

Grade 3: Life Science Module: Unit 2

Lesson Sequence 3: The Pond Is a System

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Overview

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

In this lesson sequence, students study the pond habitat in depth. They closely read an article, “Life in a Pond,” to study the different spaces in a pond and think about how those spaces provide the needs of a frog during its life cycle. Students capture their thinking on a model of a pond.



Lesson Sequence Focusing Question and Big Idea

How does a pond act as a system to support all parts of a frog’s life cycle?

- A pond acts as a system in that its various structures and living things interact to support all phases of a frog’s life cycle by providing the frog the food, water, shelter, space, and air that it needs as an egg, tadpole, froglet, and adult frog.

Long-Term Learning Addressed (Based on NGSS)

Develop a diagram to show how the environment can have differences within it; these differences can be constant or changing; these differences can affect an organism’s life cycle. (Based on NGSS 3-LS4-4)

This sequence of lessons explicitly addresses:

Science and Engineering Practices

- **Developing and Using Models:** Develop and/or use models to describe and/or predict phenomena. *Students create a cross-section diagram (or model) that names the various parts of a pond and how those parts support frogs at various stages of their life cycle. They will add further explanation to the diagram in subsequent lessons. Note: This Science and Engineering Practice is not explicitly linked to 3-LS4-4.*

Crosscutting Concepts

- **Systems and Systems Model:** A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. *Students understand the pond is a system. The various parts of the pond, with their unique features, work together to provide for the amphibians a healthy habitat for all phases of their lives. If the pond did not have all of these various features, the amphibians that live there would not survive.*

Disciplinary Core Ideas

- **LS2.C Ecosystem Dynamics, Functioning, and Resilience:** Populations live in a variety of habitats, and change in those habitats affects the organisms living there. *Students learn about the different components of a pond habitat and understand how each part is necessary for the survival of frogs by meeting different needs throughout a frog’s life cycle. The class also discusses what would happen to a frog if its needs were not met during a particular part of its life cycle.*

- **LS4.D Biodiversity and Humans:** When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, and some die. *Students connect their understanding of pond habitats to the problem of habitat loss.*



Lesson Sequence Learning Target

- I can create a cross-section diagram (or model) that explains how the different parts of a pond meet the survival needs of the frogs that live there.

Ongoing Assessment

- Student science notebook: The Pond Is a System entry
 - Communicating Information section: Pond Cross-Section Diagram
- Scientists Meeting: Building Understanding

Agenda

Total Time: 2 hours of instruction

Section 1

1. **Opening**
 - A. Reviewing Focusing Question and Learning Target (15 minutes)
2. **Obtaining Information**
 - A. Reading Aloud: “Life in a Pond” (10 minutes)
 - B. Close Reading: “Life in a Pond” (25 minutes)

Section 2

1. **Communicating Information**
 - A. Creating a Pond Cross-Section Diagram (20 minutes)
2. **Obtaining Information**
 - A. Third Read of “Life in a Pond” (20 minutes)
 - B. Revising a Pond Cross-Section Diagram (10 minutes)

Section 3

3. **Evaluating Information**
 - A. Scientists Meeting: Building Understanding (20 minutes)

Teaching Notes

Purpose of lesson sequence and alignment with NGSS standards:

- In this lesson sequence, students build their understanding of how a habitat provides for the needs of an organism and if that habitat changes and no longer meets the needs of the organism living there, the organism will not continue to survive (a Disciplinary Core Idea).

- In Section 1, students build background knowledge about the interworking parts of the pond and learn how they work together as a system (a Crosscutting Concept). Students also begin a model (a Science and Engineering Practice) of the pond. The model is a cross-section diagram, and it becomes an explanatory model as students revise it throughout the lesson sequence.
- In Section 2, students review the life cycle and identify the needs of the frog in each phase of the life cycle. They think about how a pond can meet these needs and add their thinking to the pond model. Finally, students synthesize their learning and discuss how the parts of the pond form a system and the consequences on the life cycle of a frog if one part is removed.

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

- In Lesson Sequence 1, students were introduced to the concept of habitats through the lens of a pond habitat. In Lesson Sequence 2, students learned about the cause and effect relationship between an organism and its environment. Now, they zoom in from the broader level of the environment to a narrower focus on the habitat of a frog.
- In Lesson Sequence 1, students were introduced to the idea of habitat loss; this idea is built upon with more of a focus on how a changing habitat affects the lives of organisms living in that habitat. In Lesson Sequence 2, students began to think about what a habitat provides for the organisms that live there. This idea of meeting needs continues to be built upon in this lesson sequence as well as the next lesson sequence. Students will also return to their learning about frog life cycles from Unit 1 during Section 2 of this lesson sequence. They are prompted to return to earlier entries in their student science notebook to review their notes and add new information.

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

- Students are studying freaky frogs in Language Arts Grade 3 Module 2. As an extension, students could identify the parts of the freaky frogs' habitats and how those components form a system.
- The close read in Section 1 provides students with the opportunity to practice reading informational texts (CCSS ELA RI.3.1).
- 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 may think that a pond does not have unique characteristics, whereas a pond actually is a complex system that supports a diverse array of life. Be sure to emphasize this concept when reading the article "Life in a Pond."

Possible broader connections:

- Connect to students' lives by taking a field trip to a pond.
- Connect to other sciences by discussing how the pond is a system and systems exist in many other sciences, such as the circulatory system or the solar system.
- Brainstorm and discuss a variety of systems, as well as systems within systems (e.g., the school, the classroom, a student, and the digestive system represent systems within systems).

Areas where students may need additional support:

- If students are not familiar with the Language Arts modules, take more time before the close read to discuss the steps of a close read.
- Students will closely read a text in this lesson sequence. Some students may benefit from additional support. Consider these options:
 - For students who are overwhelmed by too much print on a page: Consider copying the text so that there is only one paragraph on each page, with an organized space for recording the gist and meanings of the unfamiliar words on that page.
 - Offer selected shorter passages to specific groups based on the readiness and needs of the group. This gives students an opportunity to read a complex text within the 3rd grade level span but differentiates the length of the text, not the complexity.
 - For ELLs and students who may need additional support with reading and/or writing: Strategically pair students with a peer model.
 - For students who may need additional support determining the gist: Consider highlighting or underlining key phrases in their individual copy of the text in advance. This will lift the gist up for them.
- Students may need additional support creating scientific models—specifically, adding labels and returning to their cross-section diagram to add additional learning or change what they now understand. Consider having students use a different colored pencil when they add to their diagrams so that they can easily see the changes that they have made. In some instances, as students learn new information, they may find that their initial model no longer works and they need to construct a new model.
- Students may need additional support when returning to earlier learning about life cycles from Unit 1. Support students by providing clear instructions about page numbers and allow students to work together or share resources.
- 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:

- Students will create an explanatory model of their pond design during the performance task in Lesson Sequence 5. An explanatory model is similar to a cross-section diagram but includes more details and labels, which explain the purpose of various structures and how each part of the pond interacts to support a frog's life cycle. The cross-section diagram from this lesson sequence is good practice for this assessment.
- Students will return to the duckweed experiment from Lesson Sequence 2 in the next lesson sequence to see the results of the investigation.

In advance:

- Read each section and complete the Preparing to Teach: Self-Coaching Guide.
- Post: Life Science Module guiding question, lesson sequence focusing question, lesson sequence learning target, Concepts Scientists Think About anchor chart, Scientists Do These Things anchor chart, Norms of a Scientists Meeting anchor chart, Unit 2 guiding questions, and Planning a Frog Pond anchor chart.

Optional extensions:

- *Pond Mapping*: Map the depth and perimeter of a local pond. See <http://www.ca4h.org/files/13927.pdf> for an example used in a fifth- or sixth-grade classroom. Note that this resource would require modification for third grade.

Vocabulary

depth: the distance from the surface of the water to the bottom

Materials

General Materials

- ✓ Concepts Scientists Think About anchor chart (begun in Unit 1, Lesson Sequence 2; added to in Section 3; see supporting materials)
- ✓ Student science notebook (from Unit 1, Lesson Sequence 1; one per student)
 - The Pond Is a System entry (page 38 of student science notebook)
 - Life Cycle entry (from Unit 1, Lesson Sequence 3; page 10 of the notebook)
- ✓ “Life in a Pond” (one per student and one to display)
- ✓ Scientists Do These Things anchor chart (begun in Unit 1, Lesson Sequence 2 added to in Section 2; see supporting materials)
- ✓ Example of Cross-Section Diagram (one to display)
- ✓ Norms of a Scientists Meeting anchor chart (begun in Unit 1, Lesson Sequence 1)
- ✓ Unit 2 guiding questions (from Lesson Sequence 1; one to display)
- ✓ Planning a Frog Pond anchor chart (begun in Lesson Sequence 1; added to in Section 3; see supporting materials)

Science-Specific Materials (gathered by the teacher)

- ✓ Materials for creating cross-section diagrams (used in Section 2)
 - Colored pencils (one color per student)

Section 1: Opening

A. Reviewing Focusing Question and Learning Target (15 minutes)

- Remind students that the environment of a pond can vary, as was seen in the duckweed experiment in Lesson Sequence 2, when they tested some variations in the environment, such as the amount of water, that would affect the duckweed.
- To stimulate student thinking about how environmental changes can affect the habitat of organisms, consider posing the following questions ⁽¹⁾:

“What if a river overflowed and flooded a nearby pond? Would that still be a suitable, or adequate, habitat for a frog?” (It depends; the plants that attract insects might be underwater and the frogs wouldn’t be able to eat. Or maybe the frogs could swim to the new edge and find bugs.)

“What if there was a stretch of very hot weather and the pond started to dry up? How might that affect the frogs?” (They may not have a place to lay their eggs.)

“How are frogs affected by different amounts of water?” (They need water to lay eggs in.)

“What if a field of flowers next to a pond started to bloom? How would that affect the habitat?” (More flowers would attract more bugs and provide more food for the frog.)

“So, how can a change in the environment affect an organism’s habitat?” (A change in the environment can make a habitat not suitable anymore. Or sometimes a change can make a habitat more suitable.)

- Share with students the lesson sequence focusing question they will be exploring:
 - “How does a pond act as a system to support all parts of a frog’s life cycle?”
- Underline the word *system* in the focusing question and reference the **Concepts Scientists Think About anchor chart**. Tell students that they will be thinking like scientists today as they consider systems. Add the definition of *system* to the anchor chart.
- Using a total participation technique, invite responses from the group:

“What do you already know about the word system?” (Responses will vary but may include: a chip clip or bicycle or digestive system.)

- Invite students to take out their **student science notebook** and turn to **The Pond Is a System entry** and put their finger on the “Opening” section.
- Give students 5 minutes to write or draw their own thinking and preliminary response to the focusing question. Encourage students to express their own thinking by prompting them with questions:

“What do you think a pond that is a healthy place for a frog might look like? Draw a picture of what you think you might see.”

- Direct students’ attention to the posted lesson sequence learning target and select a volunteer to read it aloud:

— “I can create a cross-section diagram (or model) that explains how the different parts of a pond meet the survival needs of the frogs that live there.”

- Using a total participation technique, invite responses from the group:
 - “What does it mean to “meet the needs” of an organism?” (It means the habitat has the necessary amounts of food, water, and shelter.)*
- If students require prompting, encourage them to think about the wants and needs lists that they created in Lesson Sequence 2.
- Invite students to turn and talk with a partner:

“Summarize in your own words what the class will be doing today.”

Preparing to Teach: Self-Coaching Guide

1. What are some other scenarios I could propose to help students get the concept that environmental changes can affect habitats?

Section 1: Obtaining Information

A. Reading Aloud: “Life in a Pond” (10 minutes)

- Tell students that today they are going to read a text that will help them understand the living and non-living parts of a pond. Explain that this understanding will help them design their frog ponds.
- Distribute and display **“Life in a Pond.”** Tell students you are going to read the text aloud, and as you do they should consider the following ⁽¹⁾:

“If you were a frog, what would you need from the environment in which you live?”

- Read “Life in a Pond” aloud fluently, with expression, and without interruption as students follow along, reading silently in their heads.
- Ask students to turn and talk with an elbow partner:

“What is the gist of the article?”

Preparing to Teach: Self-Coaching Guide

1. It is important that this text is read without interruption simply to acquaint students with the text. Ask students to follow along in their text.

B. Close Reading: “Life in a Pond” (25 minutes)

- Remind students of some of the close reading practices they follow 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.
- Let students know they are going to have the opportunity to independently read the text multiple times. Post and read the following directions with students. Answer clarifying questions ⁽¹⁾.
 1. Complete a first, independent read of the text. Record the gist of each paragraph in the margins of the text. Circle unfamiliar vocabulary.
 2. Turn and talk with a partner who has also completed a first read to discuss the gist you captured and the vocabulary you circled.
 3. Complete a second, independent read of the text, focusing on the spaces in the pond. Record your findings in the first column of the Pond Article note-catcher in your student science notebook.
 4. Students should not go beyond the second column at this point.
- Consider doing a brief guided practice with Step 1 as necessary.
- Invite students to begin working. Circulate to support students and pair students for Step 2 as necessary ⁽²⁾.
- Refocus whole group. Give students specific positive feedback on their close read of “Life in a Pond.” (Example: “I noticed Eric returning to the text to reread while taking notes on his Pond Article note-catcher.”)

Preparing to Teach: Self-Coaching Guide

1. How will I support struggling readers? What special accommodations are needed for my students?
2. Name two or three students you are going to intentionally work with during this time.

Section 2: Communicating Information

A. Creating a Pond Cross-Section Diagram (20 minutes)

- Refocus whole group and remind students that their task for the day is to create a model of a pond.
- Draw students' attention to the **Scientists Do These Things anchor chart** and select a volunteer to read the definition for modeling aloud.
 - A model can be a drawing or diagram, a physical replica, or a simulation.
 - A model has limitations because it is used to study one part of a system or object while not paying attention to other parts.
- Remind students that they have modeled the life cycle of plants and animals in Unit 1, but now they will be drawing a cross-section diagram, which is a type of model ⁽¹⁾.
- Add "cross-section diagram" to the model column of the Scientists Do These Things anchor chart.
- Display **Example of Cross-Section Diagram**.
- Using a total participation technique, invite responses from the group:

"What do you notice about the diagram?" (We can see what's inside the house; we know the names of the different parts and how those different parts provide for the people who live there because of the labels.)

"Recall the definition for a model. What might a limitation of this model be?" (We don't know what the outside of the house looks like, so this isn't what the house actually looks like because there isn't a see-through wall.)
- Explain that even though a model has limitations, models are still important tools for scientists to use when learning about, investigating, and discussing ideas.
- Tell students that they are going to use the information they just collected in their note-catcher about spaces in the pond to create a cross-section diagram of a pond. Remind students that their diagram is a type of model and they should use labels to name and explain what they know about the various parts ⁽²⁾.
- Invite students to open their student science notebooks to The Pond Is a System entry and put their finger on the space below the section titled "Frog Pond Cross-Section Diagram."
- Tell students they will now have 15 minutes to sketch a pond cross-section diagram (a type of model) in this space.

Preparing to Teach: Self-Coaching Guide

1. What student exemplar can I use from Unit 1 to illustrate my expectations about a student model?

2. What level of detail do I expect my students to be able to add to their cross-section diagrams at this point? (Remember that students will return to their cross-section diagrams multiple times, so models will not be complete yet.)

Section 2: Obtaining Information

A. Third Read of “Life in a Pond” (20 minutes)

- Give students specific positive feedback on their ability to create a cross-section diagram of a pond, and tell them they will continue to add to these diagrams as they learn more about how the ponds provide for the frogs that live there ⁽¹⁾.
- Remind students that they have learned a lot about the lives of frogs, and now they are going to review what they learned during Unit 1 of this module about frogs’ lives.
- Invite students to open their student science notebook to the **Life Cycle entry** from Unit 1.
- Ask students to review their bullfrog life cycle models and turn and talk to an elbow partner: *“What types of things does a frog need in a pond at each stage of its life cycle?”*
- After 5 minutes, select volunteers to share out. As students share out, capture their ideas on the board.
- Direct students to return in their student science notebook to The Pond Is a System entry and add life cycle information to their Pond Article note-catcher. Tell them they can flip back and forth in their science notebook or look at the white board for details ⁽²⁾.
- Refocus whole group and invite students to retrieve their copies of “Life in a Pond.”
- Tell students that they are going to reread “Life in a Pond,” this time paying attention to food, water, shelter, and space that is available for frog eggs, tadpoles, froglets, and adult frogs in different parts of the pond ⁽³⁾.
- Ask students to begin rereading the text on their own. They should start at the section titled “Life on the Surface” and write down information in the third column of their note-catcher as they read ⁽⁴⁾.
- After 10 minutes, invite students to discuss with an elbow partner: *“What similar and different ideas did we write down?” (Responses will vary.)*
“Has your thinking about food, water, shelter or space for a frog in a pond changed? Why or why not?” (Responses will vary.)

Preparing to Teach: Self-Coaching Guide

1. What specific student work can I give specific, positive feedback to at this point?
2. Are the life cycle models still posted in the room?
3. What does a frog need during its life cycle?
 - Eggs: water and a safe place to hide—like sticks or leaves at the edge of the pond
 - Tadpole: water, a safe place to hide—like shore plants, a food source—like plants
 - Froglet: water, a sloped edge for climbing
 - Reproducing adult frog: water to lay eggs in, plants to hide in, land and water to hunt in, space for mating

4. Perhaps my students would benefit from the jigsaw approach to reading the different sections of the article?

B. Revising a Pond Cross-Section Diagram (10 minutes)

- Refocus whole group. Invite students to turn and talk to an elbow partner:
“What have we have learned about the needs of a frog during different phases of its life cycle? How can these needs be met by the different spaces in the pond?” (Eggs need a safe space because they can’t move, tadpoles need algae to eat and plants to hide in, froglets still live in the water but also need to eat insects and minnows, and adult frogs live on land and water—they need places to hide and food to eat in both places.)
- After soliciting and clarifying students’ responses, invite students to turn and talk:
“How can you change your cross-section diagram of a pond to reflect that new information?” (add labels to the diagram about the different life stages)
- Cold call a few pairs to share out. As pairs share out, ask:
“Who can paraphrase, react to, or clarify the ideas presented?”
“Who is going to revise their drawing similarly to Pair A’s?”
- Remind students that scientists frequently go back and revise their ideas as they get new information. Tell students they will do this by revising their cross-section diagram. Now it will explain their thinking and will be a good explanatory model ⁽¹⁾.
- Distribute **colored pencils**.
- Invite students to use a colored pencil to revise the diagram in their student science notebook. Explain that they are using colored pencils for their revisions so they can see how their thinking has evolved since they created the original diagram.
- Circulate to monitor students’ progress ⁽²⁾.

Preparing to Teach: Self-Coaching Guide

1. Could I model revising something in my teacher science notebook?
2. What specific students should I be sure to check in with? What will I look for in their work?

Section 3: Evaluating Information

A. Scientists Meeting: Building Understanding (20 minutes)

- Ask students to bring their science notebooks and gather for a Scientists Meeting.
- Direct students’ attention to the **Norms of a Scientists Meeting anchor chart** ⁽¹⁾.
- 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.
- Tell students the goal of this meeting is to build understanding of how a pond works as a system.

- Invite students to open their science notebooks to their cross-section diagrams.
- Invite students to turn and talk:
 - “What would happen to the frog’s life cycle if one part of the pond was changed or damaged?” (The frog would not be able to complete its life cycle.)*
 - “Would all of the frog’s needs be met if, for example, the edges of the pond were removed?”*
- Call on volunteers to share out. As students share, capture their ideas on the Concepts Scientists Think About anchor chart under the “Systems” column ⁽²⁾.
 - The pond is a system because it is made up of different parts that work together to support the needs of the organisms in it.
- Direct students’ attention to the posted **Unit 2 guiding questions** and read them aloud:
 - “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)?”
- Direct students’ attention to the posted **Planning a Frog Pond anchor chart**.
- Ask:
 - “What information has the class collected to help answer the unit guiding questions? (The pond will have specific parts to meet the different needs of a frog’s various phases of life.)*
- Remind students to use the information in their student science notebooks as evidence as they participate in the conversation ⁽³⁾.
- If conflicting information arises, help students challenge one another’s ideas respectfully:
 - “Why do you think you have different conclusions from Student A’s?”*
 - “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?”*
- Refer students to the list of things they need to know on the Planning a Frog Pond anchor chart to complete the task. Ask:
 - “What have you learned that will help you plan a successful pond?”*
- Invite students to share out. As students share, capture their ideas on the Planning a Frog Pond anchor chart. Record all valid answers and refer to the supporting materials for possible responses.

Preparing to Teach: Self-Coaching Guide

1. Is there a certain norm I really want students to think about to help improve our class discussions?
2. What do I want students to understand at this point? (different parts of a pond working together to support the frog during all phases of its life cycle)
3. Consider showing students the before and after photos of frog habitat from Lesson Sequence 1. What probing questions can I ask if they are not getting it?