Grade 4: Life Science Module

Lesson Sequence 8: Grass: Structured for Survival

Lesson Sequence 8: Grass: Structured for Survival

Overview

Total Time: 2.5 hours of instruction (divided into three sections)

NOTE: Allow one week for observation (described in Section 2) between Section 1 and Section 3.

In this lesson sequence, students continue to study the specialized structures in plants. Through an investigation, they observe that specialized structures affect the survival of an organism—in this case, the grass and radish plants. Students design an investigation to compare what happens to grass and radish plants under environmental pressures that commonly occur in grassland habitats. They observe their experiment every few days over a period of seven days (During the observation time, students may move on to Lesson Sequence 9). At the conclusion of the investigation, students observe the cause and effect relationship between environmental pressures and the grass and radish plants' survival. Students then read an article to gather additional evidence for their final step of evaluating the argument that grass has specialized structures that allow it to survive under the pressures of drought, trampling, and grazing.

Lesson Sequence Focusing Question and Big Ideas

What specialized structures allow grasses to survive environmental pressures such as drought, trampling, and grazing?

- Grasses have thin, flexible leaves that allow them to not lose as much water during a drought, and when trampled the grass blade can withstand more trauma than other plants.
- The roots of grasses are also specialized for drought scenarios, as they are close to the surface so that when there is a small amount of rainfall the grass plant can consume as much water as possible.
- Grasses are able to withstand trampling and grazing because they have a lower growth tip than many other plants. This means grasses grow from the bottom up rather than just out from the top

Long-Term Learning Addressed (Based on NGSS)

Use data to support the argument that grass is well adapted to survive environmental pressures such as drought, trampling, or grazing because of its specialized structures. (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 are given the claim that grass will survive better than radish plants under certain conditions. They gather evidence for the argument by conducting an experiment and reading an article. Students then evaluate whether or not their evidence is strong enough to support the claim.*
- **Planning and Carrying Out Investigations:** 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 and carry out an experiment to recreate common environmental pressures on grass and radish plants. Note: This Science and Engineering Practice is not explicitly aligned with 4-LS1-1.*

Crosscutting Concepts:

- **Structure and Function:** The way in which a living thing is shaped and its substructures determine its properties and function. *Students observe how two plants (grass and radish) have different specialized structures that function differently under the same conditions. Note: This Crosscutting Concept is not explicitly aligned with 4-LS1-1.*
- **Cause and Effect:** Cause and effect relationships are routinely identified and used to explain change. *Students observe that without having the right structure, a radish plant will die under the same pressures that a grass plant will survive. 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 the structures of grass that support survival under a variety of environmental pressures.*

Lesson Sequence Learning Targets

- I can plan and conduct an investigation to gather evidence about what happens to grass and radish when they experience an environmental pressure.
- I can support an argument, using evidence, that grasses have specialized structures to help them survive after environmental pressures (such as drought, trampling, or grazing.)

Ongoing Assessment

- Scientists Meeting: Building Understanding
- Student science notebook: Grass: Structured for Survival entry

Agenda

Total Time: 2.5 hours of instruction, plus one week for observation.

As part of their investigation, students observe the plants in Section 2 for at least one week before they can move on to Section 3. While students carry out their investigation, they should move on to Lesson Sequence 9.

Section 1

1. **Opening**
   A. Reviewing Learning Targets (10 minutes)
2. **Planning an Investigation**
   A. Scientists Meeting: Planning an Investigation (35 minutes)
   B. Carrying Out an Investigation: Environmental Pressures (15 minutes)

Section 2

1. **Carrying Out an Investigation**
   A. Observing Plants
   (Note: This time is spread out over one week. Times will vary.)

Section 3

1. **Obtaining and Evaluating Information**
   A. Reviewing Learning Targets (10 minutes)
   B. Scientists Meeting: Building Understanding (20 minutes)
   C. Close Reading: "Oceans of Grass" (35 minutes)
2. **Engaging in Argument**
   A. Evaluating Evidence: Grass Structured for Survival (25 minutes)

Teaching Notes

Purpose of lesson sequence and alignment with NGSS standards:

- In this lesson sequence, students deepen their understanding of structure and function (a Crosscutting Concept) by examining the cause and effect relationship (a Crosscutting Concept) between specialized structures and survival.
- In Section 1, students plan and carry out an investigation (a Science and Engineering Practice) to replicate environmental pressures on grass and radish plants.
- In Section 2, which is spread out over one week, students collect data on their investigation.
- In Section 3, students discuss the results of their investigation. Through this investigation and a close reading, students observe the structures, specifically the roots, leaf shape, and low growth tip of grass, that function to enable grass to survive a variety of environmental pressures (a Disciplinary Core Idea and a Crosscutting Concept). Students then evaluate whether or not they have enough evidence to make an argument about the survival of grass (a Science and Engineering Practice).

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

- During the anchoring phenomenon in Lesson Sequence 1, students observed grass growing in a variety of ecosystems. In this lesson sequence, they learn about the structures that help grass grow in a wide variety of locations.
- This lesson sequence further builds students' capacity to plan and carry out investigations, a practice introduced in Lesson Sequence 4, where students designed an original experiment with earthworms. Students will design their own experiment to recreate the environmental pressures of drought, grazing, and trampling on grass and radish plants. Through observation, they will learn and be able to explain with their own evidence that structures can affect survival—a concept they have been studying throughout this Life Science Module.

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 needed for survival. Encourage students to see connections between animal adaptations for survival and plant adaptations for survival.
- Students do a close read in this lesson sequence in order to determine the gist, identify unfamiliar vocabulary words, and consider how grass' structures support survival. Students use

some of the same practices for close reading that they are familiar with from the Language Arts Grade 4 Module 2. The close reading in this lesson sequence provides students the opportunity to practice reading informational texts (CCSS ELA RI.4.1 and RI.4.3).

- The students' argument in Section 3 provide students with an opportunity to practice argument writing (CCSS ELA W.4.1)

Possible student misconceptions:

- Students may think that grass is a "super plant" or a "better plant" because it can survive under harsher conditions than a radish plant. Discourage this type of thinking by focusing on how grass is able to survive these conditions because of specific adaptations. Radish plants have specific adaptations as well to help them survive under different conditions. For example, the radish plants will germinate and initially grow faster than grass; this helps the radish plant establish itself before other plants can crowd it out.

Possible broader connections:

- Connect environmental pressures to students' lives by discussing local or newsworthy floods and droughts.
- Students conducted an investigation in Lesson Sequence 4. If they have developed other authentic investigations at another time in science class, draw on this background knowledge when discussing variables and controls in an experiment.

Areas where students may need additional support:

- For students who required additional support designing the earthworm investigation in Lesson Sequence 4, provide them with additional guidance during this lesson sequence, as it anticipates that students now have some familiarity with designing investigations.
- If students are unfamiliar with close reading practices used in Language Arts Grade 4 Module 2, take a few minutes to introduce students to these practices. Consider using similar supports as in Lesson Sequence 7.

Down the road:

- Students will construct an argument as part of the summative assessment in Lesson Sequence 11. Use this lesson sequence as formative assessment and consider how best to prepare students for the summative assessment.
- Students will observe how the radish and grass respond to the pressures every other day for about a week. Be sure to provide at least 10 minutes at least three times a week for them to collect observational data in their student science notebook. Decide when to have these observations take place. Consider filler times such as a morning meeting, after lunch, or at the end of the day.
- Care for the control grass and radish plant samples using the method that is decided upon by the class when planning the investigation. This should include keeping the grass and radish plants in normal light and watering them every few days to maintain moist soil. They should not have any environmental pressures applied to them.
- Students will not be able to create a full explanation about the advantageous structures of grass until Section 3, which happens at least one week after Section 1, when students first make their predictions about grass' survival due to its specialized structures.

- In Lesson Sequence 9, students will dissect lima beans. Soak them overnight before the dissection.
- Following Lesson Sequence 9, students will observe both the environmental pressures experiments from Lesson Sequence 8, and seed observation bags created in Lesson Sequence 9; decide on a regular class time, such as a morning meeting, for students to make observations of both of these experiments. Observations of the environmental pressures experiment and the seed observation bags can alternate days.

In advance:

- Read each section and complete the Preparing to Teach: Self-Coaching Guide.
- Familiarize yourself with the environmental experiment and possible outcomes by reading the Researcher's Notes on Environmental Pressure Experiment (see supporting materials).
- Decide on any constraints for materials students should use for mimicking drought, trampling, and grazing. Consider providing students with examples of materials to use or allowing them to come up with their own method.
- Create intentional groups of three to four students for conducting each of the three experiments. Consider whether you will assign each group the environmental pressure (drought, trampling, grazing) or if you will allow groups to choose from these pressures.
- Post: Lesson sequence learning targets, lesson sequence focusing question, Norms of a Scientists Meeting anchor chart, Life Science Module guiding question, Scientists Do These Things anchor chart, Concepts Scientists Think About anchor chart.

Optional extensions:

- *Additional pressures:* Students can come up with additional environmental pressures, such as cold or freezing. The environmental pressures of drought, trampling, and grazing were chosen because they have clear structures that support survival under these conditions. Other pressures could be experimented with, but be prepared that students will need to conduct additional research about the structures that support the survival of grass under these conditions.
- *Add more plants:* Students compare grass to additional plants besides a radish. Radish was chosen because it is fast and easy to grow and has structures that are different from those of grass.

Vocabulary

drought: when there is no rainfall

trampling: when an animal walks on top of a plant

grazing: when an animal eats a plant

environmental pressure: when the conditions in an environment are hard to live through—for example, extreme temperature changes, lack of water, or strong winds

variable: something that is changed in an experiment

control: the part of an experiment that is not changed, so that the variable can be compared

observation: process of noticing how something looks, feels, smells, and sounds

fact: something that is known to be true

detail: a particular fact or small part of something that adds clarity

Materials

General Materials

- ☑ Researcher's Notes on Environmental Pressure Experiment (for teacher reference)
- ☑ Lesson sequence focusing question (one to display)
- ☑ Student science notebook (from Lesson Sequence 1; one per student)
  - Grass: Structured for Survival entry (page 42 of student science notebook)
- ☑ Norms of a Scientists Meeting anchor chart (begun in Lesson Sequence 1)
- ☑ Life Science Module guiding question (from Lesson Sequence 1; one to display)
- ☑ Photos of grass' response to fire (one set to display)
- ☑ Teacher science notebook (from Lesson Sequence 1; one for teacher use)
- ☑ 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 3)
- ☑ Class data sheet (co-constructed with students; one to display)
- ☑ "Oceans of Grass" (one per student)

Science-Specific Materials (gathered by the teacher)

- ☑ Materials for the environmental pressure experiment (one set per group, plus one set for the control group; used in Section 1)
  - Cup with grass plants
  - Cup with radish plant
  - Graduated cylinder
- ☑ Suggested materials for mimicking environmental pressures (one per group conducting that pressure experiment; used in Section 1)
  - Metal spoon (trampling)
  - Scissors (grazing)

Section 1: Opening

A. Reviewing Learning Targets (10 minutes)

- Direct students' attention to the posted lesson sequence learning targets for this lesson. Tell students that they are going to focus only on the first learning target at this time. Ask a student volunteer to read the learning target aloud while other students follow along, reading silently in their heads:

  — ***"I can plan and conduct an investigation to gather evidence about what happens to grass and radish when they experience an environmental pressure."***

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

  "Let's look at the phrase* environmental pressures. *What does the word* pressure *mean?" (Something stressful; students may note the base word* press*)

  "How can we apply our understanding of* pressure *to the figure out what* environmental pressure *might mean?" (Stressful parts in the environment)

- Give a few examples of environmental pressures, such as freezing, wind, and fire.
- Ask students to turn and talk to an elbow partner:

  "What are some of the environmental pressures in your assigned ecosystem?" (Responses will vary.)

- Remind students that they designed an earthworm investigation in Lesson Sequence 4.
- Using a total participation technique, invite responses from the group:

  "What was helpful to consider when you were designing your earthworm investigation?" (Responses will vary.)

- Consider recording students' thoughts on the whiteboard for reference in the next section.
- Draw students' attention to the posted **lesson sequence focusing question**:

  "What specialized structures allow grasses to survive environmental pressures such as drought, trampling, and grazing?"

- Using a total participation technique, invite responses from the group [1]:

  "What are some of the specialized structures (extension: and functions) of plants that you learned about in the last lesson sequence?"

- Ask students to open their **student science notebooks** to the **Grass: Structured for Survival entry** and find the "Opening" section.
- Invite students to take a few minutes to draw a picture or write down a few words in response to the posted learning targets and focusing question [2].

Preparing to Teach: Self-Coaching Guide

1. What questions can I ask to make sure students articulate both the function and structure of plant parts?
2. This is a good chance to formatively assess student learning. How can I track how students respond? Are there specific students I want to check in with?

Section 1: Planning an Investigation

A. Scientists Meeting: Planning an Investigation (35 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 students' 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 posted **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. Remind them that planning and carrying out an investigation is something scientists do, and it is something that will help them answer the Life Science Module guiding question.
- Place the **materials for the environmental pressure experiment** in the middle of the meeting area.
- Tell students that there are different environmental pressures, such as fire, *drought*, *trampling*, or *grazing* by animals that take place in the ecosystems they have been studying, especially in grasslands. Provide students with definitions of these new vocabulary words as necessary [1].
- Display **photos of grass's response to fire**.
- Ask students to turn and talk with an elbow partner:

  "What do you notice in these photos?"

  "Would a field of other plants look like this after a fire?" (Responses will vary. Do not correct students, but use the responses to gauge student background knowledge.)
- Invite a few pairs to share out. As students share, encourage them to make connections to what they have already learned, specifically that animals have special structures that allow them to survive in specific ecosystems with specific pressures. Similarly, plants have special structures—the structures of grass and radish plants differ, so grass and radish plants may have different advantages.
- Ask students to turn and talk with an elbow partner:

  "What do you think would happen to grass and radish samples under the conditions of drought, trampling, and grazing?" (Responses will vary. Do not correct students, but use responses to gauge student background knowledge.)
- After a few minutes, tell students you would like to take notes about their ideas so everyone can refer to them later. You may also consider recording the meeting for students to listen to at the end of the module.

- Ask pairs to share out; clarify and capture their ideas in the **teacher science notebook**. Push students to provide evidence for their ideas. Consider prompting with questions such as the following:

  "What structures do the grass and radish plants have that will or will not help them survive under these conditions?" (Responses will vary. Do not correct students, but use responses to gauge student background knowledge.)

  "What have you seen, heard, or read that makes you think that?"

  "What experience have you had that supports that idea?"

- Encourage students to listen to and respond to one another's ideas. Consider using or prompting students to use the following questions:

  "What do you mean by ...?"

  "Does anyone else think that? Why?"

  "Does anyone disagree?"

  "Who can add to this idea?"

  "Explain what John said in your own words."

- Ask students to open their student science notebook and put their finger on the "Planning an Investigation" section of the Grass: Structured for Survival entry.
- Call on a volunteer to read the investigative question aloud:
  - "What specialized structures allow grasses to survive environmental pressures such as drought, trampling, and grazing?"
- Invite students to silently consider what kind of investigation would help them answer the investigative question.
- After giving students 2–3 minutes of think time, consider prompting them to share their ideas using questions such as [(2)]:

  "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?"

- Draw students' attention to the "Design Experiments" column on the **Scientists Do These Things anchor chart**.
- Cold call a student to read aloud what has already been added to this chart.
- Refer to the animal earthworm investigation and remind students that it is important to have multiple tests and only one *variable* changed at a time.
- Assure students that the grass and radish samples have already been created with the same type and amount of soil, number of seeds, number of holes in the bottom of the container, etc.
- Tell students that in order to compare the variables, you will grow a sample cup that is not put under environmental pressure. This is called a *control*.
- Add to the anchor chart:
  - "Have a control—the part of an experiment that is not changed so that the variable can be compared."

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

  "What conditions should be kept the same for all the plants?" (Amount of light, temperature, amount of water—except for plants experiencing drought)

- Clarify student ideas as necessary.
- Invite students to return to their seats.

Preparing to Teach: Self-Coaching Guide

1. Grass has a complex relationship with grazing animals. Grass provides the food for the animals, and the animals help fertilize the soil, break up the soil crust, knock down weedy plants, provide natural mulch, create a good seed-to-soil contact for better germination, etc. Grass can withstand mild trampling and grazing of animals or severe trampling for a short time. However, grass cannot survive extended trampling.
2. How can I support my students as they imagine the possibilities in an experiment?

B. Carrying Out an Investigation: Environmental Pressures (15 minutes)

- Arrange students in pre-determined groups, instructing them to take their student science notebooks with them as they move to sit with their Grass and Radish Investigation group [(1)].
- Assign each group an environmental pressure, or allow groups to select.
- Post directions for planning the investigation on the board and read them with students. Emphasize for students that their plan should be clear enough that another group could replicate it. Answer clarifying questions [(2)] [(3)]:
  - 1. Working as a group, identify the procedure your group will follow for your investigation.
  - 2. Record this information in your student science notebook under the "Planning an Investigation" section.
  - 3. Repeats Steps 1 and 2 with the materials your group will need for your investigation.
  - 4. Gather the materials your group will need and bring them to your group's space.
  - 5. Consider and record a prediction of what will happen to the grass and radish plants (color, texture, size) under your environmental pressure and why.
  - 6. Consider and record what specific structures of the grass or radish plant you think will help them survive under your environmental pressure.
  - 7. Conduct and record detailed observations of your grass and radish plants before any pressure is applied.
- Give students time to write the plan for their investigation [(4)].
- Refocus the whole group of students. Discuss the type of data and observations that they will record over the next week. Examples: Will they measure the length of leaves? Will they describe the shape and color of leaves? Will they make general observations of the whole plant?
- Ask students to discuss within their groups:

  "How are you going to organize your data?" (Example: In a table, where you record the date, time, and observation.)

- Invite students to refocus their attention on their grass and radish plants and to apply the pressure to each one according to the procedure they wrote down.
- Invite students to return the grass and radish plants and materials to their proper place.

Preparing to Teach: Self-Coaching Guide

1. Planning and carrying out this investigation will be run like a workshop, and will require some student independence. What experience do my students have with workshop class time?
2. What supports would be helpful? Perhaps a timer and a visible checklist?
3. What materials do I expect my students to use? How can I have those materials available?
4. At what point will I require students to check in with me? With another group?

Section 2: Carrying Out an Investigation

Note: This section will be completed across a seven-day span.

A. Observing Plants (5–10 minutes; times may vary)

- For the next seven days, continue to provide the grass and radish plants under pressure, and the control group with the same amount of sun and water (except for the plants experiencing drought).
- Invite students to take their student science notebooks and move to sit with their Grass and Radish Investigation groups.
- Ask students to open their student science notebooks to the Grass: Structured for Survival entry and find the "Data/Observation" section.
- Model making observations and recording data using the grass and radish control samples.
- Encourage students to make detailed observations (touching, smelling, and looking closely) of the grass and radish plants under pressure, and to record these details in the organized format that was previously decided upon [(1)].
- Provide students with 5–10 minutes to observe and record in their student science notebooks [(2)] [(3)].

Preparing to Teach: Self-Coaching Guide

1. What classroom systems do I have in place that can accommodate observation?
2. With what level of detail are my students making observations?
3. How can I encourage them to be more thorough?

Section 3: Obtaining and Evaluating Information

Note: Begin Section 3 once students' observations from Section 2 are complete (after approximately one week).

A. Reviewing Learning Targets (10 minutes)

- Direct students' attention to the posted lesson sequence learning targets. Tell students that they are going to wrap up their learning on the first learning target and move on to focusing on the second learning target.

- Ask a student volunteer to read the second learning target aloud while other students follow along, reading silently in their heads:
  - ***"I can support an argument, using evidence, that grasses have specialized structures to help them survive after environmental pressures (such as drought, trampling, or grazing)."***
- Remind students that a job of scientists is to participate in scientific arguments. Refer to the Scientists Do These Things anchor chart and read from the definition in the "Engage in Argument" column.
- Tell students that they are preparing to make an argument. They have posed a question:
  - "What specialized structures allow grasses to survive environmental pressures such as drought, trampling, and grazing?"
- Today they will identify the evidence and evaluate whether or not it is sufficient and relevant to make a claim.
- Using a total participation technique, invite responses from the group [1] [2] [3]:

  "What type of evidence could you collect for an argument?" (Observations from an experiment, information from a book)
- Tell students that they have collected observations from an experiment and they need to collect more evidence in order to support the claim and construct an argument, and they will be doing that work in this lesson sequence.

Preparing to Teach: Self-Coaching Guide

1. How can I help my students reflect on the level of detail of their observation?
2. Are there any outliers or data that may confuse my students? How can I encourage my students to look for broad patterns across the data?
3. How can I help my students see the cause of the discrepancies in the data?

B. Scientists Meeting: Building Understanding (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 students' 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 posted 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 they have already discussed the internal and external structures of animals in Scientists Meeting. The goal of this meeting is to build their understanding of the structure and function of plants.
- Point out that they have observed a plant surviving well and another plant surviving not as well. They have mimicked some of the conditions of a grassland ecosystem.

- Explain that they will interpret and analyze the data they have collected in order to understand the cause and effect between structures and survival.
- Draw students' attention to the "Cause and Effect" column on the **Concepts Scientists Think About anchor chart**.
- Tell students that when scientists think about cause and effect, they "identify and test relationships in order to explain change." Add this definition to the "Cause and Effect" column.
- Ask students to turn and talk with an elbow partner:

  "What have you been doing in the Life Science Module that is an example of this way of thinking?" (Experimenting to test the effect of environmental pressures on grass and radish plants' ability to survive)
- Add this example to the "Cause and Effect" column on the Concepts Scientists Think About anchor chart.
- Give students specific positive feedback on their careful and persistent efforts with data. Tell them that analyzing the data will help them see the cause and effect and begin to answer their investigative question.
- Invite a few groups to share their data on how the grass and radish plants responded to each of the environmental pressures. Record the information on a **class data sheet** so it will be visible to everyone [(1)].
- Consider asking clarifying and probing questions about the data:

  "How much?"

  "How many?"

  "Was there anything surprising in the data?"
- Avoid "show and tell" of data. Be purposeful when choosing groups to share out. Call on groups that will help the whole class see the specific structures that supported or hindered survival.
- After you have collected the data on the class data sheet, ask students to evaluate the data they collected by asking questions such as [(2)]:

  "Why might there be some inconsistencies in the data?"

  "Did we collect enough data?"
- Then, consider asking questions such as the following to help students analyze and compare data sets to see cause and effect. Provide sentence frames to support student thinking as necessary [(3)]:

  "What do you think caused the plant to respond that way?" (This structure caused the plant to respond by ...)

  "Why do you think that pressure has that type of effect on the plant?" (This pressure affects the structure by ...)
- Ask students to turn and talk to an elbow partner. Provide sentence frames to support student thinking as necessary:

  "How might you summarize the cause and effect relationship that you observed in the 'Data Analysis' section of the Grass: Structured for Survival Entry of your science notebook?"

  - "The cause of _____ (environmental pressure) has the effect on grass of _____."

- "The cause of _____ (environmental pressure) has the effect on the radish plant of _____."

- Ask a student to read the investigation question from their student science notebook:
  - What specialized structures allow grasses to survive environmental pressures such as drought, trampling, and grazing?
- Tell students that they have gathered excellent evidence, but now they must consider whether or not they have enough strong evidence. They have evidence that something happened to the plants, but they need more evidence about *why* or what specialized structures allow the grass to survive.
- Consider asking students questions to help them evaluate if they need more data:

  "What are some of the structures that are different on grass and radish plants? How are they different?" (Leaf shape, stem height, roots, etc.).

  "What further information or evidence do you need?" (Responses will vary. Students need more information on the specialized structures of grass.)
- As students share out, capture their thinking in the teacher science notebook [4].
- Invite students to return to their seats.

Preparing to Teach: Self-Coaching Guide

1. Which student groups should I have share out? How would their data help reinforce that there is a cause and effect relationship between structures and survival?
2. What lessons can I teach from data that does not support the cause and effect relationship? (The importance of multiple trials, and looking for broad patterns in data)
3. Students should notice that something different happened to the grass and radish plant during the investigation. If students observe the control, they should notice that grass and radish plants have different specialized structures (leaf shape, stem height, roots, etc.). How can I help my students see the differences between the radish and the grass plants?
4. How can I invite more students into the conversation?

C. Close Reading: "Oceans of Grass" (35 minutes)

- Refocus the whole group of students. Tell them they will now continue to think about the evidence they will use to construct an argument for the following question:
  - What specialized structures allow grasses to survive environmental pressures such as drought, trampling, and grazing?
- Tell students that they may remember from the Language Arts module that a strong argument should have evidence from multiple sources. Right now, they are going to read from one such source and look for more information about the specialized structures.
- Distribute **"Oceans of Grass."**
- Remind students that, just as in Language Arts Grade 4 Module 2, close reading often requires readers to read a text multiple times. Generally, each read is for a different purpose. For example, the first read is generally to get the gist or an idea of what the text is about and to identify unfamiliar vocabulary. Then, additional reads are done to glean details and a better understanding of what the text is saying explicitly and implicitly [1].

- Remind students of some of the close reading routines they use in their Language Arts lessons:
  - Read small chunks of the text slowly and think about the gist.
  - Talk with my partner or group about the text.
  - Circle or underline words I don't know.
  - Write notes or answer questions about the text.
- Ask students to open their student science notebooks to the Grass: Structured for Survival entry and put their finger on the "Obtaining Information" section.
- Let students know they are going to have the opportunity to independently read "Oceans of Grass." Tell them to stop after each paragraph during this first read and jot down the gist of that paragraph and any unfamiliar vocabulary in their text. Review and model finding the gist as necessary.
- Ask students to begin reading. Circulate and support them as they read and determine the gist.
- After 10 minutes, ask students to turn and talk to an elbow partner:

  "What gist notes or vocabulary words did you write down? What similarities and differences are there between our notes?"
- After 5 minutes, refocus the whole class. Point out to students that their job is to learn everything they can about grass' structures that support survival. Explain that they should gather *facts*, *definitions*, and *details* about the structures of grass. Clarify these terms as needed.
- Tell students they are going to read the text again. This time, they should read closely for details to add to the Specialized Structures of Grass graphic organizer.
- Consider doing a brief guided practice, as necessary.
- Ask students to begin reading. Circulate and support students as they read.
- After 10 minutes, invite students to Think-Pair-Share [(2)]:

  "What is one structure of grass you read about that supports survival?" (Low growth tip, bendable stem, deep roots, narrow leaves that don't lose water)
- Give students 5 minutes to add information to the grass explanatory model in the **Plant Structures Are a System entry**.

Preparing to Teach: Self-Coaching Guide

1. How can I support my readers who need additional support? Perhaps there is a small group I should work with at this time? Would a few students benefit from having an outline of the text?
2. An important structure I want to highlight for the class is the "low growth tip." That is articulated in the text with the sentence "Grasses grow from the bottom upward, not out from the top like a tree." If students do not mention this, how will I draw their attention to it?

Section 3: Engaging in Argument

A. Evaluating Evidence: Grass Structured for Survival (25 minutes)

- Point students to the Scientists Do These Things anchor chart, "Engage in Argument" column.
- Ask:

  "What part of constructing an argument has the class been working on?" (Preparing for the argument: pose the question, identify evidence, evaluate evidence)
- Tell students they will focus on evaluating their evidence and deciding whether or not they have enough strong evidence to make a claim. This is an important part of the argument process.
- Cold call a student to read the question for which the class has been gathering evidence:
  - What specialized structures allow grasses to survive environmental pressures such as drought, trampling, and grazing?
- Tell students they are going to evaluate the evidence they have to make a claim about this question using the Back-to-Back and Face-to-Face protocol.
- Have students find a partner and stand back-to-back with each other, being respectful of space.
- Ask students the following question and give them 30 seconds to consider how they will respond:

  "What evidence did the class collect in the environmental pressure investigation to help answer this question, and is this sufficient evidence?" (Responses will vary, but students should cite data tables about the survival of radish plants and grass plants.)
- Invite students to turn face-to-face to share their responses.
- Have students repeat the steps with a new partner for other questions or statements.

  "What parts of the question can be answered by the data collected by the experiment?" (The second half of the question; grass can survive drought, trampling, and grazing)

  "What evidence did the class gather by looking at the difference between radish and grass plants? Is this sufficient evidence?"

  "What evidence did the class collect from the 'Oceans of Grass' text? Is this sufficient evidence?" (The names and functions of specific grass structures such as the low growth tip, the roots, and the leaves)

  "What do you specifically know about the structures that helps you understand why grass survived the environmental pressure investigation?"

  "What other evidence could make your argument stronger?" (Responses will vary. Students do not yet have sufficient evidence about the specialized structures that allow grass to survive trampling, for example.)
- Ask students to return to their seats.
- Ask students to open their student science notebooks to the Grass: Structured for Survival entry and find the "Conclusion: Evaluating Evidence" section.

- Ask students to decide if they are ready to make a claim and write it down in their notebook. If they are ready, they should write a claim and make note of the evidence and reasoning. If they are not ready, they should identify the evidence they do have and explain what evidence they are missing [1].
- After a few minutes, ask one student who feels prepared to make a claim to explain his or her reasoning.
- Clarify the student's thinking with questions such as:

  "Why do you think ...?"

  "What is your reason ...?"

  "What is your evidence for saying that ...?"
- Then ask a student who does not think he or she is ready to make a claim to explain his or her thinking.
- If conflicting information arises, help students challenge one another's ideas respectfully. Consider asking questions such as [2]:

  "Why do you think you have different conclusions?"

  "What in John's argument do you disagree with?"

  "What evidence do you have?"

  "What points do you agree on?"
- Assure students that this is a complex argument and one could make several claims. Congratulate them on looking at evidence so closely. Evaluating evidence is an important part of making an argument.

Preparing to Teach: Self-Coaching Guide

1. The focus of this exercise is evaluating evidence. How can I further reinforce my students' understanding of this important part of the argument process?
2. What sentence stem may be helpful for my students as they politely disagree?