

Grade 3: Life Science Module: Unit 1

Lesson Sequence 6: Summative Assessment

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Overview

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

In this lesson sequence, students use their knowledge of inheritance and variation to construct an explanation to answer the guiding question: “Why does an organism look the way it does, and why does it matter?” In the explanation, students explain that offspring inherit traits from a male and a female parent through the process of reproduction, that traits can vary, and that variation of traits can affect survivability. To demonstrate their understanding, students create their own paper bullfrog offspring from two given parents. They then look at how well the bullfrog would survive in a given water-lily scene from a pond.

Unit 2 Guiding Question and Big Ideas

What are necessary parts of a frog habitat, and how do they interact to support the survival of frogs throughout their life cycle? How can we build that (in the schoolyard or in the community or a local park)?

- Frog habitats must meet the needs of food, water, shelter, space, and air for the frog at all stages of its life cycle.
- Frogs have very distinct phases in their life cycle, and each phase has unique needs.
 - A frog’s eggs do not need food, but they do need to be sheltered in a safe place that keeps them wet at all times. This is typically the shallow-water edge of a pond, with leaf litter and twigs to provide protection from possible predators.
 - When frogs are tadpoles, the food that is consumed is algae found along the edge or on the bottom of the pond.
 - When the tadpoles become froglets, their diet includes small insects in the water.
 - As adults, frogs will live on both the shore of the pond as well as throughout the water of the pond. The adult frog consumes insects and minnows—any animal small enough to fit into its mouth.
- Frog ponds can be built by finding a suitable site, making a plan for the shape and depth of the pond as well as what structures and features will meet the needs of the amphibians that will inhabit the pond.

Long-Term Learning Addressed (Based on NGSS)

- Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. (Based on NGSS 3-LS3-1)
- Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. (Based on NGSS 3-LS4-2)

This lesson sequence explicitly addresses:

Science and Engineering Practices:

- **Constructing Explanations:** Use evidence to construct or support an explanation. *Students use evidence from previous lessons and results from the bullfrog lily pad activity in this lesson sequence to support their explanation about the relationship between inheritance, variation of traits, and survivability.*
- **Analyzing and Interpreting Data:** Represent data in tables to reveal patterns that indicate relationships. *Students collect data about their paper bullfrog creation to identify the pattern of inheritance and variation of traits.*

Crosscutting Concepts:

- **Cause and Effect:** Cause and effect relationships are routinely identified and tested to explain change. Students identify the cause and effect relationship between variation and survival by making a prediction about which constructed bullfrogs will survive in a *given habitat based on their ability to camouflage.*

Disciplinary Core Ideas:

- **LS3.A Inheritance of Traits:** Many characteristics of organisms are inherited from their parents. *Students identify and explain the similarities in traits between bullfrog parents and offspring and between a group of similar organisms (the paper bullfrogs).*
- **LS3.B Variation of Traits:** Different organisms vary in how they look and function because they have different inherited information. *Students identify and explain the pattern of variation of traits between parents and offspring).*
- **LS4.B Natural Selection:** Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. *Students predict their paper bullfrog's ability to camouflage or survivability.*

**Lesson Sequence Learning Targets**

- I can explain why an organism looks the way it does and why it matters.
- I can create a frog following the patterns of inheritance and variation of traits.
- I can create high-quality work.

Ongoing Assessment

- Paper bullfrog offspring
- Explanation on Inheritance, Variation, and Survivability

Agenda

Total Time: 2 hours of instruction

Section 1

1. Opening

- A. Reviewing Learning Targets and Guiding Question (5 minutes)

2. Analyzing and Interpreting Data

- A. Creating a Paper Bullfrog (25 minutes)
 - *Optional extension: Why My Frog Looks the Way it Does*
- B. Identifying Variation in Bullfrog Siblings (10 minutes)

3. Constructing Explanations

- A. Constructing an Explanation: Noticing Patterns of Inheritance and Variation (35 minutes)

Section 2

1. Constructing an Explanation

- A. Testing Bullfrogs in the Lily Pads (10 minutes)
- B. Constructing an Explanation: Cause and Effect of Traits (35 minutes)

Teaching Notes

Purpose of lesson sequence and alignment with NGSS standards:

- In this lesson sequence, students complete the summative assessment by answering the Unit 1 guiding question: “Why does an organism look the way it does, and why does it matter?”
- In Section 1, students look at two frog parents and create a paper frog offspring. They follow the rules of inheritance (a Disciplinary Core Idea) and construct an explanation (a Science and Engineering Practice) for why their frog looks the way it does and why it looks different from its siblings.
- In Section 2, students predict the cause and effect (a Crosscutting Concept) of their paper frog’s traits and explain how well the frog would survive in a pond.

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

- This lesson sequence is the culmination of learning about inheritance and variation of traits. Students will use the pattern of inheritance gained in Lesson Sequence 4 and the pattern of variation gained in Lesson Sequences 2 and 5 to create a paper frog offspring and an explanation predicting its survival.

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

- The student explanations in Section 1 and Section 2 are an opportunity for students to write informatively (CCSS ELA W.3.2.).

Possible student misconceptions:

- N/A

Possible broader connections:

- Connect to students’ lives by exploring the concepts of inheritance, variation of traits, and survivability in other species, such as their pets or animals at the zoo or animals common to local environments.

Areas where students may need additional support:

- Students who need additional support with writing tasks may benefit from supports such as sentences starters, differentiated graphic organizers, or technology to help them construct an explanation about inheritance, variation of traits, and survivability.

Down the road:

- This lesson sequence marks the end of Unit 1. Unit 2 will focus on how the traits that organisms inherit are influenced by the environment.
- In Unit 2, Lesson Sequence 1, an extension suggested is to visit a local pond. Prepare field-work materials as necessary.

In advance:

- Read each section and complete the Preparing to Teach: Self-Coaching Guide.
- Select a frog offspring created by a pair of students in Lesson Sequence 4 to serve as an exemplar in Section 1.
- Create a paper frog that does not meet the criteria of the Paper Bullfrog Offspring and Explanation Rubric to accompany the student exemplar used in Section 1 (optional; see supporting materials).
- Create a lily pad scene on large chart paper using the Lily Pad Scene Directions (see supporting materials). It should be large enough so that all students can put their paper frogs on it.
- Print the bullfrog parents photo in color.
- Determine partnerships for Section 1.
- Post: Unit 1 guiding question, lesson sequence learning targets, and Scientists Do These Things anchor chart.

Optional extensions:

- *Why My Frog Looks the Way It Does:* If you are going to display the paper frogs in the hallway or in a formal way, consider having students write a formal explanation for why their frog looks the way it does.

Vocabulary

Do not preview vocabulary for this assessment lesson.

Materials

General Materials

- ✓ Unit 1 guiding question (from Lesson Sequence 1; one to display)
- ✓ Student science notebook (from Lesson Sequence 1; one per student)
 - Traits and Survival entry (page 26 of student science notebook)
- ✓ Bullfrog parent photos (one to display)
- ✓ Paper Bullfrog Offspring Template (one per student)
- ✓ Paper Bullfrog Offspring and Explanation Rubric (one per student)
- ✓ Paper frog student exemplar (from Lesson Sequence 4; one to display)
- ✓ Paper frog non-example (optional; one to display)
- ✓ Scientists Do These Things anchor chart (begun in Lesson Sequence 2)
- ✓ Constructing an Explanation graphic organizer (one per student)
- ✓ Lily Pad Scene Directions (for teacher reference)

Science-Specific Materials (gathered by the teacher)

- ✓ Materials for bullfrog (enough for every student; used in Section 1)
 - Scissors (one per student)
 - Colored pencils (brown, green, yellow, black, purple, orange, and red; seven per student)
- ✓ Lily pad scene (new; teacher-created, used in Section 2)

Section 1: Opening

A. Reviewing Learning Targets and Guiding Question (5 minutes)

- Give students specific positive feedback on all the good work they have done as scientists to learn about why animals look the way they do and why this matters ⁽⁹⁾.
- Tell students that they are going to use all of their learning about traits to create a bullfrog based on a given mother and father bullfrog and explain how it got its traits, why it looks the way it does (both similarities and differences), and how its traits help it survive.
- Direct students' attention to the posted lesson sequence learning targets and **Unit 1 guiding question** and select a volunteer to read them aloud:
 - “I can explain why an organism looks the way it does and why it matters.”
 - “I can create a frog following the patterns of inheritance and variation of traits.”
 - “I can create high-quality work.”
 - “Why does an organism look the way it does, and why does it matter?”
- Invite students to open their **student science notebooks** to the **Traits and Survival entry**.
- Provide students with time to jot down their own ideas about the unit guiding question and learning targets under the “Opening” section of their notebooks.

Preparing to Teach: Self-Coaching Guide

1. How well do my students transition to science time? How can I make the process more efficient?

Section 1: Analyzing and Interpreting Data

A. Creating a Paper Bullfrog (25 minutes)

- Display the **bullfrog parent photos** ⁽¹⁾.
- Ask students to find the Bullfrog Offspring Data table in their student science notebooks.
- Tell students they will now have a few minutes to silently observe the bullfrog parent photos and record the traits of the mother bullfrog and the father bullfrog in the appropriate columns of the table.
- After 3 minutes, tell students to use the data in the table to predict what the bullfrog offspring is going to look like based on their understanding of the pattern of inheriting traits and the similarities and differences of traits between parents and offspring.
- Tell students to record the traits of their offspring bullfrog in the middle column of the table.
- After 5 minutes, distribute the **Paper Bullfrog Offspring Template, scissors, and colored pencils** to students ⁽²⁾.
- Tell students that they will be creating a paper bullfrog based on these two parent bullfrogs and their knowledge of how organisms inherit traits and how those traits can be similar or vary between parents and offspring.
- Distribute **the Paper Bullfrog Offspring and Explanation Rubric**. Review this rubric with students, referring only to the “Paper Bullfrog” and “Quality Work” sections ⁽³⁾.
- Select volunteers to read the definition of “Quality Work” aloud.
 - Drawing is neat
 - Drawing has details
 - Drawing appears realistic
 - Writing is clear
- Tell students that they should use the rubric to guide their thinking and creation of the paper bullfrog and explanation.
- Briefly model how to use the rubric as a guide with the **paper frog student exemplar**. Follow this by modeling with the **paper frog non-example** if available.
- Tell students to use these materials, the Bullfrog Offspring Data table, and the Paper Bullfrog Offspring and Explanation Rubric to cut out and color one paper bullfrog offspring ⁽⁴⁾.
- After 10 minutes, ask students to return the scissors and colored pencils to the appropriate place.

Preparing to Teach: Self-Coaching Guide

1. Perhaps some of my students would benefit from having the pictures of the bullfrog parents at their desk. How can I provide this modification?

2. I must be sure to distribute lots of colored pencils to each student. Each student must receive brown, green, black, and yellow. But they should also be given red, purple, orange, and blue. If any students choose to put blue (or another color that is not in the picture) on their frogs, then I will know they misunderstand inheritance.
3. How familiar are my students with rubrics? Do they need more explanation?
4. Will my students need more time for this activity?

B. Identifying Variation in Bullfrog Siblings (10 minutes)

- Arrange students into pre-determined pairs and tell them to bring their paper bullfrog offspring and student science notebooks.
- Invite students to find the Siblings Venn diagram in their student science notebook under the Traits and Survival entry ⁽¹⁾.
- Tell students that they will compare similarities and differences of the paper bullfrog offspring. Tell students to observe and discuss the similarities and differences they see.
- After a few minutes, direct students to transfer their observation to the Siblings Venn diagram. Model as necessary.
- Tell students to return to their seats.

Preparing to Teach: Self-Coaching Guide

1. How familiar are my students with Venn diagrams?

Section 1: Constructing Explanations

A. Constructing an Explanation: Noticing Patterns of Inheritance and Variation (35 minutes)

- Tell students that they will now create an explanation about their bullfrog offspring to answer the question, “Why does an organism look the way it does?”
- Direct students’ attention to the **Scientists Do These Things anchor chart** and remind them of the steps of constructing an explanation.
- Ask students to retrieve their Paper Bullfrog Offspring and Explanation Rubric.
- Refer to the “Explanation” section and the two bullet points about naming the pattern of inheritance and the pattern of variation. Tell students to use the rubric to help ensure they incorporate all of the pieces of an explanation.
- Distribute the **Constructing an Explanation graphic organizer**.
- Tell students that they will use this graphic organizer to help them organize their explanation, but first they will think about the observations they noted in their student science notebook.
- Walk students through Explanation #1 on the Constructing an Explanation graphic organizer, reading each question aloud and giving students an opportunity to jot down some notes.
- Invite students to open their student science notebooks and identify evidence they have collected from previous lesson sequences. They should use the questions on the graphic organizer to jot down notes.

- After 10 minutes, tell students to use the sentence stems and information from the first part of the graphic organizer (what they’ve learned and data from the lesson) to construct their explanation ⁽¹⁾.
- Collect students’ paper bullfrog offspring, Constructing an Explanation Graphic Organizer, and Paper Bullfrog Offspring and Explanation Rubric.

Preparing to Teach: Self-Coaching Guide

1. Would my students benefit from writing this explanation into a cohesive paragraph?

Section 2: Constructing an Explanation

A. Testing Bullfrogs in the Lily Pads (10 minutes)

- Post the **lily pad scene** (see **Lily Pad Scene Directions** in supporting materials).
- Tell students that you will now put their paper bullfrog offspring to the test to see if it would survive well in this lily pad pond setting.
- Ask students to open up their student science notebooks to the “Bullfrog and Lily Pad Survival” section.
- Place students’ paper bullfrog offspring in various places on the lily pad scene ⁽¹⁾.
- Tell students to record their observations in the “Bullfrog and Lily Pad Survival” section about how well the bullfrogs are camouflaged in the lily pad scene.
- After a few minutes, tell students that a large water snake has come along. Invite them to make a prediction about which bullfrog would be most likely to survive and which one(s) would most likely not survive ⁽²⁾.
- Tell students to record their predictions in their student science notebook.

Preparing to Teach: Self-Coaching Guide

1. Perhaps I should add a number of frogs that are the wrong color to blend into the environment to further demonstrate how camouflage can help with survival.
2. I may want to use a snake prop (like a stuffed snake, or a rubber or paper snake) to demonstrate the snake eating. Perhaps some students could come and up and use the snake to pretend to eat the frog they think is not camouflaged.

B. Constructing an Explanation: Cause and Effect of Traits (35 minutes)

- Tell students that they will now create an explanation about their bullfrog offspring to answer the question, “Why is the way an organism looks important?” ⁽¹⁾
- Ask students to retrieve their paper bullfrog offspring and redistribute the Explanation Rubric.
- Refer to the “Explanation” section, reading the last bullet aloud:
 - Explanation for cause and effect relationship between traits and survival
- Redistribute the Constructing an Explanation graphic organizer.

- Tell students that they will use this graphic organizer to help them organize their explanation, but first they will think about the observations they noted in their student science notebook throughout the unit ⁽²⁾.
- Walk students through Explanation #2 on the Constructing an Explanation graphic organizer, reading each question aloud and giving students an opportunity to jot down some notes.
- Invite students to open their student science notebooks and identify evidence they have collected from previous lesson sequences. They should use the questions on the graphic organizer to jot down notes.
- After 10 minutes, tell students to use the sentence stems and information from the first part of the graphic organizer (what they've learned and data from the lesson) to construct their explanation on the second half of the graphic organizer.
- After 20 minutes, collect students' paper bullfrog offspring, Constructing an Explanation graphic organizer, and Paper Bullfrog Offspring and Explanation Rubric.
- Give students specific positive feedback on their ability to construct explanations. (Example: "You used some clear scientific reasoning as you constructed your explanation.")

Preparing to Teach: Self-Coaching Guide

1. Is there a student model or exemplar I could share from Explanation #1 that students could deconstruct before they write Explanation #2?
2. How much time will my students need for this explanation? Could my students construct this explanation orally instead? (The graphic organizer could scaffold an oral explanation as well.)