cells. During a second session, they celebrate the body’s ability to move—attaching a photograph of themselves in motion (captured during Session 1) into their science notebooks and surrounding it with original verses about how the body moves.

This lesson is completed over two sessions. Session 1 can be flexibly implemented with a physical education class. Session 2 can be flexibly implemented with language arts.

Skill Building Activity: Reading Science Books

Students are given a short tour of the organization and presentation of the student reference book. They are encouraged to look through each section before they begin reading so they can use visual and text cues—such as headings, margin notes, and illustrations—to help understand the material and its relationship to other things that they know. Ongoing strategies for helping children absorb the material are included at the end of the lesson.

Skill Building Activity: Observing and Describing

Children practice making accurate and detailed descriptions before and after observing a familiar object. They discover the importance of careful observation and detailed description in science.

Skill Building Activity: Designing a Fair Test

An important aspect of any scientific experiment is designing a fair test. In this lesson, students analyze elements of an unfair test and discuss ways to make the test fair. They identify variables that could affect how high a ball bounces and strategize about how to change only one variable while keeping all other parts of the experiment the same.