

Grade 4: Life Science Module

Lesson Sequence 6: Structures of Body Coverings

Lesson Sequence 6: Structures of Body Coverings

Overview

Total Time: 2 hours of instruction (divided into two sections)

Students continue their survey of the specialized structures of animals. In this lesson sequence, students focus on structures and functions of different body coverings. First, they sort pictures of animals according to their body coverings. They then form expert groups and learn about the structures and functions of fur, feathers, scales, and exoskeletons. With this new learning, students create an argument for which body covering helps animals survive in a given habitat.



Lesson Sequence Focusing Question

How do different types of body coverings and colorations affect an animal's ability to survive in its habitat?

- Animals have a variety of body coverings, such as fur, feathers, scales, and shells with coloration that function to help animals survive well by regulating temperature and moisture, providing protection, and attracting mates.

Long-Term Learning Addressed (Based on NGSS)

Construct an argument about how animals use different body coverings, such as scales, fur, feathers, and an exoskeleton, as well as methods of coloration to help them survive in their environment. (Based on NGSS 4-LS1-1)

This lesson sequence explicitly addresses:

Science and Engineering Practices:

- **Engaging in Argument from Evidence:** Construct and/or support an argument with evidence, data, and/or a model. *Students construct an argument about how different body coverings can affect survival in a given ecosystem.*

Crosscutting Concepts:

- **Structure and Function:** The way in which a living thing is shaped and its substructures determine its properties and function. *Students read texts to learn how the body coverings on animals have particular functions.*
- **Cause and Effect:** Cause and effect relationships are routinely identified and used to explain change. *Students identify the cause and effect relationship between the body covering and survival in an ecosystem. Note: This Crosscutting Concept is not explicitly aligned with 4-LS1-1.*

Disciplinary Core Ideas:

- **LS1.A Structure and Function:** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. *Students learn about the variety of structures and functions of body coverings and how they help animals survive in different ecosystems.*



Lesson Sequence Learning Target

- I can construct an argument to defend how specific body coverings help an animal to survive well in a tundra, grassland, or desert ecosystem.

Ongoing Assessment

- Student science notebook: Structures of Body Coverings entry
 - Body Covering Argument

Agenda

Total Time: 2 hours of instruction

Section 1

1. Opening

- A. Reviewing Learning Target (5 minutes)
- B. Creating a Concept Map (20 minutes)

2. Obtaining and Communicating Information

- A. Jigsaw Part I: Reading in Body Covering Expert Groups (35 minutes)

Section 2

1. Obtaining and Evaluating Information

- B. Jigsaw Part II: Sharing in Ecosystem Expert Groups (30 minutes)

2. Engaging in Argument

- C. Constructing an Argument: Body Coverings and Ecosystem (30 minutes)

Teaching Notes

Purpose of lesson sequence and alignment with NGSS standards:

- In this lesson sequence, students explore the structures and functions (a Disciplinary Core Idea) of body coverings such as fur, feathers, and scales.
- In Section 1, students read texts to learn that particular body coverings help animals survive well by supporting temperature and moisture regulation, and providing protection.
- In Section 2, students discuss the evidence to see the cause and effect relationship (a Crosscutting Concept) between the body covering of an animal and surviving well in a particular ecosystem. Then they argue (a Science and Engineering Practice) which body covering will help an animal survive well in the desert, tundra, or grassland ecosystem.

How it builds on previous work in the Life Science Module:

- Similar to the learning in Lesson Sequences 3–5, students continue to study the specialized structures of animals that allow them to survive. As they study the structures and their functions, students gather options for the fictional animal they will design for the performance task. Students also continue to build capacity around constructing arguments.

How it connects to the CCSS Standards and EL Education's Language Arts Grade 4

Module 2:

- In Language Arts Grade 4 Module 2, students learn about body coverings that also function as a defense mechanism. Make explicit connections between the animals they are familiar with through the Language Arts module, and the ways that body coverings can protect animals.
- The Jigsaw in Section 1 provides students with the opportunity to practice reading informational texts (CCSS ELA RI.4.3).
- The Jigsaw in Section 2 provides students with the opportunity to practice their speaking and listening skills while collaborating in a small group discussion (CCSS ELA SL.4.1).
- The student argument Section 2 provide students with an opportunity to practice argument writing (CCSS ELA W.4.1)

Possible student misconceptions:

- Students may understand that body coverings are important for the survival of animals through camouflage or other ways, but may not realize the multiple functions of one body covering. Through the texts, students learn that body coverings help with moisture and temperature control, and defense. You may begin by asking students about the way they cover their body. "What is the function of your clothes?"

Possible broader connections:

- Connect to other sciences by thinking about other cause and effect relationships in the natural world, such as the relationship between the sun and the warmth of the earth, weather and climate, or predator and prey.
- Consider letting the students explore what ecosystem our body coverings were designed for. "What kinds of things do we do to alter our environment so that we can live in such a wide range of places?" (Build homes, wear coats, air condition, build dams for water)

Areas where students may need additional support:

- Students may need additional support with reading comprehension when reading in their expert groups. Consider this when creating the expert groups and assigning texts, as the texts have differing Lexile measures.
 - For students who are overwhelmed by too much print on a page: Consider copying the text so that there is only one paragraph on each page, with an organized space for recording the gist and meanings of the unfamiliar words on that page.
 - For students who may need additional support with paraphrasing: Consider providing running notes on today's text.
 - Offer selected shorter passages to specific groups based on the readiness and needs of the group. This gives students an opportunity to read a complex text within the 4th grade level span, but differentiates the length of the text, not the complexity.
 - For ELLs and students who may need additional support with reading and/or writing: Strategically pair students with a peer model.
 - For students who may need additional support determining the gist: Consider highlighting or underlining key phrases in their individual copy of the text in advance. This will make the gist clear for them.

- Students may need additional support with determining the meaning of unfamiliar vocabulary when reading in their expert groups. Encourage students to use the glossary in the back of their student science notebook to help with the vocabulary load.
- Students may need additional support identifying a claim to make about which body covering is the best for their ecosystem because fur, scales, feathers, and exoskeletons are found in all of the ecosystems studied. Explain that there is not one right answer; rather, they will be assessed on how well they support their claim with evidence and reasoning.

Down the road:

- Students will use their learning about body coverings in the creation of their realistic but fictional animal in the performance task.
- In Lesson Sequence 7, students will begin examining the specialized structures of plants. Gather a variety of plant parts for Section 1. Consider obtaining live plants (including prickly pear cactus, diamond leaf willow, and coneflower) from a local or online plant nursery for student observation in Section 3.
- Continue to care for the grass and radish plants seeded in preparation for Lesson Sequence 8. Refer to the Grade 4 Life Science Module Overview for additional information.
- By constructing an argument, students continue to build capacity engaging in argument, a Science and Engineering Practice they will use in the summative assessment in Lesson Sequence 11. Use the body covering argument in this lesson sequence to guide your instruction. Students will construct another argument in Lesson Sequence 8.

In advance:

- Read each section and complete the Preparing to Teach: Self-Coaching Guide.
- Assign students to body covering expert groups: Feathers, Fur, Scales, Exoskeleton. Each ecosystem expert group—Desert, Tundra, and Grassland—from Lesson Sequence 2 should have a representative in each of these body covering expert groups. Students who would benefit from reading a text with a lower Lexile measure should be placed in the Fur expert group, while students who would benefit from a more challenging text should be placed in the Scales expert group.
 - Use the Student Jigsaw Groups chart in the supporting materials to help you create groups.
- Review the Jigsaw protocol. See the Classroom Protocols pack on Curriculum.ELeducation.org.
- Prepare texts for the expert groups.
- Prepare additional sets of animal cards from Lesson Sequence 2. Depending on class size, you may want three or four more sets. Each expert group needs 15–20 cards.
 - Preview the Creating a Concept Map activity in Section 1.
- Post: Lesson sequence learning target, lesson sequence focusing question, Scientists Do These Things anchor chart, Concepts Scientists Think About anchor chart.

Optional extensions:

- N/A

Vocabulary

Fun Fur Facts

mammal: an animal that breathes air, has a backbone, and grows hair at some point in its life

keratin: hard, flexible material that hair, feathers, scales, shells, and fingernails are made out of

insulation: a material for keeping something at a constant temperature—either warm or cool

pigment: a substance that gives something its color

camouflage: colors that blend in with the environment

concealed: hidden

Scales: Coats of Armor

mucus: slimy substance

scutes: large, hard, plate-like scales that do not overlap

Flights of Fantasy

downy feathers: soft feathers for staying warm

semiplume feathers: feathers for warmth and floating

bristle feathers: feathers that surround the eyes and nostrils

filoplume feathers: feathers for sensing the quality of flight feathers

contour feathers: feathers that provide protection from the wind

Animals with Skeletons on the Outside: The Exoskeleton

exoskeleton: skeleton on the outside of the body

endoskeleton: skeleton inside the body

segments: small sections that make up a larger thing

hydrated: has enough water

moisture regulation: an animal's ability to control how much moisture it has internally

temperature regulation: an animal's ability to control its internal temperature

Materials

General Materials

- ☒ Student science notebook (From Lesson Sequence 1; one per student)
 - Structures of Body Coverings entry (Page 30 of student science notebook)
 - Ecosystems entry (Page 6)
- ☒ Student Jigsaw Groups chart (For teacher reference)
- ☒ Animal cards (Multiple sets; from Lesson Sequence 2; see Teaching Notes)
- ☒ Chart paper (One piece per expert group; used in Section 1)
- ☒ Body covering expert group texts
 - “Fun Fur Facts” (One per student in Fur expert group)
 - “Flights of Fantasy” (One per student in Feathers expert group)
 - “Scales: Coats of Armor” (One per student in Scales expert group)
 - “Animals with Skeletons on the Outside: The Exoskeleton” (One per student in Exoskeleton expert group)
- ☒ Highlighters (One per student)

- ✓ Scientists Do These Things anchor chart (Begun in Lesson Sequence 2; added to in Section 2)
- ✓ Concepts Scientists Think About anchor chart (Begun in Lesson Sequence 2 added to in Section 2)

Science-Specific Materials

- N/A

Section 1: Opening

A. Reviewing Learning Target (5 minutes)

- Direct students' attention to the posted lesson sequence learning target.
- Read it aloud as students follow along, reading silently in their heads:
"I can construct an argument to defend how specific body coverings help an animal to survive well in a tundra, grassland, or desert ecosystem."
- Direct students' attention to the posted lesson sequence focusing question and ask for a volunteer to read it aloud:
 - "How do different types of body coverings and colorations affect an animal's ability to survive in its habitat?"
- Ask students to open their **student science notebooks** to the **Structures of Body Coverings entry** and find the "Opening" section.
- Ask them to jot down words or draw a quick sketch about their thoughts about the learning target or focusing question in the "Opening" section.
- Prompt students by encouraging them to think about what they already know and what they wonder about animals body coverings ⁽¹⁾.
- Ask for a few volunteers to share examples of body coverings, such as feathers, scales, or fur.

Preparing to Teach: Self-Coaching Guide

1. Will I capture student ideas and questions publicly, or in my notebook?

B. Creating a Concept Map (20 minutes)

- Arrange students into four body covering expert groups: Feathers, Fur, Scales, and Exoskeleton ^{(1) (2)}.
- Focus your whole group of students and tell them they will be creating a concept map. Explain that a concept map is a type of organizer that has a main idea in the middle and then branches out to show how the main idea can be broken up into specific topics ⁽³⁾.
- Distribute **animal cards** and **chart paper** to each expert group ⁽⁴⁾.
- Tell students that the main idea for the concept map will be body coverings. Ask expert groups to take 30 seconds to designate a recorder for their group.
- Ask the recorder to write "Body Coverings" in the middle of the chart paper and circle it.
- Explain that students will sort their animal cards into different categories according to their body coverings. Allow students to group animals according to their thinking, and not necessarily only to feathers, fur, shells, and scales ⁽⁴⁾.

Structure and Function in Terrestrial Animals and Plants

- After 5 minutes, ask students to give each category a name and to record the names spaced out around the “Body Coverings” bubble on the concept map. (Examples: warm body coverings, feathers, fur, or hard body coverings.)
- Model briefly with two or three cards that have something in common. Consider saying: “These three animals all have a hard body covering. Therefore, I’m going to make a bubble, write the words ‘hard body covering’, and connect it to the ‘Body Covering’ bubble in the middle.”
- Tell students to list the animals from the cards on the map near the sub-category groups, with lines from the sub-category group going to each animal, and put a box around the name of the animal.
- Allow students to brainstorm and list other animals that could go into those categories.
- After 5 minutes, ask groups to clear their workspace of everything but their concept map and to stand up and push in their chairs.
- Explain that each expert group will travel around the room (in a calm, quiet, and orderly way) to visit the other groups concept maps to notice similarities and differences. Tell students you will signal them when it is time to move to the next concept map, and they should do so quietly and quickly.
- Ask students to move with their expert group clockwise to the next closest concept map and begin noticing.
- Signal students when it is time to move to a new concept map, and continue this process until they have viewed all maps.
- Ask students to return to their seats.
- Invite students to turn to the “Opening” section in the Structures of Body Coverings entry of their student science notebook and record any new questions or ideas they have about body coverings.

Preparing to Teach: Self-Coaching Guide

1. How will I quickly and efficiently move students into the body covering expert groups? Use the **Student Jigsaw Groups chart** (see supporting materials) to help you create groups.
2. What group work norms do students need to re-establish?
3. How familiar are my students with concept maps? Do they know what a concept map looks like? Have they created one before? Consider using a model of a concept map to show students what it should look like.
4. How will I manage the materials for the concept map?
5. What additional questions can I ask the student groups to help them examine the body coverings more closely?

Section 1: Obtaining and Communicating Information

A. Jigsaw Part I: Reading in Body Covering Expert Groups (35 minutes)

- Ask students to take their student science notebook and move to sit with their body covering expert group.

- Distribute the **expert group texts**:
 - **“Fun Fur Facts”** (Fur expert group)
 - **“Flights of Fantasy”** (Feathers expert group)
 - **“Scales: Coats of Armor”** (Scales expert group)
 - **“Animals with Skeletons on the Outside: The Exoskeleton”** (Exoskeleton expert group)
- Explain to students that they will be exploring the lesson sequence focusing question by becoming an expert on either feathers, fur, scales, or exoskeletons.
- Post directions for the jigsaw on the board and read them aloud with students. Remind students that they participated in a jigsaw when they read in their ecosystem expert groups in Lesson Sequence 2. Answer clarifying questions ⁽¹⁾ ⁽²⁾.
 - Read the entire article once, stopping only to mark unfamiliar vocabulary and phrases ⁽³⁾.
 - When the teacher gives the signal (after 5–10 minutes), discuss unfamiliar vocabulary and clarify confusions with your expert group.
 - When the teacher gives the signal (after 3–5 minutes), read the article a second time, paying careful attention to the different structures of body coverings, and record your ideas in the Structures and Functions chart in the Structures of Body Coverings entry in your student science notebook.
 - When the teacher gives the signal (after 5–10 minutes), read the article a third time, paying careful attention to the functions of those structures, and record your ideas in the Structures and Functions chart in the Structures of Body Coverings entry in your student science notebook.
- Explain to students that they have 5 minutes to share the list of structures as a body covering expert group, and to record any structures on the list that they didn’t previously have ⁽⁴⁾.
- Invite students to read the article for a final time to identify the functions of those structures. Remind students to record the functions in the Structures and Functions chart in their student science notebook.
- Allow groups time to discuss functions and record any new learning.
- Ask students to return to their seats.

Preparing to Teach: Self-Coaching Guide

1. What close reading strategies and vocabulary are my students familiar with?
2. Which student group will I work with?
3. Which students may benefit from the glossary in their student science notebook?
4. What discussion norms are in place, and how can I encourage my students to share and have a productive conversation about structures and functions of body coverings?

A. Jigsaw Part II: Sharing in Ecosystem Expert Groups (30 minutes)

- Ask students to take their student science notebook and move to sit with their Desert, Grassland, or Tundra expert groups from Lesson Sequence 2 ⁽¹⁾.
- Remind students that in each of these ecosystem expert groups, there are now experts on fur, feathers, scales, and exoskeletons. Tell students they will work together in this group

Structure and Function in Terrestrial Animals and Plants

to determine the best fur, feathers, scales, or exoskeleton adapted for the desert, tundra, or grassland ecosystem ⁽²⁾.

- Ask students to go back to the **Ecosystems entry** in their student science notebook and find the Ecosystems Characteristics note-catcher. Encourage students to help their group members find the correct section in their student science notebook ⁽³⁾.
- Give students 1 minute to reread the characteristics of their assigned ecosystems to remind themselves of the challenges animals in those ecosystems face to survive well. Prompt students to consider the temperature of each ecosystem. Provide examples as necessary: “In the desert, it is hot and there isn’t much water. In the tundra, it is extremely cold in the winter. In a grassland, there are not very many structures for shelter.”
- Ask students to record their ecosystem characteristics under the “Ecosystem Characteristics” section in the Structures of Body Coverings entry. Students may be confused because they just returned to the Ecosystems entry ⁽³⁾.
- Distribute **highlighters**.
- Invite students to highlight examples from their Structures and Functions chart for fur, feathers, scales, or exoskeletons that would allow animals to survive well in their assigned ecosystem. Remind students to consider the characteristics of their assigned ecosystem. Provide an example: If students are assigned to the tundra, they would highlight “thick fur helps animals stay warm.”
- Circulate to check for understanding.
- Refocus the whole group.
- Refer students to the chart in “Obtaining Information” titled “How Body Coverings Function in My Ecosystem” and ask them to notice the three functions listed in the table. Explain that most functions of body coverings can be classified as a function to protect the animal (like camouflage), regulate moisture, or regulate temperature.
- Work together as a class to create a definition for each of these functions. As students share their thinking, encourage them to provide examples from their texts. Model recording the decided-upon definition of each function in the left-hand column of the “Obtaining Information” section in the student science notebook.
- Explain to students that they will be taking turns to share the structures and functions of fur, feathers, shells, and scales that would allow animals to survive well in a particular ecosystem. Post these directions on the board and read them aloud with students. Answer clarifying questions.
 1. Number your group members.
 2. Group member #1 shares. Other group members record the examples provided in the “How Body Coverings Function in My Ecosystem” table in the “Structures of Body Coverings” entry.
 3. Repeat Step 2 with remaining group members.
- Provide a model for sharing as necessary. Say:

“If I were in the grassland or tundra group and I became an expert about fur, then I know that animals need body coverings to keep warm, so I would share, ‘Thick fur or hair keeps an animal warm,’ and everyone in my ecosystem group would record that in the ‘Temperature regulation’ section under ‘Fur.’”

- Ask students to begin sharing; circulate to support them ⁽⁴⁾.
- Give students specific and positive feedback on their ability to read and share in expert groups. (Example: “By working so hard to learn about your assigned body covering and share that knowledge with your expert groups, you have all become experts on all of the body coverings and their functions.”)

Preparing to Teach: Self-Coaching Guide

1. Who is in the ecosystem expert groups? Do I want to split the large groups into smaller cohorts, or keep them as they are to share out expert information?
2. How familiar are my students with jigsaws and learning from one another? What expectations and/or norms should I review based on our work in Lesson Sequence 2?
3. Will students require extra support when switching between the Ecosystem entry and the Structures of Body Coverings entry?
4. What do I want my students to understand?
 - Moisture regulation- an animal's ability to control how much moisture it has internally
 - Temperature regulation- an animal's ability to control its internal temperature)
 - Sometimes animals have special structures, such as antlers, to protect themselves.
 - Note: The Tundra expert group may have trouble with thinking about how scales work in the tundra. Encourage group members to think about the scales of fish.

Section 2: Construct an Argument

B. Constructing an Argument: Body Coverings and Ecosystem (30 minutes)

- Remind students of the lesson sequence learning target and focusing question, and point out that they will use their new knowledge of body coverings and their functions to construct an argument about the relationship between body coverings and surviving well.
- Direct students' attention to the **Scientists Do These Things anchor chart** and add:
 - “Body covering in my ecosystem argument”
- Remind students there are two steps in constructing an argument. Remind students that they discussed these steps when they constructed an argument in Lesson Sequence 2. Read the steps aloud as students follow along:
 - First, a scientist prepares to make an argument:
 - Pose the question: What is the body covering that will cause an animal to survive well in your particular ecosystem? Why?
 - Identify evidence: Evidence is scientific data that answers the question.
 - Evaluate evidence: The process of deciding if the data are accurate and relevant to support the claim.
 - After a scientist has thought about all the evidence, he or she is ready to make the argument:
 - Make a claim: A *claim* is a statement or conclusion that answers the original question.

Structure and Function in Terrestrial Animals and Plants

- Using evidence and scientific reasoning to support a claim: Using the evidence to support and further explain your claim.
- Explain why the evidence is sufficient and relevant.
- Ask students to turn and talk to an elbow partner ⁽¹⁾:
“What kind of evidence do we have about how body covering affects survival in a particular ecosystem?” (Responses will vary.)
- Tell students that they will identify evidence about body coverings and about ecosystem characteristics in order to support a claim. Emphasize that they need evidence from the body coverings and the ecosystem. Model with:
“I would highlight ‘exoskeleton helps an animal stay hydrated’ in the Body Coverings Functions chart and ‘The desert is hot and dry’ in the Ecosystem Characteristics list.”
- Tell students that they don’t need to make a claim about the body covering to which they were assigned. Instead, they should look at the evidence and decide which body covering is best for their ecosystem.
- Ask students to use their highlighter to highlight one example of a body covering and one example of the matching ecosystem characteristic ⁽²⁾.
- Circulate to check for understanding.
- Ask:
“Is your evidence relevant and sufficient to make a claim about which body covering will help an animal survive well?”
- Ask several students to share out.
- Tell students it’s time to make a claim. Ask them to turn and talk with an elbow partner:
“What does your evidence suggest? What is the body covering that will cause an animal to survive well in your particular ecosystem?”
- Ask students to write their claim in their student science notebook ⁽³⁾.
- Model for students how to construct the argument by combining the claim with the evidence about body coverings and characteristics of an ecosystem. Say:
“My claim is that an exoskeleton is a good body covering for a desert. One piece of evidence I have is that an exoskeleton helps an animal stay hydrated in the dry and hot desert ecosystem. This is an important part of surviving well. So I think this is good evidence.”
- Tell students to construct their own argument. Post these guidelines as reminders ⁽⁴⁾:
 - The claim will be specific to your assigned ecosystem, as you have already recorded.
 - Identify and record evidence for all three functions of the body covering of your choice.
 - Put the claim, evidence, and reasoning together to construct an argument.
- Circulate to support students as they construct their arguments ⁽⁵⁾.
- After 10 minutes, post the **Concepts Scientists Think About anchor chart** and explain to students that they have been thinking like a scientist about cause and effect relationships in this lesson sequence.
- Ask:
“What is the cause and effect relationship between a body covering and surviving well in an ecosystem?” (The body covering is the cause, and surviving well is the effect.)

“What evidence do we have that there is a cause and effect relationship?” (Responses will vary.)

“What would happen if an animal moved into an ecosystem where its body covering did not work as well—for example, if a snake with scales moved into the tundra, or a rabbit with thick fur moved into desert?” (The body covering would cause the animal to not survive well in that ecosystem.)

- Record the cause and effect relationship on the anchor chart:
- There is a relationship between having a body covering that functions correctly for the ecosystem in which the animal lives and the animal’s ability to survive well.

Preparing to Teach: Self-Coaching Guide

1. The How Body Coverings Function in My Ecosystem table and the Ecosystem Characteristics note-catcher provide evidence.
2. How can I help my students manage their materials? Would some students benefit from having an additional copy of the Ecosystem Characteristics note-catcher?
3. Consider posting this sentence stem for your students who may need additional support:
“The body covering that will help an animal survive well in a tundra/desert/ grass-lands ecosystem is _____. The evidence for this is _____.”
4. How can I direct my students’ attention to the sentence stems on the Scientists Do These Things anchor chart?
5. How can I easily collect this argument as a formative assessment? Should I have students write it as an exit ticket instead of in their notebook?

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.