

LESSON 3: What connections can we see between the structures inside the body?

PREVIOUS LESSON *We investigated how the parts of a chicken wing work together when moving. We mapped the parts of the chicken wing to the parts of the foot to compare functions. We revised the investigation to figure out how an injury can affect the wing's function.*

THIS LESSON

INVESTIGATION

1 day



We observe various images from different methods (scans and tests) that medical professionals use to view inside a body. Since these images only provide a two-dimensional view of the body, we look at cross-sectional images of a leg and a foot. Realizing we don't have the training or experience to interpret these images, we use diagrams to help us make sense of what we are observing. Noticing that there are some other structures inside the leg that we still can't identify, we look at close-up diagrams of the skin, muscle, and bone. From looking at close-up cross-sectional diagrams, we discover that blood vessels and nerves are found throughout the skin, muscles, and bone.

NEXT LESSON *We will observe images of blood vessels in the body and blood that has settled in test tubes. Using microscopes, we will figure out that blood is a mixture of smaller structures. We will read an article to help us consider how the structures of the blood and its components support their functions in the body.*

BUILDING TOWARD NGSS

MS-LS1-1, MS-LS1-2, MS-LS1-3*,
MS-LS1-8*



WHAT STUDENTS WILL DO

3.A Critically read and interpret scientific texts adapted for classroom use to obtain scientific and technical information about various parts of the human foot and leg to describe patterns among interacting systems.

WHAT STUDENTS WILL FIGURE OUT

- There are blood vessels in the different parts of the bone, muscle, and skin.
- There are nerves that run through the layers of the skin, the muscle, and the bone.
- There are structures that connect the skin to the muscles and muscles to the bone.
- Skin has different layers.

Lesson 3 • Learning Plan Snapshot

Part	Duration	Summary	Slide	Materials
1	5 min	NAVIGATION Reflect on what we figured out from observing the chicken wing.	A-B	Parts of a Body poster
2	7 min	COMPARE MEDICAL IMAGES FOR PARTS OF THE BODY Compare and discuss different images taken by medical professionals.	C-F	<i>Handout: A Medical Professional's View Inside the Body</i> or <i>A Medical Professional's View Inside the Body</i> in student editions, tape
3	3 min	DISCUSS CROSS-SECTIONAL IMAGES Discuss how we have used cross-sectional images in the past and how looking at cross-sectional images might be able to provide us a way to see how these parts interact or work together.	G	
4	7 min	EXAMINING CROSS-SECTIONAL IMAGES OF THE LEG Connect the cross-sectional images of the leg with scientific diagrams in order to connect and interpret what structures they are observing.	H-I	<i>Reference: Interpreting MRI</i> or <i>Interpreting MRI</i> in student editions, tape
5	7 min	LOOKING CLOSER AT THE SKIN, MUSCLE, AND BONE Investigate cross-sectional diagrams of the skin, muscle, and bones to look for patterns or structures found there which help identify other structures in the leg.	J-K	<i>Reference: Interpreting MRI</i> or <i>Interpreting MRI</i> in student editions, <i>Reference: Close up of Skin, Muscle, and Bone</i> or <i>Close up of Skin, Muscle, and Bone</i> in student editions, tape
6	10 min	DISCUSS AND RECORD OBSERVED STRUCTURES Share observations from the cross-sectional images and record them on the Parts of a Body poster.	L-M	<i>Reference: Interpreting MRI</i> or <i>Interpreting MRI</i> in student editions, <i>Reference: Close up of Skin, Muscle, and Bone</i> or <i>Close up of Skin, Muscle, and Bone</i> in student editions, Parts of a Body poster
7	3 min	NAVIGATION Motivate the need to take a closer look at blood and nerves in the next two lessons.		<i>Reference: Interpreting MRI</i> or <i>Interpreting MRI</i> in student editions, <i>Reference: Close up of Skin, Muscle, and Bone</i> or <i>Close up of Skin, Muscle, and Bone</i> in student editions

End of day 1

Lesson 3 • Materials List

	per student	per group	per class
Lesson materials	<ul style="list-style-type: none">• science notebook• <i>Handout: A Medical Professional's View Inside the Body</i> or <i>A Medical Professional's View Inside the Body</i> in student editions• <i>Reference: Interpreting MRI</i> or <i>Interpreting MRI</i> in student editions• <i>Reference: Close up of Skin, Muscle, and Bone</i> or <i>Close up of Skin, Muscle, and Bone</i> in student editions	<ul style="list-style-type: none">• tape	<ul style="list-style-type: none">• Parts of a Body poster

Materials preparation (20 minutes)

Review teacher guide, slides, and teacher references or keys (if applicable).

Make copies of handouts and ensure sufficient copies of student references, readings, and procedures are available.

Be sure you have materials ready to add the following word to the Word Wall: **cross section**. Do not post this word on the wall until after your class has developed a shared understanding of its meaning.

Lesson 3 • Where We Are Going and NOT Going

Where We Are Going

In this lesson, students will be looking at the different structures inside the body to see how the muscles, bones, and skin are interconnected by looking at different types of images medical professionals use to look inside someone. We are using cross-sectional images of a foot and leg. These cross sections allow students to more readily see the interconnectedness of these parts **and** supports them in figuring out there are blood vessels and nerves in all of these parts of the body. In Lesson 2, we began expanding out from just looking at the foot in order to think about how other parts of our body work as well. In that lesson, we made observations about how our arms and legs and feet all have muscles, bones, and skin, so we convinced ourselves that we could use the chicken wing, which is representative of the human arm, to make observations about how muscles and bones move and work together. To help students interpret what they are seeing in different images and scans, they will compare what they see in the images to the cross sections. To help identify structures within the skin, muscle, and bone students look at close-up images and discover that blood vessels and nerves are found throughout. This motivates students to want to understand the role of blood and nerves and understand how they work together with skin, muscle, and bone.

Where We Are NOT Going

While we are looking closer at skin, muscle, and bones, we are not zooming in close enough to identify cells here. In the next few lessons, students will discover different cells and develop a working definition of what they are and why they look different. We may notice blood vessels and nerves, but by the end of this lesson, we will not be figuring out what the role of these structures is or how they work together with the skin, muscle, and bone.

LEARNING PLAN for LESSON 3

1 · NAVIGATION

5 min

MATERIALS: science notebook, Parts of a Body poster

Reflect on what we figured out from observing the chicken wing. Display **slide A**. As students come into class, have students reflect on the last lesson by looking at their Progress Tracker in their science notebooks. Begin by saying, *Last lesson, we used a chicken wing to investigate three different parts of the body: the muscles, bones, and skin, and how they interact.*

Facilitate a short discussion to elicit student ideas about what they have figured out.

Suggested prompt	Sample student response
<i>What did we figure out about how the skin, muscles, and bones interact for a part of the body to move?</i>	<i>When the muscles move, the bones that are attached to them move too because we saw that the bones are attached to muscles somehow.</i> <i>The skin is connected somehow to the muscle underneath it and it covers all our body and seems to protect everything inside our body.</i> <i>There is something that connects the skin to the muscle.</i> <i>The bones are solid and do not bend, but are moved with the muscles.</i>

Display **slide B**, and continue the discussion with students to remind us why we used the chicken wing to see what is inside our bodies and how it connects. Refer students back to the Parts of a Body poster that we revised in the last lesson.

Suggested prompt	Sample student response
<i>We are trying to figure out how the foot that was injured healed, so why were we observing the movement of a chicken wing instead of a foot or a leg's role in walking?</i>	<i>We saw that the chicken wing has similar structures to our arms so we thought we could use it to see how the muscles and bones work together.</i> <i>Yeah, and we said we can't really bring in just a foot to move the parts of the foot or leg around like we could the chicken wing, and then remove parts to see if it still works.</i>

Revoice, *We observed these different structures, parts of the chicken wing, and connected them to their function, the job that they do. We also observed different parts of our body like our arms, legs, and feet to see what we could figure out about how the skin, muscles, and bones work together for these parts of our body to move. Because we can't look inside our body, we used the chicken wing to make sense of how the muscles and bones interact. We began to wonder how these structures interact in our body and decided we wanted to look closer at these structures inside our bodies to see what is going on where they are connected to each other.*

Suggested prompt	Sample student response
<p>So, we know that we can't bring in a human foot to investigate parts that we can't see. Doctors have this challenge too and have technology they use to allow them to "see" inside different parts of the body. In Lesson 1 we saw x-rays of a foot. Does anyone know of any other types of images or scans that doctors use to collect data about different parts of the inside of the body?</p> <p>So we figured out a few things about different body parts by observing the chicken wing, but we still wonder how these structures are interconnected in the body system. If we could look at some of these images or scans, how do you think that could help us figure out more about how the body parts work together?</p>	<p><i>I've had x-rays taken of my arm when I broke it (we can see bones other than foot bones with x-rays).</i></p> <p><i>Yeah... and there are other tests or scans they can do like MRIs, CT scans, or ultrasounds. Doctors also sometimes do surgery so they can see what is going on inside the body if these tests don't help, or if they show that surgery is needed, like for the foot.</i></p> <p><i>We could see what we can't see on the outside.</i></p> <p><i>We'll be looking at human parts instead of chicken parts.</i></p> <p><i>We might be able to see different parts more clearly... like we could see the bones in the x-rays. Maybe we'll be able to see different body parts in the other images.</i></p>

Say, Let's analyze and compare some of these images of human body parts using different methods.

2 · COMPARE MEDICAL IMAGES FOR PARTS OF THE BODY

7 min

MATERIALS: science notebook, *Handout: A Medical Professional's View Inside the Body* or *A Medical Professional's View Inside the Body* in student editions, tape

Compare and discuss the different images of the body taken by medical professionals.* Display slide C. Say, *There are two images on the slide of the machines used to capture images of different parts of the body. The first image is of an x-ray machine and the second image is of an MRI machine. Have any of you had an x-ray or MRI? What did the x-ray or MRI images show?* Accept all responses.

ADDITIONAL GUIDANCE

The science behind how x-rays and MRIs produce their images is beyond the scope of sixth grade and this unit. However, if your students ask how these images are produced, you could say something like the following: MRI stands for magnetic resonance imaging and uses magnets, radio waves, and computers to create images. X-rays are called that because they use beams of energy called x-rays to pass through that part of the body onto a detector on the other side, creating the image. Bear in mind that students will not have schema for the range of electromagnetic radiation or magnetic fields.

Display slide D. Say, *Here are two images of the foot. The one on the left was taken using the x-ray machine so it will look familiar to us because we saw x-rays of a foot in Lesson 1. The image on the right was taken using an MRI machine. In a moment I will give you a handout including these two images as well as x-rays and MRIs of a leg and hand so we have more examples of what these images can show us. As you're comparing the images, make annotations on the handout to capture what you notice. What body parts are visible (or not) in each image?*

Distribute *Handout: A Medical Professional's View Inside the Body* to each student. Students may also refer to *A Medical Professional's View Inside the Body* in their student edition, but they should record their thinking on *Handout: A Medical Professional's View Inside the Body*. Allow students time to individually annotate the different images with the following directions (also on slide D).

- Make observations about what parts of the body you can recognize. Draw arrows to label those parts.
- Circle parts of the images you have questions about.

* SUPPORTING STUDENTS IN DEVELOPING AND USING PATTERNS

Note that the images of the foot on *Handout: A Medical Professional's View Inside the Body* and on slide D are both of the left foot. The x-ray image was taken looking down at the foot and the MRI is on a transverse plane looking up at the left foot. It will be helpful to refer back to the cross sections in the cut fruit.

Display slide E. *Have students work with a partner to discuss and summarize their ideas from annotating *Handout: A Medical Professional's View Inside the Body* and share out what the x-ray and MRI helped us see inside each body part. As students are working, walk around and listen to their discussions for ideas to bring out in the whole-class share out. To help support students in preparing for whole-class discussion, ask them if they would feel comfortable sharing the idea you heard when we come back together as a whole group.

Display slide F, bring the class back together and share what they figured out from these images.

Suggested prompt

What did you and your partner notice about MRIs and x-rays?

Did the x-ray and MRI images show us what we wanted to know about how the muscles, skin, nerves, and blood vessels work together with each other? Why or why not?

Sample student response

X-rays helped us see the bones.

We think the MRI is showing us other parts of the body, like maybe muscles or something, but we're not really sure... it's hard to tell what we're looking at. MRIs helped us.

There are a lot of structures we can see in the MRI of each body part, especially the foot and the hand!

No... the x-ray only showed us bones.

The MRIs showed more than the x-rays.

I'm not sure about the MRI either - we weren't quite sure what we were looking at in those images.

And we know the skin is involved somehow but these images don't show us much about the skin we don't think.

These were cool but we need a way to get more information about what all these parts are.

Say, *It sounds like we want more information or images about what we are looking at and how muscle, skin, blood, nerves, and bone are working together.*

ADDITIONAL GUIDANCE

The images presented are produced using different technologies which are designed to highlight specific structures inside the body. Structures that may be visible using one type of technology may not be visible using the other types. It's important to help students understand that just because a structure may not be visible, does not mean it's absent. Later in this unit, students will be looking more closely at structures using microscopic images to figure out that these body parts are made of cells. Students will see some structures clearly, while other structures may not be visible with the classroom microscope.

*** SUPPORTING STUDENTS IN ENGAGING IN OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION**

Students annotate the body part images to indicate what they notice and wonder. This work gives students practice in interpreting scientific and technical images to find patterns in different views of common structures. For now, it's not essential that students reach consensus on any relevant patterns, as they will have additional opportunities to engage in this practice later in the lesson. For now, it's sufficient for students to become accustomed to ways in which imaging can be used to see beneath the skin.

3 · DISCUSS CROSS-SECTIONAL IMAGES

3 min

MATERIALS: None

Discuss how cross-sectional images have been useful in earlier OpenSciEd units. Explain that in order to understand more complicated structures or systems, it's sometimes helpful to use different perspectives or scales to be able to figure out more about how the parts of these systems interact or are connected, such as when we looked at the layers of the Earth in the *OpenSciEd Unit 6.4: How and why does Earth's surface change? (Everest Unit)*.

Say, *Remember back in earlier units we have used cross-sectional views of different systems to help us figure out more about the parts of the systems, or patterns that we could not see just from viewing the system from the top or outside. In order to gain a more holistic view of a part of the body that could be injured, we can look at cross sections of these body parts. Depending on what they're looking for, doctors might look at a different "slice" view of the body part.*

Display **slide G**. Bring out the two apples (or two of the same kind of other fresh fruit or vegetable), a cutting board, and a knife. Ask, *What are some different ways we could cut this apple? In what directions could we slice it to see what's inside?*

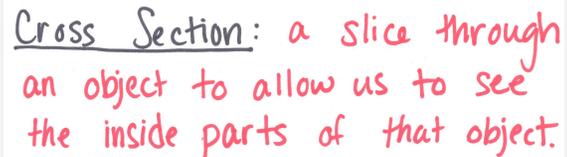
Sample student responses include:

- *Through the stem, vertically, like longitude on the globe.*
- *Crosswise, horizontally, like in half between the stem and flower ends, like latitude on the globe.*
- *Just cut off a slice you might want to eat, avoiding the core.*
- *Diagonally, maybe? There are lots of different ways we could slice it!*

Say, *Okay, let's try some and see what we can see.*

Cut each apple in different directions and show the students the cut sides. Ask, *What can we see differently in each of these cross sections?* Accept all responses, calling attention to the fact that the different sections allow us to see different parts and patterns (such as the location of the seeds, how the stem joins the flesh, how the core meets the flesh, etc.).

Add "cross section" to the Word Wall. Your definition might be something like "a slice through an object to allow us to see the inside parts of that object." Say, *We've talked about and used cross sections in OpenSciEd Unit 6.4: How and why does Earth's surface change? (Everest Unit) and it looks like it might be important in this unit as well. How could we define cross sections so that we can add it to our Word Wall?*



Cross Section: a slice through an object to allow us to see the inside parts of that object.

Say, *Like we cut the apple, MRI images can show different cross-sectional views of a body part. So, we noticed in the MRIs and x-ray that we think we can see bones, muscle, and maybe skin in each body part. I have two different MRIs of a person's leg for us to look at. I think the leg is a good place for us to look at these different cross sections because we can see the body parts we have questions about clearly there, but there are fewer structures to examine.*

4 · EXAMINING CROSS-SECTIONAL IMAGES OF THE LEG

7 min

MATERIALS: *Reference: Interpreting MRI* or *Interpreting MRI* in student editions, tape

Observe cross-sectional images of a leg. Display **slide H**. Ask students to share what they notice and wonder about these two images. Use gestures toward your own leg to help illustrate where the two sections were “cut” (compare to the slices that you made in the fruit). Elicit that we’re still not exactly sure what we’re seeing in these images.

Say, Doctors and other medical professionals use labeled scientific diagrams to help identify the structures that are visible in a cross-sectional view of a body part. So, we can do the same thing. I have some scientific diagrams of these same views of the leg that we can use to help us identify what we’re seeing in these images. Let’s see what information we can figure out from looking at these images.

Ask students to look at the images on the slide individually for a few minutes before bringing the class back together to discuss them.

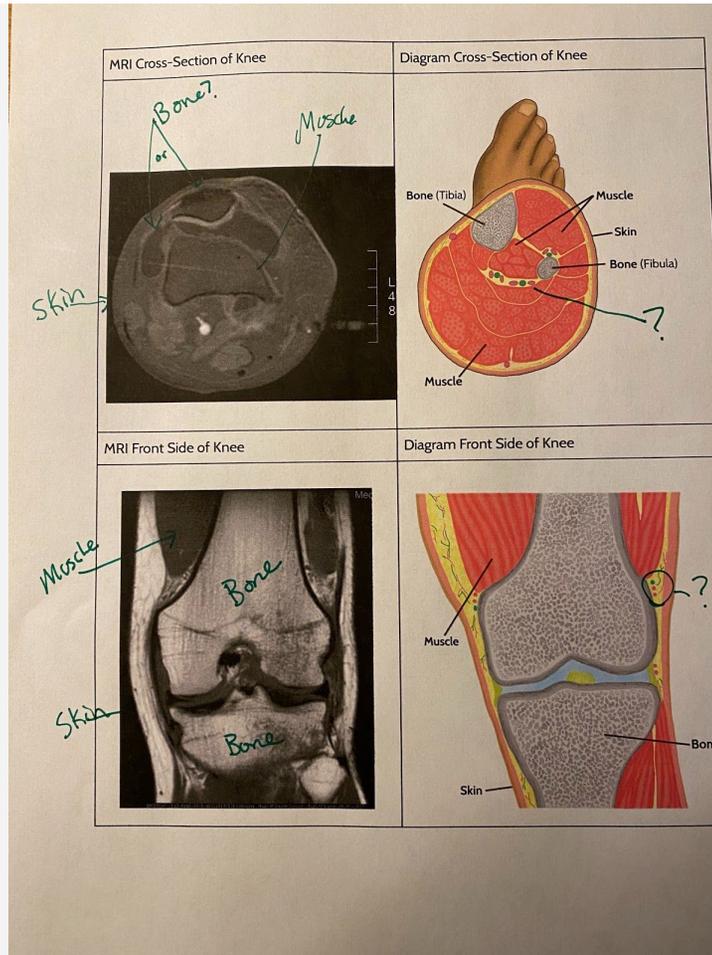
Suggested prompt	Sample student response
<i>What are some things that you notice and wonder about the MRI images?</i>	<i>I think we are looking at the same part of the body but with a different view.</i> <i>It looks like the fruit where we are seeing a slice cut through the middle!</i> <i>The image is really hard to interpret, or make sense of, like what are the different shaded parts?</i> <i>There seems to be a lot of different structures but we are having a hard time identifying which parts are bones, muscles, etc.</i>
<i>What resources do you think medical professionals refer to in order to help them interpret these images? How do medical professionals know how to interpret these images?</i>	<i>They might know what these different structures are in each of the images because they have looked at diagrams of the body before.</i> <i>Maybe they have gotten to see dissections or surgery like we did of the chicken wing so they know what the structures are inside.</i>

Interpret the leg MRI using scientific diagrams.* *Say, Since we are not medical professionals who have had a lot of training and experiences developing and looking at these and different images, I have some scientific diagrams we can use to help us make sense of these different images of the leg we are looking at, similar to how we would read scientific text. These images were created by professional artists based on research from doctors who have conducted investigations and surgeries on actual human bodies to help students and doctors in training understand what they are looking at inside the body.*

Display **slide I**, and distribute *Reference: Interpreting MRI* and *Interpreting MRI* to all students. Students should refer to the color copy of *Interpreting MRI* and make all their annotations on *Reference: Interpreting MRI*. Have students make connections between the MRI images and the scientific diagram, drawing lines between these two representations of the inside of the leg.

* SUPPORTING STUDENTS IN ENGAGING IN OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION

In attempting to make visual connections between MRI images and the scientific diagrams of the leg, students once again practice interpreting scientific and technical scientific diagrams. Here, students will use scientific diagrams to help identify the skin, muscle, and bone visible in the MRI images. As students then consider the other visible structures, they begin to wonder what their role may be, thus motivating the need to observe them more closely for potential patterns.



Facilitate a brief discussion. Have students share and discuss their findings from looking at the MRI with the scientific diagrams.

KEY IDEAS

Purpose of this discussion: Summarize as a whole group what we are able to identify, what we still need to identify, and ways to figure out what other structures we observe.

Listen for these ideas:

- We were able to identify the skin, some of the muscles and bones.
- There are some other structures we see in both the scientific diagram and MRI that aren't currently labeled and we don't have agreement on what they could be.
- We need to zoom in to look closer at these areas to help us identify these other structures.

Suggested prompt	Sample student response
What connections were you able to make between the MRIs and the scientific diagrams?	<p>Although the MRIs were clear, I couldn't always tell what I was looking at. The scientific diagram made it easier to see some of the parts because of the colors.</p> <p>In the scientific diagram, I could see where one structure from the MRI ends and another one begins.</p>
What parts of the MRI or scientific diagram do you have questions about?	<p>We could see where there are muscles and bones, but there were also other structures in there that I wonder what they are.</p> <p>I don't know what the parts between the skin and muscle are or what they do.</p>
How might we get a better look in order to figure out more about these other structures we are observing in the leg?	<p>Can we look at more cross sections above and below the knee so we can see where the muscles or bones begin and end?</p> <p>Can we look at a close-up or a different scientific diagram that shows the other structures we were not able to identify in this same area of the knee?</p>

Summarize, Remember when we looked at the chicken wing our goal was to understand the different structures inside the body and how they work together. So far we have been able to identify skin, muscles, and bones in the MRI, but we also see other parts that are there that we have not been able to identify and understand their role inside the body. We want to look closer at these structures like skin, muscle, and bones in order to understand what these other structures are and what they are doing.

5 · LOOKING CLOSER AT THE SKIN, MUSCLE, AND BONE

7 min

MATERIALS: Reference: *Interpreting MRI* or *Interpreting MRI* in student editions, Reference: *Close up of Skin, Muscle, and Bone* or *Close up of Skin, Muscle, and Bone* in student editions, tape

Introduce additional cross-sectional diagrams to look for patterns about the structures found in each. Say, *Let's analyze some more scientific diagrams of these structures that are closer up. I have some close-up cross-sectional diagrams of the skin, muscle, and bone that were made by scientists who actually got to look at the real structures in the body. Let's use them to help us understand these different structures.* Distribute the student edition or color images of *Close up of Skin, Muscle, and Bone*. You can also provide students with Reference: *Close up of Skin, Muscle, and Bone* as a black and white handout to annotate and tape into their science notebook.

Display **slide J**. Have students observe and discuss with a partner what they observe by looking at these close-up diagrams of skin, muscles and bone. Encourage students to look for similarities, differences, and patterns between the images.*

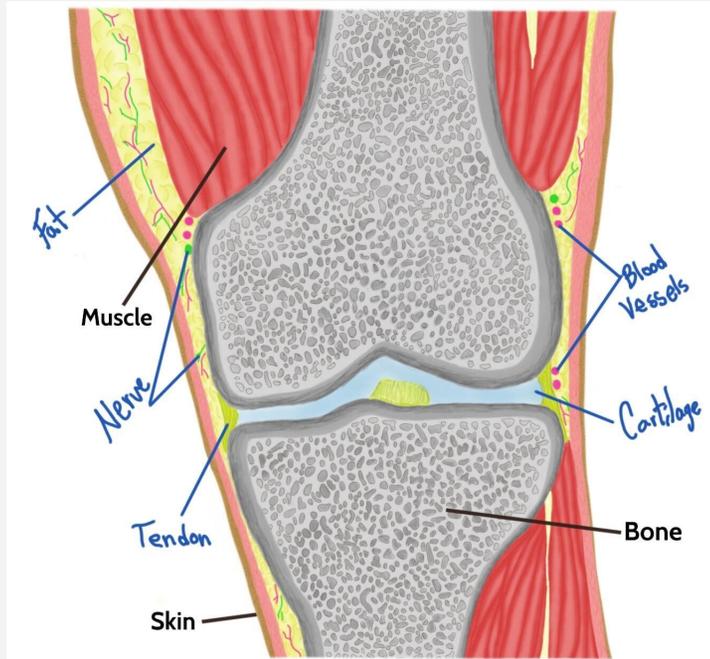
 Display **slide K**. Allow students to individually make connections between the close-up cross-sectional diagrams and *Interpreting MRI*. Tell students that they should create additional labels on Reference: *Interpreting MRI* to connect and incorporate the new structures they have identified.

Say, *Now that you have had a chance to analyze these new images, go back to Reference: Interpreting MRI and add any new connections and/or structures you have found that we see on both the Close up of Skin, Muscle, and Bone and on the Interpreting MRI. If there are any additional structures you can identify, add labels to Interpreting MRI.*

* SUPPORTING STUDENTS IN DEVELOPING AND USING SCALE, PROPORTION, AND QUANTITY

These diagrams help support students' transition to considering body parts at a microscopic scale. However, students will develop their understanding of this level of "zoom in" over the next three lessons, as they use microscopes to investigate blood, nerves, skin, bone, and muscle. As such, do not yet call attention to the idea of microscopic scale here; simply continue to use the idea of getting closer and seeing inside. In Lesson 6, after students have seen these tissues magnified 40, 100 or even 1000 times, you can revisit these diagrams

See one example to the below:



to notice that the artist may not have represented in these diagrams exactly what we actually see at the microscopic scale. The artist's purpose here was instead to show what we cannot see from outside the body and the ways these structures are connected.

ASSESSMENT OPPORTUNITY

3.A Building towards: Critically read and interpret scientific texts adapted for classroom use to obtain scientific and technical information about various parts of the human leg to describe patterns among interacting systems.

What to look for/listen for: Annotations or ideas about (1) how we can use multiple sources of information (images taken with different tools and from different perspectives) together in order to gain a fuller understanding of a structure or system, (2) by using multiple sources of scientific or technical information (images), a more complete representation can be used to connect information from multiple sources (in this case, to notice that blood vessels and nerves are located throughout skin, muscle, bone, and even in the material connecting all three structures).

What to do: Encourage students to share their observations and questions as they compare the images and diagrams from *Interpreting MRI* with the diagrams from *Close up of Skin, Muscle, and Bone*. Encourage students with "What did the diagrams from *Close up of Skin, Muscle, and Bone* help us understand about the images in *Interpreting MRI*?" and "What kinds of questions do you have about the skin, muscle, and bone after seeing the diagrams from *Close up of Skin, Muscle, and Bone*?"

6 · DISCUSS AND RECORD OBSERVED STRUCTURES

10 min

MATERIALS: *Reference: Interpreting MRI or Interpreting MRI* in student editions, *Reference: Close up of Skin, Muscle, and Bone or Close up of Skin, Muscle, and Bone* in student editions, Parts of a Body poster

Discuss observations from leg images. Display **slide L** and refer to the Parts of a Body poster. Say, *Let's take stock of what we noticed after looking at images of cross sections of the leg. Let's use the images we analyzed that are now in our science notebook to help us do so. Let's remember as we do this, that we are doing these investigations to help us figure out what was happening at the site of the injury as the student healed his foot.*

Tell students to turn to a partner and share one thing they found in common as they looked at cross sections of the skin, muscle, and bone. Give students one minute to share with a partner.

Say, I noticed many of you were able to identify structures more clearly inside the leg, such as details in the skin, muscle, and bone. What were some of the things you noticed about the skin, muscle, and bone from looking at the cross-sectional images?

KEY IDEAS

Purpose of this discussion: For students to highlight how they were able to use cross-sectional images to help make connections about how the different parts were interconnected within the body.

Additionally we want students to collectively observe that blood vessels and nerves are visible in all of the cross-sectional images of skin, muscle, and bone. How blood vessels and nerves work together in each of these parts of the body is still unknown and what we will figure out in the next few lessons.

Listen for these ideas:

- Blood vessels and nerves were found throughout the skin, muscle, and bone. We wonder why they are found in all these structures.
- There are structures that connect the skin, the muscles, and bones together (i.e. the skin to the muscle), and even these connecting structures have blood vessels and nerves going through them.

Ask for a student volunteer to share what their partner identified in the cross sections. Ask other students in the class whether they also noticed something similar to this from the cross-sectional diagrams and images. Once there is agreement among students, record these two parts or structures, blood and nerves were also found within other structures, on the Parts of a Body poster in the left hand column. Ensure there is agreement with what is shared about the different structures in the body before adding to the poster. One way to do this is to press students to clarify their responses before you record it on the poster. See an example on the next page.

Parts of ~~the~~ ^a body

structures	The job in the body (Functions)	structure related to function
skin	It covers the muscles and bones. It protects the parts inside.	connected to muscle with a thin layer stretchy moves with parts its attached to
muscle	It contracts to move different parts of the body, like arms and legs. It is attached to the bones somehow.	stretchy contracts to move
bone	It gives the body structure and shape so it can stay up.	solid and hard attached to muscles somehow
blood (also found in other structures)		
nerves (also found in other structures)		

Suggested prompt

What structures in the leg were we able to identify more clearly by looking at these close-up cross-sectional images?

Remember one of our goals of looking at the chicken wing was to figure out how the skin, muscle, and bones work together. What were some common structures or parts you noticed in the images that could help us understand how these parts work together?

Sample student response

There were a lot of different structures that we were able to identify and label, like the bone, cartilage, tendons, fat, blood vessels, and nerves.

We noticed that blood vessels and nerves were found in all three of the cross sections, whereas some of the other structures were not.

We also noticed that fat and tendons were structures that help connect some of the other structures we observed.

Display slide M, then continue the discussion.

Suggested prompt	Sample student response
<i>Why do you think blood vessels and nerves are found in each of these structures like skin, muscles, and bone? What do you think blood vessels and nerves do?</i>	<i>Accept all answers.</i> <i>We think blood vessels are tubes that carry blood throughout the body.</i> <i>Nerves, we think, help us feel, but we are not sure why bones have nerves in them.</i>
<i>If blood vessels carry blood, then why do all these areas in our body need blood? What does blood do?</i>	<i>Accept all answers.</i> <i>We aren't quite in agreement about why we need blood in all these places in the body.</i> <i>Some people mentioned that blood carries oxygen to different parts of the body, but we are not sure what the different parts of our body do with this oxygen.</i>

ADDITIONAL GUIDANCE

Some students might bring to the class a number of different ideas about what our blood and/or nerves do inside our body. When a student puts these ideas on the table, affirm their contribution and ask the student to say more about why our body needs this structure in all three of these areas: the skin, muscle, and bone. The goal is to recognize and affirm that students may bring ideas to the table, but also to help students identify gaps in their thinking to help motivate the next lesson.

7 · NAVIGATION

3 min

MATERIALS: *Reference: Interpreting MRI or Interpreting MRI in student editions, Reference: Close up of Skin, Muscle, and Bone or Close up of Skin, Muscle, and Bone in student editions*

Navigate to the next lesson. *Say, Today we found that there are blood vessels and nerves in all the parts of the foot that had been injured, and many of you noticed that the injured foot we investigated in our first lesson had dried blood on it. However, it seems like we still have lots of questions about blood. So maybe we need to investigate more about the blood and what it does to help us figure out how our body heals.*

ADDITIONAL GUIDANCE

We make the navigation to look at blood for two reasons. First, as explained to students, blood is generally the most visible indicator that bodily injury has occurred. Most students will have some experience with this phenomenon. Second, in the next two lessons, students will observe cells with the aid of a microscope, and blood cells have a more easily recognizable cell boundary than do nerves. After observing blood cells under a microscope, students may find it easier to then identify other types of cells, such as nerve, bone, muscle, and skin.

Additional Lesson 3 Teacher Guidance

**SUPPORTING
STUDENTS IN
MAKING
CONNECTIONS IN
ELA**

CCSS.ELA-LITERACY.RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.

In this lesson, students viewed several images and diagrams to make sense of some of the structures inside a human body - where they're located and how they're arranged. In order to support their claims that blood vessels and nerves are found in the bone, skin, and nerves, students must compare diagrams with MRI images and cite evidence about how the images support their claims.