

Lesson 4.1

Frog Models

SAMPLE



Lesson Overview

In this chapter, students begin a new task in their role as aquarium scientists. They use what they have figured out about plant and animal defenses to showcase models of defenses in an aquarium exhibit. This lesson begins by setting the new context and defining the purpose of an aquarium exhibit; then, students are introduced to a new question about how models can be used to help explain ideas. The class reads the book *Frog Models*, a fictional story about children who make their own models of the phenomenon of frogs' camouflage defense against being eaten by snakes. This book acts as an exemplar for the class about how models can be useful for scientists to show their ideas. The introduction of the Modeling Checklist allows students to evaluate models based on criteria that will be important as they plan and create their own models throughout Chapter 4. The purpose of this lesson is to establish a context for students to apply what they have learned about animal and plant defenses and to provide exemplars of models to guide students as they create models to explain how a particular animal uses its defenses to survive.

Investigative phenomenon: Frogs survive.

Students learn:

- A model does not need to include things that are not important for what is being explained.
- Making careful observations can help a scientist make a model that explains something well.



Lesson at a Glance

ACTIVITY

1

Introducing the Exhibit (10 min)

Students are introduced to the aquarium director's latest request and their new task to create a model for an exhibit. Students discuss what they know about museum exhibits and review what they learned about scientific models in Chapter 2. The purpose of this activity is to set the context for the rest of the chapter.

TEACHER-LED
DISCUSSION

2

Reading: Frog Models (20 min)

The teacher conducts a Shared Reading of *Frog Models*, which provides students with an example of children using scientific models to explain how camouflage works. Students practice visualizing and consider how the models help explain ideas.



READING

3

Evaluating Frog Models (15 min)

Students evaluate three models, two from *Frog Models* and a new frog model, using the Modeling Checklist. This prepares students for creating their own models in the upcoming lessons by helping them to recognize the important criteria of a complete scientific model. Included in this activity is an On-the-Fly Assessment that provides an opportunity to informally assess students' understanding of how models represent only what is essential for explanation.

TEACHER-LED
DISCUSSION



Materials & Preparation

Materials

For the Classroom Wall

- Chapter 4 Question: *How can aquarium scientists explain animal defenses to the visitors?*
- Models of Animal and Plant Defenses chart
- What Scientists Do chart

For the Class

- *Frog Models* big book
- 1 piece of chart paper*
- marker*
- masking tape*

*teacher provided

Preparation

Before the Day of the Lesson

1. **Gather the following item (from your *Animal and Plant Defenses* kit):**
 - Chapter 4 Question: *How can aquarium scientists explain animal defenses to the visitors?*
2. **Create the Modeling Checklist chart.** Across the top of a sheet of chart paper, write “Modeling Checklist.” Refer to Modeling Checklist—Completed (in Digital Resources) to write the three questions students will use as they make their models.
3. **Plan ahead for the Aquarium Exhibit activity in Lesson 4.3.** By Lesson 4.3, your class will have created models and planned their explanations to showcase their understanding of animal defenses. This might be an opportunity to invite parents, another class, or other members of the school community to be the visitors to the exhibit. Consider designating a time for visitors to see the exhibits and sending out invitations. You can hold the exhibit in your classroom, a multipurpose room, or cafeteria. Visitors can circulate to the different “exhibits,” listening to students’ explanations and seeing the models they created. You can play up the fictional context as much as you would like, such as including signs that direct visitors to the aquarium exhibit hall or using “Visitor” and “Aquarium Scientist” name tags, depending on each person’s role.



VOCABULARY

- defend
- defense
- model
- scientist
- survive



DIGITAL RESOURCES

Modeling Checklist

Animal and Plant Defenses

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4. **Preview the *Frog Models*.** In Activity 2, you will read this book with students. Read through and familiarize yourself with the book so that you are prepared to lead the discussion about it.
5. **Prepare for the On-the-Fly Assessment.** Included in Activity 3 of this lesson is an On-the-Fly Assessment that provides an opportunity to informally assess students' understanding of how models represent only what is essential for explanation. Select the hummingbird icon on the menu bar and then select the ON-THE-FLY ASSESSMENT for details about what to look for and how you can use the information to maximize learning by all students.

Immediately Before the Lesson

1. **Write Investigation Question on the board.** Write “How do scientists make and use models to explain their ideas?”
2. **Post the following on the classroom wall:**
 - Chapter 4 Question
 - Models Checklist chart
3. **Have on hand the following materials:**
 - *Frog Models* big book

Differentiation**Embedded Supports for Diverse Learners**

Book exemplifies making scientific models. The book *Frog Models* provides an accessible example of the kinds of thinking students will use when they make a model to explain how something happens. Reading and discussing this book helps prepare students to make their own models later in the chapter.

Shared Reading. In this lesson, you will lead a Shared Reading and invite students to join you in reading, asking questions, and visualizing. Engaging in Shared Reading allows students to discuss ideas about how models help scientists explain their ideas. You will stop at strategic points as you read aloud, asking students to think about how the models in the book show the characters' ideas.

Modeling Checklist chart. This lesson includes explicit instruction about how to evaluate a model. The teacher introduces and explains the criteria on a Modeling Checklist chart. Students are then guided in using the criteria to evaluate models of frog camouflage in *Frog Models*, as well as one additional frog camouflage model. In Lesson 4.2, students will use the checklist again to check the models they create and use the criteria to make their models better.



Potential Challenges in This Lesson

Recalling previous activities. The discussion in Activity 3 asks students to draw upon their memories of making models in Chapter 2. Although students can refer to the Models of Animal and Plant Defenses chart that lists and explains the models students made in Chapter 2, some students still may find it difficult to recall those activities. You may wish to hold up an example of each of the models from Chapter 2 so students can see a visual reminder.

Staying focused on task. In this lesson, students are asked to focus on reading and discussing a book for an extended time. In addition, students are also asked to review and discuss the two models in the book using the Modeling Checklist. In each of these cases, students are required to think somewhat abstractly as they evaluate the models to determine the characteristics of an effective model. Depending on the needs of your class, you may wish to take additional time in order to provide more explanation of the Modeling Checklist, to include more concrete connections to previous models in the unit, or to review the modelling activities in Chapter 2.

Specific Differentiation Strategies for English Learners

Previewing the book. English learners may benefit from an opportunity to look through the book before reading it with the class. This can allow them time to access relevant prior knowledge and recall related words in English, and it may reduce the cognitive load when they participate in the Shared Reading during this lesson.

Bilingual Spanish glossary. Having access to translations and definitions of vocabulary words in Spanish is helpful for English learners for whom Spanish is their native language. Have these students turn to pages 16–17, Glossary, in the *Animal and Plant Defenses Investigation Notebook*. Encourage students to refer to this glossary as needed throughout the unit.

Language support. Some students may benefit from additional language support as they discuss the models with a partner using the Modeling Checklist chart in Activity 3. Offering students optional language frames to use with their partners helps students share their ideas orally, as well as provides an opportunity for students to use important vocabulary, such as the word *model*. We recommend offering students the following language frames:

- The model shows the idea that _____. [e.g., Shells defend an animal from being broken into pieces.]
- The model includes important parts for explaining the idea like _____. [e.g., Hard plastic for the hard shell.]
- The model leaves out parts that do not matter like _____. [e.g., Eyes.]

Specific Differentiation Strategies for Students Who Need More Support

Additional discussion. Although students were introduced to and create different types of models in Chapter 2, they may need to be reminded of the importance of models in science. You may wish to provide additional instruction about models at the beginning of this lesson by reinforcing the idea that scientists often make models to show their ideas about how something happens or how something works. It is important that students realize a model is not the real

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thing scientists want to answer questions about, but is like the real thing in ways that help scientists understand and explain a real phenomenon. Providing this additional support will help students as they read about and discuss models in this lesson.

Additional visual representations. In the first activity, students are introduced to the word *exhibit*. Although two visual examples of indoor exhibits are provided in this lesson, you may wish to provide additional examples. In particular, providing examples of outdoor exhibits at a zoo or aquarium may help some students gain more familiarity with the idea.

Work with a small group. Some students may find it challenging to evaluate the models from the book and the additional frog model example during the third activity. You could sit with a small group of students and lead them through this discussion. Use the Modeling Checklist chart to think aloud about how each model from the book meets or does not meet the criteria listed. If the group is ready, you can ask them to practice using the checklist more independently with the new frog model example.

Additional practice. Although the Think and Walk activity was used once before in Chapter 2, students may have difficulty following the activity's multistep procedure: the teacher poses a question, students think about their answers, and then students move to a section of the room that corresponds to their idea. If your students are having difficulty following the multiple steps of this activity, feel free to offer additional support, such as modeling the procedure or helping students find the section of the room that corresponds to their idea.

Specific Differentiation Strategies for Students Who Need More Challenge

Read for a new purpose. You could challenge students to read the book with a partner and identify all the ways that Juan and Luz do what scientists do. Remind students of the What Scientists Do chart, and then provide each pair with a copy of the book and sticky notes. As pairs read, invite students to place sticky notes on each of the pages that show Juan and Luz doing what scientists do (observing, reading, communicating, making models, or explaining).

Standards

Key

Practices Disciplinary Core Ideas Crosscutting Concepts

3-D Statement

Students ask questions and gather information through reading the book *Frog Models* in order to understand that frogs use camouflage to keep from being eaten by snakes (structure and function, cause and effect).

Next Generation Science Standards (NGSS)

NGSS Practices

- **Practice 1:** Asking Questions and Defining Problems



- **Practice 2:** Developing and Using Models
- **Practice 8:** Obtaining, Evaluating, and Communicating Information

NGSS Disciplinary Core Ideas

- **LS1.A: Structure and Function:**
 - All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)
- **LS1.D: Information Processing:**
 - Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1)
- **ETS1.A: Defining and Delimiting Engineering Problems:**
 - Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)
- **ETS1.A: Defining and Delimiting Engineering Problems:**
 - Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

NGSS Crosscutting Concepts

- Cause and Effect
- Structure and Function

Common Core State Standards for English Language Arts (CCSS-ELA)

- **CCSS.ELA-LITERACY.RI.1.1:** Ask and answer questions about key details in a text.
- **CCSS.ELA-LITERACY.RI.1.7:** Use the illustrations and details in a text to describe its key ideas.
- **CCSS.ELA-LITERACY.SL.1.1:** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
- **CCSS.ELA-LITERACY.SL.1.2:** Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

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- **CCSS.ELA-LITERACY.L.1.6:** Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., because).

Common Core State Standards for Mathematics (CCSS-Math)

CCSS-Math Practices

- **CCSS.MATH.PRACTICE.MP1:** Make sense of problems and persevere in solving them.

SAMPLE



1

TEACHER-LED DISCUSSION

Introducing the Exhibit



Introducing the Exhibit



Students are introduced to the context of the new chapter—helping the aquarium director by building a model for an exhibit.

Instructional Guide

1. Introduce the aquarium's latest request. Explain that the aquarium director appreciates students' work explaining how Spruce the Sea Turtle's offspring, if she has any, will survive when they are young and when they are grown. Let them know the director has sent a final task for them to help with.



The aquarium director wants to create an exhibit in the aquarium that uses models to explain how different types of animals in the aquarium defend themselves.



The aquarium director wants our help to make the models for the exhibit.

2. Discuss students' prior knowledge of museum exhibits. Let students know that an exhibit is something in a museum that visitors look at or work with. If you have been to a museum with your class, remind them of a memorable exhibit. Then, discuss students' other experience with museums and exhibits.



Some of you may have visited a museum, a zoo, or an aquarium in the past. What kinds of exhibits were there? [Answers will vary.]





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3. Project Museum Exhibits. Let students know they can use these pictures to find more information about what exhibits are like.





-  The picture on the left shows a person visiting an exhibit. It looks like she is watching and listening to a video that is teaching her something new about an animal. Some exhibits are small, like the one she is visiting.
-  The picture on the right shows a bigger exhibit in a different museum. This exhibit has models of animals. It looks like the models are showing the visitors something about what happens in nature where those animals live.
-  There are many different kinds of exhibits. Some are very big and some are smaller. Some use real plants and animals, and some use models.
-  We will work over the next few lessons to make models for an exhibit in the aquarium. Our exhibit will use models to help explain how different defenses help different animals survive in the ocean.

If you have arranged for visitors to come to your exhibit in Lesson 4.3, explain that to students now.

4. Introduce the Chapter 4 Question. Post to and read aloud the Chapter 4 Question:


-  We need to figure out this question: *How can aquarium scientists explain animal defenses to the visitors?*

5. Review the Models of Animal and Plant Defenses chart. Remind students that they made models of different animal defenses in earlier lessons.


-  We have been making models and learning how to use those models to explain an idea.
-  Let's think about how our models helped us explain animal defenses.

Invite a few students to share what each of the four models on the chart helped students explain.




 We made models after we figured out how shells worked, how spines worked, and how camouflage worked. The models helped us explain what we figured out.

6. Introduce the Investigation Question.

 As we work on making models to help the aquarium, it will help for us to learn more about how scientists use models.

Point to the Investigation Question and read it aloud.

 We will think more about this question: *How do scientists make and use models to explain their ideas?*

Teacher Support

Rationale

Pedagogical Goals: Modeling Focus

This chapter is intended to deepen students' understanding and skill with the practice of scientific modeling. In the book *Frog Models*, they will read about other children working as scientists to make models that explain their ideas about how an animal's defense works. Using examples from the book, students will use a set of criteria to evaluate the model's effectiveness. Later, they will use this same set of criteria as a checklist to evaluate and improve the models they make. This chapter is also as a chance for students to apply key ideas about structure and function, cause and effect, and animal and plant defenses in an increasingly independent way.

Background

Crosscutting Concepts: Cause and Effect Across Chapter 4

Throughout this chapter, students apply the understanding they built throughout Chapter 2 of the cause-and-effect relationships between specific defense structures and the ways they deter being eaten and help an animal survive predation. Students apply their ideas as they read about two fictional children making models and explanations of a defense, and then as they create their own models and explanations of one ocean animal's defense.

Instructional Suggestion

Providing More Experience: Making Connections to Students' Family and Community Experiences

In this lesson, students are introduced to a new task in their role as aquarium scientists—creating a model to explain how Spruce will use her structures to survive in the ocean. You may want to take additional time to invite students to share from their own experiences with visiting museums, zoos, or exhibits at informal institutions of learning as a way to support them in making connections to the tasks they will be engaging in during Chapter 4 instruction.



2

READING

Reading: Frog Models



Reading: Frog Models



The teacher conducts a Shared Reading of *Frog Models*. Students practice visualizing and consider how the models help explain ideas.

Instructional Guide

1. Transition to the Shared Reading. Hold up the cover of the *Frog Models* big book.


 We are trying to figure out how scientists use models to explain their ideas. The children in this book work as scientists to explain their ideas about an animal's defense.

2. Set the purpose for reading. Explain that reading about how the children in this book make and use models will help students plan their exhibit models.


 As we read, we will focus on the how the children plan and make their models, as well as how the models help them explain their ideas.


3. Read through page 5 and have students visualize. Pause and have students visualize what happened on the forest floor. Give students a moment to picture what happened before having them share what they visualized with a partner.

4. Read through page 11 and discuss Luz's model. Keep the book open to pages 10–11 so students can see the illustrations.

 What was Luz's idea about why the snake did not eat the frogs?
[The frogs were brown like the leaves, so the snake did not see them.]


Think aloud to model considering how Luz's model explained her idea.

 We are reading to find out how the models help explain the children's ideas. Luz's idea was the frogs survived because they were brown like the leaves, so the snake did not see them.


 Luz used her model to explain her idea. She made circles that were brown like the frogs. She put them in the leaves and, just like the frogs, the circles were hard to see.



5. Read through page 15 and discuss Juan's model. Keep the book open to pages 14–15 so students can see the illustrations.

 What was Juan's idea?
[The frogs are a similar shape to the leaves, so the snake did not see them.]

Have students talk with a partner to answer the following question.

 How did Juan's model show his idea?

Call on a few volunteers to share. Students should mention that Juan made shapes that were like the shape of the frog. He put them in the leaves and, just like the frogs, they were hard to see. They will also likely mention Juan's shapes were hard to see because they were brown like the leaves.


6. Read through page 18 and have students visualize.

 Visualize Juan and Luz using their models to explain their ideas to their mom. What do they do with their models? What do they say?


Give students a minute or two to silently visualize. Then, have partners share ideas. After pairs share, call on a couple of volunteers to share with the class.

7. Read the final page and have students share ideas. After reading the final page, call on a few students to share other ideas of what else could be explained using models. Accept all responses.

8. Using the What Scientists Do chart, lead a reflection on how Luz and Juan worked as scientists. Remind students that they were reading to find out more about how scientists use models to explain ideas.

 This chart helps us think about how we have been working as scientists. It can also help us think about how Luz and Juan worked as scientists.

Gesture to the chart and read each card aloud. Students may be ready to read along with you.

 Talk with your partner about how Luz and Juan worked as scientists by doing some of the things on this chart.

Provide pairs a moment to discuss, and then call on volunteers to share. Emphasize the following points:

- Luz and Juan observed the frogs and snakes to learn more about the frogs' defense.
- Luz and Juan communicated with each other and their mom by discussing their ideas.
- Luz and Juan made models.
- Luz and Juan put the models they made in the leaves to explain their ideas.



- Luz and Juan did not read in this story, but they could have found more information about frogs' defenses using a book.

Teacher Support

Background

About the Book: *Frog Models*

Frog Models is a story about a pair of siblings who use models to explain their ideas about frog camouflage. Luz and Juan are walking in a forest when they see a snake hunting. There are some frogs nearby, but the snake does not see them. Each child has an idea about why the snake did not see the frogs, and they make paper models to show their ideas. Using their models, the siblings are able to explain that the frogs' color and shape make them hard to see against the leaves. *Frog Models* is a Shared Reading that uses simple language to support students' firsthand investigations by demonstrating the process that scientists go through when constructing models for reasoning and explanation. The book shows the process that students will engage in as they create their own models in the unit.

Instructional Suggestion

What One Teacher Did: Pantomiming What Scientists Do

While students have the opportunity to move around in the next activity, one teacher noticed her students beginning to wiggle by the end of this Shared Reading. In order to help her students continue to focus as they reflected on the What Scientists Do chart, she had them think of ways to show with their bodies the different scientific practices Luz and Juan used in *Frog Models*. Her students acted out looking very closely at something to observe, cutting and drawing to make models, and pointing and pantomiming speaking to another student to communicate and explain. As they shared their ideas, they also shared how they acted out each scientific principle. The teacher then had the whole class stand and act out their ideas.



3

TEACHER-LED DISCUSSION
Evaluating Frog Models






Evaluating Frog Models



Students are introduced to the Modeling Checklist and use it to evaluate three scientific models.

Instructional Guide

1. Introduce the Modeling Checklist. Point to the Modeling Checklist chart you posted.

-  We know scientists use models to explain their ideas and we have learned some important things about making models.
-  We know that models are like the real thing in ways that help the scientist explain. We also know that models are not exactly like the real thing. Models do not need to show things that do not help the scientist explain something.
-  When scientists make a model, they want to make sure that it does what it needs to do to help them explain an idea. They use what they know about making models to help them check their model.
-  This is the Modeling Checklist that shows what we know about making models. We can use the checklist to see if our models are doing what they need to do to explain the ideas we chose to model.
-  We will practice using the checklist today. This will help you know how to use the checklist when you make your own model later.

2. Review the three important ideas on the Modeling Checklist. Read each criteria aloud:


- Did I chose an idea to explain?
- Did I include parts that are important for explaining?
- Did I leave out parts that do not matter for explaining?

3. Think aloud to model using the Modeling Checklist. Open the *Frog Models* big book to the pages about Juan's model, beginning on pages 12–13.


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Activity 3

-  I can use the Modeling Checklist to think about Juan’s model and check how well his model explains an idea about frog defenses. The first question on the checklist is *Did I chose an idea to explain?*

Refer to the images as you think aloud to confirm that Juan chose an idea to explain.

-  The frog’s shape is like the shape of the leaves. Juan wanted to explain how the frogs’ shape made the frogs hard for the snake to see. Yes, Juan chose an idea to explain using a model.



Turn to pages 14–15 in the *Frog Models* big book to show Juan’s model.

-  The second question on the checklist is *Did I include the parts that are important for explaining?*
-  Juan wanted to explain how the frogs’ shape made it hard for the snake to see the frogs. He cut paper in the same shape as the frogs. Then, he put the paper shapes in the leaves where the frogs were.
-  The shape of the paper and the leaves are the important parts for explaining why the snake could not see the frogs. Yes, Juan included the important parts for explaining.
-  The third question on the checklist is *Did I leave out parts that do not matter for explaining?*
-  There are many other parts of a frog Juan could have included in his model, but his idea was about the shape of the frogs. Juan did not include other frog parts, like their long legs or the lines on their backs. Yes, Juan left out the parts that did not matter for explaining.


4. Practice using the Modeling Checklist with a Think and Walk activity. Let students know they will practice using the checklist with a Think and Walk activity. This time the class will use the checklist to decide if Luz’s model does what it needs to do to explain her idea.

- Remind students the activity is called Think and Walk because in each round they will have to first think about an idea, and then walk to one side of the room to show their thinking.
- Designate one part of your classroom as “Yes” and one part as “No.”
- Let students know you will read each question on the checklist. Then, they will think about Luz’s model before walking to either the “Yes” or “No” part of the room and sharing their ideas.

5. On-the-Fly Assessment: Lead students in evaluating Luz’s model. Open the *Frog Models* big book to the pages about Luz’s model, beginning on pages 8–9. Guide students in evaluating the model.


-  The first question on the checklist is *Did I chose an idea to explain?* Think about Luz and her model. Did Luz chose an idea to explain using a model?
-  If you think Luz chose an idea to explain, go the “Yes” part of the room. If you think Luz did not choose an idea to explain, go to the “No” part.




 Talk with a partner about why you chose your answer.

Allow time for pairs to talk, and then call on a few students to share. Students should point out Luz's idea was the frogs' color made them hard to see, and this is what she chose to explain with her model. Have students return to the middle of the room.

Turn to pages 10–11 in the *Frog Models* big book to show Luz's model.

 The second question on the checklist is *Did I include the parts that are important for explaining?* Think about what parts Luz included in her model. Did Luz include important parts for explaining her idea?

Give students time to think and then walk to their choice.

 Talk with a partner about why you chose your answer.

Allow time for pairs to talk, and then call on a few students to share. Students should point out that Luz's model showed her idea about color by using brown paper because it was the same color as the frogs, and by putting the paper in the leaves, where the frogs were. Have students return to the middle of the room.

 The third question on the checklist is *Did I leave out parts that do not matter for explaining?* Think about Luz's model and what you know about frogs and the forest. Did Luz leave out parts that did not matter for explaining her idea?

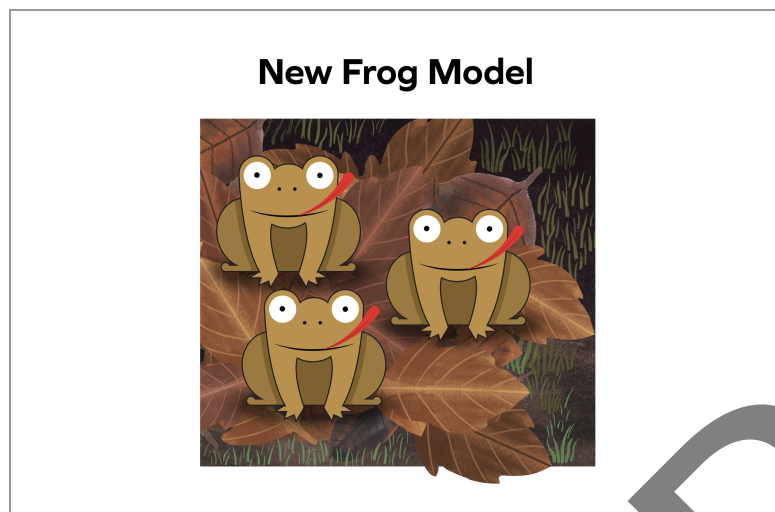
Give students time to think and then walk to their choice.



 Talk with a partner about why you chose your answer.

Allow time for pairs to talk, and then call on a few students to share. Students should point out Luz's model did not show any frog parts except color, which was her idea. Have students return to the middle of the room.




6. Project and introduce the New Frog Model. Let students know they will also practice using the Modeling Checklist to decide if this new model does what it needs to do to explain an idea.




-  Someone made this model to explain the same idea Luz explained.
-  Remember, Luz wanted to explain that the frogs' color makes them hard to see. Being hard to see helps defend the frogs from snakes that might eat them.

7. Students use the Think and Walk activity to evaluate the New Frog Model. Following the same procedures in Steps 5–6, guide students in evaluating the New Frog Model. Read the Modeling Checklist questions aloud, allowing time after each for students to think and then walk to the “Yes” or “No” part of the room. Allow time for partners to discuss their choice before sharing their ideas with the class. Use the example below to guide discussion.

- Yes, the model does show an idea to explain. (The color makes the frogs hard to find.)
- Yes, the model does include important parts for explaining the idea. (It is brown like the leaves and is placed on the leaves.)
- No, the model does not leave out parts that do not matter. (The model frogs have big eyes and a tongue, which actually make it easier to see against the leaves.)

-  This model is meant to show the idea that the frogs were hard to see because they were brown. But the frogs are easy to see because they have bright eyes and a bright tongue!

8. Conclude the lesson by discussing improvements to the New Frog Model.

-  How could the scientist who made this model make it better for explaining the frog's defense?
[They could make a new model to place on the leaves that is brown but does not have the tongue and eyes.]



Scientists check their work, and then try to make it better. In the next lesson, you will get a chance to build your model for the aquarium exhibit. Then, you will use the Modeling Checklist check your own work and make it better.



Embedded Formative Assessment

On-the-Fly Assessment 13: Students' Evaluations of the Projected Models

Look for: Students' evaluations of frog models presents an opportunity to informally assess their understanding of how models represent only what is essential for a complete explanation. In general, students should evaluate the purpose of the models as intending to explain how the frogs can avoid being eaten by snakes. They should describe how Luz's model leaves out extraneous features (e.g., eyes, legs, mouth, etc.) and includes one of the two important components for explaining how the frogs' camouflage works (i.e., brown color, leafy shape). They should describe the New Frog Model as including the brown color but not the shape, as well as including a number of things not required for showing how camouflage works (e.g., eyes, tongue, mouth).

Now what? If you notice that many students are having difficulty evaluating how the respective models represent what is and is not essential for explaining the frogs' camouflage, take some extra time at the end of this lesson or before Lesson 4.2 to offer additional instruction. Using *Frog Models* as a resource, ask students to describe what helps the frogs match the leaves around them so they are hard to see. [Their brown color and their similar shape to the leaves.] Invite them to share what other parts the frogs have that do not add to their camouflage. You may choose to create a T-chart on the board as a reference for which parts are and are not important for explaining the frogs' camouflage. Project each model one by one, and have students talk in pairs about whether the model includes the brown color, leafy shape, and/or other parts. Once students have discussed all three models, summarize their evaluations by comparing all three models.

Teacher Support

Background

Pedagogical Goals: Evaluating Models

Throughout this unit, students have modeled with a small set of carefully chosen materials that lend themselves to creating streamlined models. In other words, the modeling experiences have been designed for students to include the important parts of an idea or process they are modeling, without providing them much opportunity to include extraneous parts. This sets up students to be comfortable with the idea that a model often does not look like the thing it represents, and even to be surprised by the New Frog Model in this activity. Making this idea explicit in this lesson prepares students to develop streamlined models, without extraneous parts, in the upcoming lessons.

Background

Pedagogical Goals: Modeling Checklist

In this chapter, students have the opportunity to apply what they have learned about models to create a model that explains an idea about how a different ocean animal defends itself. The Modeling Checklist provides a scaffold for students to begin thinking more independently as they choose an idea and then build a model to explain that idea. The

Animal and Plant Defenses

Lesson Guides

Lesson 4.1
Activity 3

purpose of the checklist is not to teach students to find one right answer or to teach them that one student's model is better than another. There are many effective ways to build a model explaining the same idea. Rather, it is to meant to help students begin to develop the observing and thinking skills that are essential for evaluating and identifying modifications to make a model better. In the next lesson, students will have the opportunity to use the checklist to evaluate their own model and then, if needed, change the model to make it better.

Background**Crosscutting Concepts: Structure and Function Across Chapter 4.**

In this chapter, students apply what they have learned in previous chapters about how the shape, color, and other characteristics of plants' and animals' structures allow those body parts to function in a particular way. Students will need to carefully attend to which characteristics of a structure they need to highlight and which they can leave out as they create a model to explain how particular structures can function as defenses.

SAMPLE

SAMPLE