Grade 3: Life Science Module: Unit 1

Lesson Sequence 2: Variation among Siblings

Lesson Sequence 2: Variation among Siblings

Overview

Total Time: 1.5 hours of instruction (divided into two sections)

In Lesson Sequence 2, students investigate why plants and animals look the way they do by exploring the question: "What patterns of variation are there among siblings?" The focus of this lesson sequence is on noticing the pattern of variation rather than explaining why variation occurs. Through close observation and data collection, students note that siblings look similar to and different from one another and their parents.

Lesson Sequence Focusing Question and Big Idea

What patterns of variation are there among siblings?

- There is a pattern in all organisms in which siblings look similar to one another but not exactly the same.

Long-Term Learning Addressed (Based on NGSS)

Use logical reasoning to make sense of the phenomenon that the traits of offspring will vary among siblings—for example, animals with the same parents may have different-colored fur. (Based on NGSS 3-LS3-1)

This lesson sequence explicitly addresses:

Science and Engineering Practices:

- **Analyzing and Interpreting Data:** Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. *Students collect and analyze data on flowers to logically understand that there is variation among sibling organisms, including plants.*

Crosscutting Concepts:

- **Patterns:** Patterns can be used as evidence to support an explanation. *Students use the pattern that they identify in their data to support the explanation that family members look similar to one another, but not the same.*

Disciplinary Core Ideas:

- **LS3.B Variation of Traits:** Different organisms vary in how they look and function because they have different inherited information. *Students see that sibling organisms look different from and yet similar to each other. In Lesson Sequence 4, students learn that this difference and similarity in appearance is because organisms have inherited both similar and different traits from their parents.*

Lesson Sequence Learning Targets

- I can observe and analyze patterns of variation among siblings.
- I can analyze data about traits in siblings and identify patterns of similarities and differences.

Ongoing Assessment

- Student science notebook: Variation among Siblings entry
- Scientists Meeting: Building Understanding

Agenda

Total Time: 1.5 hours of instruction

Section 1

1. **Opening**
   A. Reviewing Learning Targets and Focusing Question (10 minutes)
2. **Analyzing and Interpreting Data**
   A. Identifying Patterns in Animals' Traits (15 minutes)
   B. Poster Session: Frog Siblings (15 minutes)

Section 2

1. **Analyzing and Interpreting Data**
   A. Identifying Patterns in Plants' Traits (25 minutes)
2. **Constructing Explanations**
   A. Scientists Meeting: Building Understanding (25 minutes)

Teaching Notes

Purpose of lesson sequence and alignment with NGSS standards:

- In this lesson sequence, students build background knowledge on the variation of traits (a Disciplinary Core Idea).
- In Section 1, students identify patterns (a Crosscutting Concept) in the variation of animal siblings. They begin by observing human families and siblings and move on to familiar animals like dogs and birds. They note that animal siblings have similarities and differences. They then look for this pattern in frog siblings through a Poster Session.
- In Section 2, students apply this pattern of variation to plants and collect data to support the idea that plant siblings also have similarities and differences in how they look. Finally, students create an explanation with evidence that the variation among siblings follows a pattern.
- In this lesson sequence, students begin two anchor charts that they will use throughout the Life Science module. The Concepts Scientists Think About anchor chart captures student learning about the Crosscutting Concepts explicitly addressed in the Life Science Module, and the Scientists Do These Things anchor chart captures student learning about the Science and Engineering Practices explicitly addressed in the Life Science Module.

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

- In Lesson Sequence 1, students noticed patterns of difference among organisms of the same species and were introduced to pictures that depicted human families and showed similarity in traits yet also many differences. In this lesson sequence, students focus on the similarities and differences among siblings. They will use this learning about variation in

traits throughout the Life Science Module and especially in Unit 2, where they will learn how these differences could provide an advantage.

How it connects to the CCSS Standards and EL Education's Language Arts Grade 3 Module 2:

- Students use the Poster Session protocol in Language Arts Grade 3 Module 2.
- The Poster Session and Identifying Patterns in Plants' Traits provide students with an opportunity to collect and sort evidence (CCSS ELA W.3.8).
- The student explanations in Section 2 provide students with the opportunity to practice their informative writing skills (CCSS ELA W.3.2).
- The Scientists Meeting in Section 2 provides students with the opportunity to practice their speaking and listening skills while collaborating in whole group discussions (CCSS ELA SL.3.1).

Possible student misconceptions:

- Students often do not realize that humans are considered animals. Discuss what makes an animal an animal and that humans have these same characteristics. Animals are made up of many cells (unlike bacteria) and they digest food (unlike plants).
- Not all students have experience with biological family structure (both biological mother and father in the household) and, often, students believe that traits are received only from one family member—that female children receive traits from the mother and male children receive traits from the father. When looking at the family slideshow picture of mom and child and/or dad and child pictures, ask: "Could the offspring get traits from something or someone besides the mother?"

Possible broader connections:

- Connect to students' lives by including pictures of students' families, as well as your own.
- The images of families provided in the Families pass-around cards are only some of the possible images you could use. Consider providing additional images as appropriate for your context. Be sure the images show diversity, as well as similarities and differences in traits.
- Connect to other sciences by focusing on other patterns found around us. Examples: the pattern of seasons, day/night, the moon's phases and how that relates to the patterns of student lives, like when they go to school, wake up, eat, etc.

Areas where students may need additional support:

- Continue to support students in effectively using their science notebooks. Refer to the Grade 3 Life Science Module Overview for additional information.
- For students who need additional support organizing their ideas in conversation, provide discussion questions from the Scientists Meeting in advance and provide ample processing time.

Down the road:

- In this lesson sequence, students only notice the pattern of similarities and differences of traits in siblings and in the parent/offspring relationship. In Lesson Sequence 4, students will return to this idea and learn that variation is because of inheritance of traits.

- As part of the Unit 1 summative assessment in Lesson Sequence 6, students will note the similarities and differences among sibling frogs. Be sure students understand the pattern of variation: across species, siblings look similar to and different from one another.
- Students will return to the Concepts Scientists Think About anchor chart and the Scientists Do These Things anchor chart throughout the module. The Concepts Scientists Think About anchor chart helps reinforce the Crosscutting Concepts, or core ideas and patterns of thinking, that scientists use. These concepts include thinking about patterns, cause and effect, as well as looking at systems. The Scientists Do These Things anchor chart tracks the Science and Engineering Practices explicitly taught within this module. These practices include designing and using models, analyzing and interpreting data, engaging in argument, and constructing explanations.

In advance:

- Read each section and complete the Preparing to Teach: Self-Coaching Guide.
- If possible, obtain three sibling water lilies grown from seed from the same parent plant (optional). Otherwise, make color copies of the pictures of water lily siblings for each triad (see supporting materials).
- Prepare the Families pass-around cards. You will need at least one card for every two students. You may have repeat cards. Consider printing out photos from the Families pass-around cards in color (see supporting materials).
- Prepare for the Frog Sibling Poster Session by printing out color photos and mounting them to large chart paper and hanging them around the room at students' eye level.
- Determine groupings for the Poster Session protocol. Each group should contain roughly the same number of students, and the number of groups should match the number of posters.
- Review the variation of the Poster Session protocol used in this lesson sequence. In this variation of the protocol, an expert student is optional. Have students rotate to each poster, record their notices and wonders about the photo mounted to the chart paper directly on the chart paper, and then rotate to the next poster. Encourage students to read other students' notices and wonders and respond to these comments in writing as well. (See Classroom Protocols pack on Curriculum.ELeducation.org.)
- Determine triads for Section 2.
- Create the Concepts Scientists Think About anchor chart and Scientists Do These Things anchor chart. See supporting materials.
- Post: Unit 1 guiding question, lesson sequence learning targets, Concepts Scientists Think About anchor chart, Scientists Do These Things anchor chart, Inheritance anchor chart.

Optional extensions:

- N/A

Vocabulary

siblings: organisms with the same mother and father
pattern: a pattern is a repeated event or object
trait: a characteristic of an organism
female: woman or girl; can bear children or lay eggs; a plant that makes seeds
male: man or boy; cannot bear children or lay eggs; a plant that has pollen
variation: difference between things

Materials

General Materials

- ☑ Concepts Scientists Think About anchor chart (new; teacher-created; added to during Section 1; see supporting materials)
- ☑ Student science notebook (from Lesson Sequence 1; one per student)
  - — Variation among Siblings entry (page 6 of student science notebook)
- ☑ Variation among Siblings class photos (one to display)
- ☑ Families pass-around cards (one per every pair of students; teacher-created; see supporting materials)
- ☑ Frog Sibling Poster Session photos and chart paper (to display)
- ☑ Markers (one per student)
- ☑ Pictures of water lily siblings (optional; one color copy per group and one to display)
- ☑ Scientists Do These Things anchor chart (new; teacher-created; see supporting materials)
- ☑ Norms of a Scientists Meeting anchor chart (begun in Lesson Sequence 1)
- ☑ Unit 1 guiding question (from Lesson Sequence 1; one to display)
- ☑ Inheritance anchor chart (new; co-created with students during Section 2)
- ☑ Inheritance anchor chart (examples, for teacher reference)

Science-Specific Materials (gathered by the teacher)

- ☑ Sibling water lilies (optional; three; used in Section 2)

Section 1: Opening

A. Reviewing Learning Targets and Focusing Question (10 minutes)

- Direct students' attention to the posted lesson sequence learning targets, and read the first one aloud:

  —"I can observe and analyze patterns of variation among siblings."
- Underline the word *sibling* and define as needed.
- Underline the word *pattern* (1).
- Draw students' attention to the **Concepts Scientists Think About anchor chart**, specifically the "Pattern" column.

- Ask:

  "What is a pattern?" (A pattern is a repeated event or object.)

  "How can noticing patterns be helpful to our learning and understanding?" (Noticing a pattern helps us understand similarities and differences and allows us to make predictions about other things that might be similar but are difficult to observe.)

  "Based on the lesson sequence learning target, what patterns are we going to be looking at?" (a pattern in how siblings look)

- Add the definition of *pattern* to the Concepts Scientists Think About anchor chart.
  - "A repeated event or object. Finding patterns help us see similarities and differences and make predictions."
- Ask students to retrieve and open their **student science notebook** to the **Variation among Siblings entry**. Invite them to jot down their own ideas about the focusing question under this entry.

Preparing to Teach: Self-Coaching Guide

1. What experience do my students have with identifying or creating patterns? How could I leverage that experience?

Section 1: Analyzing and Interpreting Data

A. Identifying Patterns in Animals' Traits (15 minutes)

- Explain to students that they are going to record information in their student science notebook in the "Analyzing and Interpreting Data" section. Draw students' attention to the Identifying Patterns in Animals T-chart in this section [(1)].
- Tell students they are going to view some pictures of families. While they view the slideshow, they should record the similarities and differences among members of each family in the Identifying Patterns in Animals T-chart. As a class, they will look at two pictures together, then they will do look at more pictures with a partner.
- Display the **Variation among Siblings class photos**. As students view each picture, ask them to notice similarities and differences among the members of each family by posing questions such as:

  (For the human family picture) "How are children in the same family similar? How are they different?" (Responses will vary, but may include: noticing similarities and differences in skin color, hair color, and face shape.)

  (For the animal family picture) "Why do you think these puppies who all have the same mom and dad look different?" (Responses will vary but may include: Some of the puppies have more spots than others because the dad had more spots than the mom.)

- Model recording data of similarities and differences on the Identifying Patterns in Animals T-chart in the student science notebook.
- To get observational data for the chart, ask questions such as [(2)]:

  "What traits do these siblings share?" (similar shape/size of features and coloration)

  "What traits are different?" (coloration and patterns of markings on fur)

- Tell students they will now gather data on more siblings.
- Arrange students into pairs.
- Distribute the **Families pass-around cards**. (Repeat cards are fine.)
- Tell students they will look at each card for about a minute and record the similarities and differences they see. Then they will pass the card along to the next pair.
- After 7 minutes, focus students' attention back on the Concepts Scientists Think About anchor chart, specifically the "Patterns" column.
- Ask [3]:

  "What pattern did you notice about the siblings?" (Siblings in a family have similar traits and different traits.)

  "Was this pattern true for all siblings?" (Yes.)
- Emphasize that the photos helped show similarities and differences in the traits of human families and other animal families. Be sure that students understand that the fact that siblings look similar but not exactly the same is a pattern across all animals, and that this pattern is called *variation* [4].
- Record students' ideas on the Concepts Scientists Think About anchor chart. Example: "Variation in siblings happens in human families as well as other animal families."
- Provide students with time to summarize the observed pattern in their student science notebook in the Identifying Patterns in Animals T-chart.

Preparing to Teach: Self-Coaching Guide

1. Note that students first look at pictures of human families because this is the type of animal they will be most familiar with. Students then move on to looking at pictures of other animals, such as dogs and ducks.
2. After creating and previewing the pass-around cards, what do I think my students will name as differences and similarities?
3. What pattern am I hoping my students will notice? (Siblings that look similar to one another but are not exactly the same are a pattern across all animals, including humans.) This pattern of similar and different traits is called *variation*.
4. What additional examples can I give from my experience or from the experience of my students? (Example: In my family, we are all tall but not exactly the same height. In my family, we all have black hair but my sister's is naturally curly.)

B. Poster Session: Frog Siblings (15 minutes)

- Direct students' attention to the **Frog Sibling Poster Session photos** and **chart paper** that have been posted around the room [1].
- Tell students they are going to use the Poster Session protocol to make close observations about siblings of frogs. Remind them that they used this protocol in the EL ELA Grade 3 Module 2.
- Distribute **markers**.

- Post directions for the protocol on the board and read them with students. Answer clarifying questions:
  1. Move into pre-determined groups.
  2. When I give the signal, quickly and quietly move with your group to your first assigned poster.
  3. (2 minutes) Record notices and wonders on the poster about the picture; respond to the question written on the chart paper.
  4. (30 seconds) When I give the signal, rotate clockwise with your group to the next poster.
  5. (3 minutes) Record notices and wonders on the poster about the picture; respond to the question written on the chart paper; respond to what your classmates have written.
  6. (30 seconds) When I give the signal, rotate clockwise with your group to the next poster.
  7. Repeat until you have visited each poster.
- Invite students to move into their pre-determined groups and begin the protocol.

Preparing to Teach: Self-Coaching Guide

1. How can I help my students move quickly and efficiently throughout the Poster Session?

Section 2: Analyzing and Interpreting Data

A. Identifying Patterns in Plants' Traits (25 minutes)

- Give students specific positive feedback on their ability to notice patterns in their observations and record information about animal families.
- Tell students that they are now going to look at water plants with the same parents to see what traits they share and which they do not.
- Explain that just like animals, plants also have parents. Show students the first **picture of water lily siblings**, and tell students that these water lilies are all part of the same family. (Note: If you have live sibling water lilies you can use them instead of the photos) [1].
- Tell students that they are going to use this picture of sibling water lilies to notice the similarities and differences in the traits of sibling plants.
- Invite students to open their student science notebook to the Variation among Siblings entry and find the section titled "Identifying Patterns in Plants Table."
- Explain to students that they will use this table to organize their observations about each of the water lilies.
- Ask:

  "What will we be able to see once we fill in this data? How does the organization of this table help us see similarities and differences?" (The table is organized by trait, so we'll be able to quickly see patterns of similarity and differences among siblings.)

- Using the first picture of water lily siblings, model how to make close observations about the traits of the water lily and record those observations in the table.
- Answer clarifying questions.
- Move students into pre-determined triads, reminding them to take their student science notebooks with them.
- Display the second picture of water lily siblings.
- Invite students to work with their partners to make their observations and record their data.
- After 10 minutes, facilitate a discussion of what is the same about all of the water lilies and what is different.
- Ask questions such as:

  "What traits do these sibling plants share?" (similar coloration and shape)

  "What traits are different?" (differences in height of plant and size of petals)

  "If there were another sibling water lily, what do you think it might look like?" (It would have traits that were similar to those of its siblings, but it wouldn't look exactly the same as any of them.)

  "What do you think the parents of these water lilies may have looked like?" (Responses will vary but should include: traits found in at least one of each of the sibling – i.e., offspring – water lilies.)
- Refocus whole group and direct students' attention to the **Scientists Do These Things anchor chart**, specifically the "Analyzing and Interpreting Data" column.
- Call on a volunteer to read the definition of Analyzing and Interpreting Data [(2) (3)]:

  1. Organize data in tables and/or graphs.

  2. Look at the table/graph to see patterns and relationships.
- Invite students to turn and talk:

  "How did you work like a scientist in your triads today?" (Our lily observations are organized into a table. Organizing the data helped us identify the pattern of variation among siblings.)
- Record this example in the "Analyzing and Interpreting Data" column on the Scientists Do These Things anchor chart.
- Tell students that as they make close observations and collect data throughout this module, they will be doing the work of scientists.

Preparing to Teach: Self-Coaching Guide

1. The differences among the flowers are nuanced. How can I support my students in seeing the subtle differences?

Note: The water lily plants may or may not come from the same seed. Because it is impossible to know from this photo, assume they are sibling plants.

2. What experience do my students have with tables and charts?

3. What experience do my students have with data collection?

Section 2: Constructing Explanations

A. Scientists Meeting: Building Understanding (25 minutes)

- Ask students to bring their science notebooks and gather for a Scientists Meeting [1].
- Gather students to a whole group area on the floor.
- Direct students' attention to the **Norms of a Scientists Meeting anchor chart**. Using a total participation technique, invite responses from the group:

  "What are the norms of a Scientists Meeting?" (take turns talking, build on one another's ideas, disagree respectfully, ask questions to clarify information)
- Remind students that a Scientists Meeting is a conversation where they speak to one another as scientists and not just to the teacher [2].
- Tell students the goal of this meeting is to build understanding about patterns in variation among siblings [3].
- Direct students' attention to the posted **Unit 1 guiding question** and read it aloud:

  — "Why does an organism look the way it does, and why does it matter?"
- Invite students to open their science notebooks to the Variation among Siblings entry and find the "Constructing Explanations" section.
- Ask:

  "What pattern did you observe today about organisms within the same family?" (Organisms look similar to yet different from their siblings.)

  "What evidence do you have to support this pattern?" (the frog Poster Session and the water lily data table)

  "How does noticing this pattern of variation among siblings help you answer the unit guiding question?" (Animals in the same species are going to look similar yet different.)
- Encourage students to listen to and respond to one another's ideas. Consider using or prompting students to use the following:

  "Can someone paraphrase what Student A said?"

  "Who thinks something similar to Student A?

  "Who thinks something different from Student A?"

  "Can you add to what Student A said?"
- Remind students to use the information and data in their student science notebooks as evidence as necessary.
- Ask:

  "What data did you record that supports that idea?" (specific data about the traits of the water lilies)
- If conflicting information arises, help students challenge one another's ideas respectfully:

  "Why do you think you have different conclusions from Student A?"

  "With what in Student A's argument do you disagree? On what points do you agree? What evidence do you have to support those ideas?"

- After 10 minutes, help students synthesize their thinking and record broad takeaways on the **Inheritance anchor chart**. Responses will vary. Record all valid answers on the anchor chart and refer to the **Inheritance anchor chart (example, for teacher reference)** as necessary.
- At the end of the conversation, direct students' attention to the Norms of a Scientists Meeting anchor chart. Briefly discuss how well the class kept the norms of the Scientists Meeting. Congratulate students are their ability to keep the norms of the Scientists Meeting. Offer specific feedback to students. (Example: "I saw you building on her ideas when you___). Invite students to turn and talk about the specific norms they kept well today [4].
- Invite students to return to their seats.
- Provide students with time to write their ideas and highlights from the Scientists Meeting in their student science notebook in the "Constructing Explanations" section. Encourage students to include evidence to support their explanation [5] [6].

Preparing to Teach: Self-Coaching Guide

1. How well did my students keep the norms of the Scientists Meeting in Lesson Sequence 1?
2. How can I encourage reluctant participants to join the conversation?
3. I will give my students the definition of *inheritance* in Lesson Sequence 4.
4. How much practice do my students have with self-evaluation? Will they need a more structured way to reflect on how well they kept the norms?
5. My students will be constructing an explanation as part of the summative assessment in Lesson Sequence 6. This can provide baseline data for my students' ability to construct explanations. Depending on my students, they may need more time for this. How much time would I like to give them?
6. How will I collect and use this student work to inform my teaching in subsequent lessons?