Grade 4: Life Science Module

Lesson Sequence 4: Sensory Structures in Animals

Lesson Sequence 4: Sensory Structures in Animals

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 the structures animals use to sense their environment and how they respond to the stimulus. They begin by designing and testing their own experiments to see how an earthworm responds to stimuli in its environment. Students are guided through completing an explanatory model of an earthworm and use a flow chart model to learn how the nervous system works. Students then engage in a Poster Session to apply their understanding of the nervous system to different animals responding to stimulus.

Lesson Sequence Focusing Question and Big Ideas

How do the parts of an animal's nervous system work together to collect and react to information about the animal's surroundings?

- Animals sense stimuli in the environment with their sensory structures. The stimuli are interpreted by the nervous system (brain and nerves) of the animal in a message. The message then provides information to other animal body parts telling the animal to respond through various behaviors. Sometimes this interaction between stimulus and response becomes a memory.

Long-Term Learning Addressed (Based on NGSS)

Develop an explanatory model showing how sense receptors are sensitive parts of an animal's body that collect information about sights, sounds, odors, and vibrations and send that information to the brain, where it is used to determine behavior. (Based on NGSS 4-LS1-2)

Note: This is the only lesson sequence aligned with 4-LS1-2 *in this module. Depending on the needs of your students, they may need additional instruction to completely meet this standard.*

This lesson sequence explicitly addresses:

Science and Engineering Practices:

- **Developing and Using Models:** Develop and/or use models to describe and/or predict phenomena. *Students use a model (a flow chart) of a stimulus, sensory structure, nervous system, and response to describe the process of animal behavior.*
- **Planning and Carrying Out an Investigation:** Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. *Students design an original experiment in which they investigate the sensory system of earthworms. Note: This Science and Engineering Practice is not explicitly aligned with* 4-LS1-2.

Crosscutting Concepts:

- **Systems and Systems Model:** A system can be described in terms of its components and their interactions. *Students represent the nervous system in a model (a flow chart) and use it to explain how the different parts of the nervous system work together to make a system.*

- **Structure and Function:** Different materials have different substructures, which can sometimes be observed; and substructures have shapes and parts that serve functions. *Students learn about the different sensory structures of animals. Note: Crosscutting Concept is not explicitly aligned with* 4-LS1-2.

Disciplinary Core Ideas:

- **LS1.D Information Processing:** Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. *Students describe how animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.*

Lesson Sequence Learning Targets

- I can design an investigation to answer questions about an animal's ability to respond to its environment.
- Using a flow chart, I can explain the relationship between an animal's sensing structures and how the animal behaves in its environment.

Ongoing Assessment

- Student science notebook: Sensing Structure entry
  - Earthworm Explanatory Model
  - Using a Model

Agenda

Total Time: 2 hours

Section 1

1. **Opening**
   - A. Reviewing Learning Targets (10 minutes)
2. **Planning and Carrying Out an Investigation**
   - A. Scientists Meeting: Planning an Investigation (20 minutes)
   - B. Planning an Earthworm Investigation (15 minutes)

   Note: Students may need time to gather materials before moving on to Section 2.

Section 2

1. **Planning and Carrying Out an Investigation**
   - A. Conducting an Earthworm Investigation (15 minutes)

Section 3

1. **Developing a Model**
   - A. Developing an Explanatory Model (25 minutes)
   - B. Poster Session: Sensing Structures (20 minutes)
2. **Evaluating and Communicating Information**
   - A. Revisiting Anchor Chart (15 minutes)

   Optional Extension: Animal Nervous System

Teaching Notes

Purpose of lesson sequence and alignment with NGSS standards:

- In this lesson sequence, students study the information processing structures of animals (A Disciplinary Core Idea).
- In Section 1, students design an investigation (a Science and Engineering Practice) to explore the various ways in which an earthworm responds to its environment.
- In Section 2, students work with models (a Science and Engineering Practice) in two ways. With support from the teacher, they develop an explanatory model that explains how an earthworm senses and reacts to the environment. They also use a flow chart to explain how animals receive different types of information through their senses, process the information (a Disciplinary Core Idea) in their brain, and respond to the information in different ways. Finally, students explain how this assemblage of sensors and nerves working together performing a task is another type of system, and thus can be called a system (a Crosscutting Concept).

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

- In Lesson Sequence 3, students began studying specific structures (mouthparts) of animals and the function of those structures (how they obtain food). In this lesson sequence, students study a different structure (sensory structures) and the function of those structures (how they affect the animals' nervous system). By the end of the lesson sequence, students will have the necessary background information to brainstorm possible sensory structures their fictional animals will have to process and respond to information in their ecosystem.

How it connects to the CCSS Standards and EL Education's Language Arts Grade 4 Module 2:

- Language Arts Grade 4 Module 2 focuses on defense mechanisms. Consider encouraging students to make connections between animal defense mechanisms and the external and internal structures that act as a system to create that behavior. Example: the pronking of the springbok.
- Students use the Poster Session protocol in the Language Arts module.
- The Poster Session in Section 3 provides students with the opportunity to practice reading informational texts (CCSS ELA RI.4.1).
- The Scientists Meeting in Section 1 provides students with the opportunity to practice their speaking and listening skills while collaborating in whole-group discussions (CCSS ELA SL.4.1).

Possible student misconceptions:

- Students may think that humans are not animals. To lead students to understand that humans are part of the Animal Kingdom, ask: "What makes an animal an animal?" Note that any characteristics that animals have, humans also have. Humans have structures that may appear different but have many similar functions, such as our ability to sense and respond to the world around us.
- Students may think that an animal's nervous system, which is used to sense the animal's environment, is different from a human's nervous system. Even though the animal may look

different from a human, the nervous systems are not so different. All nervous systems have a sensing structure, nerves, and a brain, and they respond or store memories. When students complete the flow chart in Section 3, consider having a human as one of the Poster Session animals.

Possible broader connections:

- Connect learning in this lesson sequence to students' lives by giving them an opportunity to examine how they or their pets respond to stimuli in their environment.
- Connect to other sciences by thinking about how we find systems in many different domains of science, such as solar systems, ecosystems, and body systems. Consider what kinds of models students may be familiar with that are used to study those systems—for example, replicas of solar systems, diagrams of food webs in ecosystems, and diagrams of body systems.

Areas where students may need additional support:

- Students may need additional support in order to successfully participate in the Earthworm Investigation and Poster Session. Consider how to group students to create supportive experiences.
- Students may need additional support when determining variables for the Earthworm Investigation. Stimulate their thinking with questions about opposites: "Could we make it colder?" "Hotter?" "Lighter?" "Darker?" "Quieter?" "Noisier?" "Wetter?" "Drier?"

Down the road:

- In Lesson Sequence 5, students will complete a chicken wing dissection. Prepare the necessary materials. See the Lesson Sequence 5 materials list.
- 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.

In advance:

- Read each section and complete the Preparing to Teach: Self-Coaching Guide.
- Gather materials for the teacher Earthworm Investigation. Students will plan and conduct their own earthworm investigations after the teacher investigation. An intentional break following the planning stage has been inserted to allow time for students to gather their necessary materials. Consider having backup materials available.
- Prepare the Earthworm Investigation stations. Use the same earthworm pairings from Lesson Sequence 3. Each pair will conduct three trials.
- Review the Poster Session protocol (see the Classroom Protocols on Curriculum.ELeducation.org).
  - Prepare Poster Session images. Print out images and text and post around the room. Consider printing in color and laminating for future use. To print in color, click the URL provided on the material.
  - Determine triads.
- Post: Lesson sequence learning targets, Norms of a Scientists Meeting anchor chart, Life Science Module guiding question, Scientists Do These Things anchor chart, Poster Session images, Concepts Scientists Think About anchor chart, Animals Structures and Functions anchor chart.

Optional extensions:

- *Animal Nervous System Study:* Students observe and take notes of their personal pets, classroom pets, or other animals responding to stimuli in their environment.

Vocabulary

investigation: a scientific examination of something
stimulus: thing or event that creates a reaction
response: a reaction
trial: a single test or experiment
variable: the thing that is changed in an investigation
external: outside
internal: inside
nerves: internal structure that sends messages to different parts of the body
nervous system: a collection of nerves and sometimes a brain that helps an animal sense and respond

Materials

General Materials

- ☑ Student science notebook (from Lesson Sequence 1; one per student)
  - — Sensing Structures entry (page 18 of Student science notebook)
  - — Animal Structures and Functions anchor chart entry (page 2 of Student science notebook)
- ☑ Norms of a Scientists Meeting anchor chart (begun in Lesson Sequence 1)
- ☑ Life Science Module driving question (from Lesson Sequence 1; one to display)
- ☑ Scientists Do These Things anchor chart (begun in Lesson Sequence 2; added to in Section 1)
- ☑ Handling Live Animals in the Classroom (from Lesson Sequence 3; for teacher reference)
- ☑ Earthworm diagram (one to display)
- ☑ Sensory Structures Flow Chart (one to display)
- ☑ Sensory Structures Flow Chart: Earthworm Model (for teacher reference)
- ☑ Poster Session images (10 to display)
- ☑ Concepts Scientists Think About anchor chart (begun in Lesson Sequence 2; added to in Section 2)
- ☑ Animal Structures and Functions anchor chart (begun in Lesson Sequence 3; added to in Section 2)

Science-Specific Materials:

- ☑ Materials for teacher earthworm investigation (one set; used in Section 1)
  - — Earthworms (three)
  - — Petri dishes or plates (three)
  - — Wet paper towels (three)
  - — Small bottle of vanilla extract
  - — Spray bottle with de-chlorinated water

☑ Materials for student earthworm investigation (one set per pair; used in Section 1)

- Earthworms (three)
- Petri dishes or plates (three)
- Wet paper towels (three)
- Spray bottle with de-chlorinated water
- Student stimuli materials (three sets; chosen by students; see Teaching Notes)

Section 1: Opening

A. Reviewing Learning Targets (10 minutes)

- Remind students that they have learned about the structures animals use to obtain food, and have brainstormed what structures might work for their fictional animal. Now they will explore the structures animals use to sense the world around them.
- Remind students that the animal they design will need to have sensing structures that fit the animal and the grassland, tundra, or desert ecosystem they are assigned to.
- Direct students' attention to the posted lesson sequence learning targets. Read them aloud as students follow along, reading silently in their heads [1]:

  "I can design an investigation to answer questions about an animal's ability to respond to its environment."

  "Using a flow chart, I can explain the relationship between an animal's sensing structures and how the animal behaves in its environment."
- Relate the notion of animals being able to use sensing structures to respond to their environment to how humans use and do the same thing. Ask students to turn and talk with their elbow partner. Then cold call students to share out [2] [3] [4]:

  "What structures do humans use to sense the environment?" (Eyes, ears, nose, skin, or structures that are used to hear, see, touch, smell, and taste.)

  "What structures are internal to the human body—which means we can't see them—that allow us to respond to our environment?" (Nerves, brain, muscles)

  "What happens to us once we sense something in our environment?" (We react to it.)

  "How is this similar to how other animals sense and respond to their environment?" (Responses will vary.)
- Invite students to take out their **student science notebooks** and open to the **Sensing Structures entry**.
- Ask for a volunteer to read the question listed under "Opening" aloud, while the other students follow along, reading silently in their heads:

  "How do the parts of an animal's nervous system work together to collect and react to information about the animal's surroundings?"
- Ask students to record their ideas about this question or the learning targets in their notebook.

Preparing to Teach: Self-Coaching Guide

1. What new vocabulary should I focus on in the learning targets?
2. What question should I ask to informally assess what students already know about the nervous system and stimulus/response?
3. What Language Arts organisms can I refer to when introducing the learning targets?
4. How will I use student examples to guide the conversation about humans sensing and responding to their environment? Note: It's not required that students know the answers as this is what they will be learning about throughout this lesson sequence.

B. Scientists Meeting: Planning an Investigation (20 minutes)

- Ask students to bring their science notebooks and gather for a Scientists Meeting.
- Remind them that a Scientists Meeting is a conversation where they speak to one another as scientists and not just to the teacher.
- Direct their attention to the **Norms of a Scientists Meeting anchor chart:**
  - We take turns talking.
  - We build on one another's ideas.
  - We disagree respectfully.
  - We ask questions when we don't understand.
- Direct students' attention to the **Life Science Module guiding question:**
  - "How do the internal and external structures of plants or animals function together as a system to help them survive well in a given habitat?"
- Tell students the goal of this meeting is to plan an investigation, and that planning and carrying out investigations is something that scientists do. An investigation will help students answer the Life Science Module guiding question. And this particular investigation will help them learn more about the internal and external structures of earthworms. By studying one animal as an example, they can learn something about more animals.
- Explain that scientists always follow the same directions when planning an investigation and that to plan their investigation, they will follow the same directions.
- Direct students' attention to the posted **Scientists Do These Things anchor chart** and read the four steps of planning an investigation aloud while students follow along:
  1. Pose a question that can be investigated with trials.
  2. Decide what can be changed (variables).
  3. Set up the procedure.
  4. Record observations.
- Tell students that they will first do an investigation as a class to observe how an earthworm responds to a *stimulus* in its environment, and then they will create their own earthworm investigation.
- Write "Earthworm Investigation" on the Scientist Do These Things anchor chart.
- Briefly discuss the word *stimulus*—a thing or an event that an animal responds to. Consider

asking students to give a few examples.

- Using a total participation technique, invite responses from the group:

  "What structures does an earthworm have that help it respond to its environment?" (Tiny hairs, receptors in the skin, nose)

- Discuss with students that earthworms don't have eyes or ears or many observable sensing structures.
- Using a total participation technique, invite responses from the group:

  "Do you think an earthworm can respond to things in its environment, even if it doesn't have many sensing structures we can see?" (Yes)

  "How does it know if there is a predator lurking, or if it's raining and the worm needs to come out of the ground so it doesn't drown, or how to find food?" (Responses will vary.)

- Refocus students on the Sensing Structures entry in their student science notebook. Ask them to put a finger on the question they're going to investigate as a class:

  "Does an earthworm respond to its environment even though we can't see its sensing structures?"

- Tell students this is a good question to investigate because they can design some *trials*, or tests, to see if earthworms respond to different *stimuli* (meaning more than one stimulus) in the worm's environment.
- Remind students of the importance of handling the earthworms respectfully. Refer to **Handling Live Animals in the Classroom (for teacher reference)** as necessary.
- Conduct the teacher earthworm investigation [(1)]:
  - Place **Earthworm #1** on a wet paper towel on the plate. If earthworm gets dry during the experiment, use the spray bottle to lightly spritz with water.
  - (3 minutes) Ask students to locate the "Brainstorm Ideas to be Tested" section in their Sensing Structures entry, and silently record a list of things they could change about the plate to see if the earthworm can sense the change and respond. Reinforce that they don't want to hurt the animals.
  - Refocus the whole class. Explain the things they are changing are *variables*. Capture students' ideas about possible variables on the board [(2)].
  - Emphasize the importance of testing only one variable at a time. Tell students that when scientists investigate a question, they want to look at only one variable at a time. That means they should change one thing at a time. Tell students that the variable for this whole class investigation will be testing whether or not the earthworm prefers the smell of vanilla [(3)].
  - On the middle of the wet paper towel on the right-hand side, put one drop of **vanilla extract**. Move the earthworm to the middle of the plate.
  - (2 minutes) Ask students to locate the data chart under the "Whole Class Investigation / Earthworm Observation" section in their Sensing Structures entry. Invite them to record their observations in the first box under the heading "Observation: Did the earthworm move toward the vanilla or away from it?" section in their Sensing Structures entry, as well as a list of things they could change about the plate to see if the earthworm can sense the change and respond. Model as necessary.

- Invite volunteers to share out.
- Invite students to record "Yes" or "No" in the first box under the heading "Results: Does the earthworm sense the vanilla?"
- Discuss the importance of multiple trials [4].
- Repeat these steps with Earthworms #2 and #3, having students record their observations and results in the appropriate boxes for each earthworm.

- Refocus the whole group. Refer students back to the question being investigated: "Does an earthworm respond to its environment even though we can't see its sensing structures?"
- Model how to answer this question under the "Our Conclusions" section in the Sensing Structures entry, using data from the investigation. (Example: An earthworm does respond to its environment because I observed three out of three earthworms move toward the vanilla during the investigation.)
- Invite students to return to their seats.

Preparing to Teach: Self-Coaching Guide

1. How will I set up the teacher earthworm investigation so that all students will be able to see the earthworm investigation and the board for taking notes in their student science notebooks?
2. How can I use some of the following questions to stimulate student thinking about variables?
   - "If we change ... what would happen to ...?"
   - "What do you think will happen if we change ...?"
   - "What do you think will happen if ...?"
   - "Have you considered ...?"
   - "Can you figure out how to ...?"
   - "Does anyone have a different idea?"
3. How can I use the example of the earthworm to explain the importance of testing only one variable at a time? Consider asking questions:
   - "What if I put a drop of vanilla on a dry paper towel on the right-hand side of the plate and the earthworm moved toward it? How many variables would I be testing? If I tested both variables at the same time, would I be able to tell if the earthworm prefers darkness or vanilla? No, I wouldn't. So scientists test only one variable at a time."
4. How can I use the example to make it clear to students that it is important to do more than one trial or test? Consider asking questions like:
   - "Do I know that earthworms, in general, have a preference for vanilla, or do I just know what this earthworm prefers?"
   - "What do we have to do to determine if earthworms in general have a preference for vanilla?"
   - "Do we have to test every earthworm on earth? No, but if we test a few earthworms, would that help us make a decision about whether or not earthworms prefer vanilla? Yes, so let's do that."

C. Planning an Earthworm Investigation (15 minutes)

- Invite students to put their finger on the "Student Investigation" section of the Sensing Structures entry in their student science notebooks. Tell them that now they are going to work with their same partner from Lesson Sequence 3 to design their own investigation using earthworms. Note: Students will conduct these investigations during the next section. There is an intentional break here so that students can gather necessary materials.
- Ask students to take their student science notebooks and move to sit with their partner.
- Tell them they will now work with their partner to determine their question, variable, materials, and procedure for their investigation. They should each record their ideas in their own student science notebook. Emphasize that they must get their plans approved by you before they proceed with the investigation [(1)].
- Circulate to support students as they work with their partners [(2)].
- Approve plans or provide feedback to pairs as necessary. Once a pair's plan has been approved, ask them to help another pair of students who are still working.
- Refocus the whole group. Remind them to gather any necessary materials to conduct their investigation during the next meeting.

Preparing to Teach: Self-Coaching Guide

1. How will I limit students' choice of variables to the materials that are feasible?
2. How will I help students keep track of time?

Section 2: Planning and Carrying Out an Investigation

A. Conducting an Earthworm Investigation (15 minutes)

- Direct students' attention to the posted lesson sequence learning targets and review as necessary.
- Invite students to take their student science notebooks and move to sit with their earthworm partners.
- Remind students to follow their approved procedure in the "Student Investigation" section of their Sensing Structures entry, and to record their observations in the data chart provided.
- Circulate to support students as they conduct their investigations [(1)] [(2)].
- Warn students when they have a few minutes left to complete their investigations and record their observations. Then ask them to return all materials to their proper place and return to their seats. If time permits, they may write a conclusion.

Preparing to Teach: Self-Coaching Guide

1. What can I do to help my students conduct a successful investigation? (Encourage students to see failure as part of the process of science and not necessarily a result of them doing something wrong. Stress the importance of following the procedure to try to get the best results.)

2. If earthworms are not moving, what can I do?
   - — Do not tell students to poke or prod earthworms.
   - — Ask students to experiment with another earthworm.
   - — Tell students to join another group where the earthworm is moving.

Section 3: Developing a Model

A. Developing an Explanatory Model (25 minutes)

- Remind students of the question from the whole class investigation (1):

  "Does an earthworm respond to its environment even though we can't see its sensing structures?"

- Ask students to turn and talk to an elbow partner:

  "How does the evidence you collected during the whole class and partner investigations help you answer this question?" (If students observed an earthworm moving away or toward a stimulus, then they have some evidence.)

- Cold call a few pairs to share out.
- Ask students to turn and talk to an elbow partner:

  "What information are we missing that would help answer this question more completely?" (What structures the earthworm uses.)

- Explain that the class will use some models to explore the internal and external structures that allow the earthworm to respond to its environment.
- Ask students to find the diagram of an earthworm in the Sensing Structures entry of their student science notebooks.
- Post the **earthworm diagram**. Point out the *external* (outside) and *internal* (inside) structures of the earthworm.
- Explain that this diagram helps us identify the structures but not how they work together. There is a flow to the way the earthworm senses the stimuli and the way the worm responds.
- Post the **Sensory Structures flow chart** and ask students to find it in the Sensing Structures entry in their notebook and put their finger on it.
- Using **Sensory Structures Flow Chart: Earthworm Model (for teacher reference)** as a guide, explain that the flow chart can illustrate the flow of response as the earthworm sensed a stimulus, interpreted it in the nervous system, and responded by either taking an action or making a memory [(2)].
- Invite students to think of another animal they are familiar with which responds to stimulus, perhaps a pet or a classroom pet. Once they have one in mind, they should give you a "thumbs up."
- Once most students have a thumb up, ask them to turn and talk with their partner about the stimulus, structure, nervous system, response and memory of that animal. Encourage them to use the flow chart in the Sensing Structures entry of their student science notebook.
- Refocus the whole class. Explain that *nerves* are structures inside the body that we can't see. Nerves send messages to the brain. All the structures that are used to sense things in the environment are together called a *nervous system*.

- Break the word *nervous system* into two parts: Focus on the root word *nerve* and then on *system*.
- Ask:

  "Who can remember the definition of system from Lesson Sequence 2?" (A set of different parts that work together to do something the individual parts cannot do.)
- Tell students not only do they want to understand how this system of response works, but they also want to be able to represent it on an earthworm diagram. When they show how something works, they are creating an explanatory model.
- Turn students' attention to the displayed earthworm diagram. Model drawing arrows on the diagram to match your explanation of how messages are sent and received. Ask students to draw these same arrows on their earthworm diagram in their student science notebooks [(3)].
- Explain that the diagram is now an explanatory model because it explains how the sensing structures work together as a system.

Preparing to Teach: Self-Coaching Guide

1. Students may have different answers because the earthworm in their investigation may or may not have responded to the stimulus. How can I support students when they have different results?
2. Fill in each box according to the earthworm's response. (For example, earthworm sensed the vanilla—the stimulus; used bristles to sense the stimulus; the nerves and brain interpreted the message; and finally, a memory was made and/or the earthworm responded and moved toward the vanilla.)
3. How can I draw arrows to the earthworm diagram to show how the parts of the earthworm nervous system work together?

B. Poster Session: Sensing Structures (20 minutes)

- Tell students they are going to use the Poster Session protocol to study pictures of two different animals responding to their environment and to consider how to represent their response using a flow chart. Remind them that they used this protocol in the Language Arts module. Review as necessary. Refer to the Classroom Protocols pack on Curriculum.ELeducation.org for the full version of the protocol.
- Direct students' attention to the **Poster Session images** posted around the room.
- Tell the students they will silently visit two different posters. At each poster, they will use the flow charts found in their student science notebooks under "Poster Session: Animal #1" and "Poster Session: Animal #2" to name the animal, possible stimulus, the sensing structure of the animal, the message of the nervous system, and the response including the memory the animal could have made.
- Arrange students into triads and assign the poster at which each triad will begin [(1)].
- Ask students to take their student science notebooks and move to their first poster.
- Circulate to support students as they look at the posters and record their observations.
- After 5 minutes, warn students that they have 1 more minute at this poster. Signal them to move quietly and efficiently to their next assigned poster.

- Circulate to support students as they look at the posters and record their observations.
- After 5 minutes, warn students that they have 1 more minute at this poster.
- Invite them to find a classmate who visited a poster that they did not and share their flow charts.
- After 5 minutes, direct students to return to their seats.

Preparing to Teach: Self-Coaching Guide

1. How will I direct students to the posters and transition them between posters?

Section 3: Evaluating and Communicating Information

A. Revisiting Anchor Chart (15 minutes)

- Direct students' attention to the posted **Concepts Scientists Think About anchor chart**.
- Tell students they have been really thinking like scientists as they have been learning about and looking for systems.
- Using a total participation technique, invite responses from the group:

  "Can you name the different parts of the nervous system that work together, and give an example from the animals you saw in the Poster Session?" (The sensing structure senses the stimulus, the nerves and brain send the message, the other parts of the body respond by running away or looking, etc.)

- Add "nervous system" to the Concepts Scientists Think About anchor chart under "Systems."
- Invite students to turn their attention to class **Animal Structures and Functions anchor chart** and to turn to the **Animal Structures and Functions anchor chart entry** in their student science notebook.
- Ask:

  "What sensing structures and functions should we consider adding to our Animal Structures and Functions anchor chart?" (Responses will vary. Record all valid answers on the anchor chart and refer to the supporting materials for possible responses.)

- Probe students to think about what ecosystems they would find animals with those structures and why. For example, if an animal lives in a place that is very hot, it might be nocturnal. In that case, the animal may need large eyes, like a raccoon's.
- Remind students that for the performance task they will be creating a fictional but realistic animal that would survive well in a given ecosystem.
- Ask them to silently consider:
  - "What types of sensing structures would your animal need to respond to the stimulus in your assigned ecosystem?"
- Advise students to write down a list on the Animal Structures and Functions anchor chart in their notebook of possible sensing structures that would make sense for the animal they are designing for the performance task. Remind students that they should choose only those structures that would be realistic for their animal, so they must consider where it lives.

Consider saying: "If I am assigned to the tundra, I know there are a lot of wide-open places, so I may have my animal have big ears to hear with. The large ears would also be able to point in lots of directions so it could hear everything around it." (1) (2)

- Congratulate students on the way they are thinking about structures and functions. They are gathering a lot of good information for their animals.

Preparing to Teach: Self-Coaching Guide

1. Would students benefit from discussing their ideas with a partner before they write the list? Or perhaps they could write the list, discuss, and then write some more?
2. Would some students benefit from more direct instruction ("List three possible structures")?

Notes