

Plant and Animal Defenses

Unit guide



Welcome to Animal and Plant Defenses

Most curricula that address the topic of animal and plant defenses do so by asking students to memorize a list of survival needs, or merely show examples of how organisms meet their needs. In contrast, Amplify Science California invites students to figure out how living things survive by gathering evidence from photographs and videos that they observe, texts that they read together with classmates, and models that they create.

Unlike a typical curriculum, Amplify Science California anchors learning by inviting students to take on the role of scientists and engineers.

In this unit, students take on the role of marine scientists. Their job is to help an aquarium director explain to aquarium visitors how Spruce the Sea Turtle and her offspring can defend themselves from ocean predators when they are released into the wild. Working together, students learn how Spruce and her offspring survive in the ocean, particularly among predators like sharks. By the end of the unit, students use the ideas of structure and function to explain how a wide variety of animals and plants, and their offspring, defend themselves from being eaten.

Unit Type: Modeling

Student Role: Marine Scientists

Phenomenon: How do living things survive in the wild despite the presence of predators?

Core Concept: Understanding structures that make up animals and plants, as well as how some of these structures function as defenses against predators

Target Performance Expectations:

- 1-LS1-1: Mimicking Organisms' Structures
- 1-LS1-2: Parents Promote Survival of Offspring
- 1-LS3-1: Young Organisms Resemble Parents

Students figure out the unit phenomenon through the use of a variety of resources.



Big Books



Student Books



Hands-On Kit



Videos

About reading in this unit:

In grade 1, students are never asked to read alone. Rather books are read *to*, *with*, and *by* students with ample scaffolding and support provided by the teacher. Big books are used to introduce ideas through read-aloud and shared reading experiences. While matching student books allow for small-group reading and reading in pairs.

About technology in this unit:

In grade 1, students are never asked to access their own digital content. All media (videos, images, etc.) are experienced through whole-class projections initiated by the teacher.

Chapter 1: The storyline begins

What students investigate:


How does Spruce the Sea Turtle do what she needs to do to survive?


What they figure out:


Living things (including humans) use their body structures to meet their needs. Sea turtles have body parts that help them get food, air, and water. In the ocean, there are predators that might try to eat the sea turtle. To survive in the ocean, she needs to avoid being eaten by predators.


How they figure it out:


- Watching videos of animals eating
- Exploring the concept of structure and function during a shared reading of the big book *Tortoise Parts*
- Exploring four categories of defenses: camouflage, shells and armor, spikes and spines, and poison and venom during a shared reading of the big book *Spikes, Spines, and Shells: A Handbook of Defenses*
- Watering a plant
- Observing their partners chewing and swallowing
- Playing a game about the basic survival needs of organisms


 HANDS-ON

 READING




 STUDENT-TO-STUDENT DISCUSSION

 TEACHER

 TEACHER-LED DISCUSSION




 WRITING

Day 1 | Lesson 1.1 Pre-Unit Assessment

-  Introducing Spruce the Sea Turtle (10 min)
-  Leading a Pre-Unit-Assessment Conversation (15 min)
-  Playing the Survival Game (20 min)





Pre-Unit Assessment

Day 2 | Lesson 1.2 Tortoise Parts

-  Reading: *Tortoise Parts* (20 min)
-  Observing Structures Used to Eat (15 min)
-  Discussing Observations and Structures (10 min)




On-the-Fly Assessment

Day 3 | Lesson 1.3 Animal and Plant Structures

-  Describing Tortoise Structures (10 min)
-  Observing Animal and Plant Structures (15 min)
-  Describing Animal and Plant Structures (10 min)
-  Structures in *Spikes, Spines, and Shells* (10 min)





On-the-Fly Assessment

Day 4 | Lesson 1.4 Surviving by Not Being Eaten

-  Revisiting the Survival Game (15 min)
-  Explaining Not Being Eaten (15 min)
-  Writing About Survival (15 min)

On-the-Fly Assessment

Day 5 | Lesson 1.5 Explaining Sea Turtle Survival

-  Gathering Evidence About Sea Turtle Structures (15 min)
-  Explaining Use of Structures for Survival (10 min)
-  Writing About Spruce's Survival (15 min)
-  Reflecting on Being a Scientist (5 min)

Critical Juncture Assessment

Chapter 2: The storyline builds

What students investigate:


How can Spruce the Sea Turtle survive where there are sharks?


What they figure out:


Sea turtles have a shell and camouflage that enable them to defend themselves from predators. The shell is hard, so predators can't eat them. The camouflage helps them to blend in with their habitat, which makes it hard for predators to see them.


How they figure it out:


- Exploring seven different food-web relationships by listening to a read aloud of the big book *Whose Lunch is This?*
- Gathering more evidence about how shells and armor help animals defend themselves in a re-reading of the big books *Tortoise Parts* and *Spikes, Spines, and Shells: A Handbook of Defenses*
- Observing photographs and videos of animals and plants defending themselves using shells, spines, and camouflage
- Creating models demonstrating their ideas about how these defenses work
- Design ways to protect the sea turtle's food through a biomimicry workshop


 HANDS-ON

 READING


 STUDENT-TO-STUDENT DISCUSSION


 TEACHER


 TEACHER-LED DISCUSSION


 WRITING

Day 6 | Lesson 2.1
Whose Lunch Is This?

 Introducing the Chapter (5 min)


 Reading: *Whose Lunch Is This?* (15 min)


 Observing Animals Eating (15 min)


 Breaking Food Apart (10 min)


On-the-Fly Assessment

Day 7 | Lesson 2.2
Sharp Structures for Eating

 Demonstrating Breaking Food Into Pieces (10 min)


 Searching for Structures in *Whose Lunch Is This?* (15 min)


 Describing Sharp Structures for Eating (10 min)


 Structures Used for Getting Food (10 min)


On-the-Fly Assessment

Day 8 | Lesson 2.3
Introducing Modeling

 Exploring Defenses in *Spikes, Spines, and Shells* (10 min)


 Modeling Defenses (20 min)


 Recording Model Explorations (10 min)


 Discussing Models in Science (5 min)


On-the-Fly Assessment

Day 9 | Lesson 2.4
Modeling Shells and Armor

 Observing Shells as a Defense (10 min)


 Revisiting Books and Discussing Shells (10 min)


 Creating Shell and Armor Models (15 min)


 Discussing Shell and Armor Models (10 min)


On-the-Fly Assessment

Day 10 | Lesson 2.5
Modeling Spikes

 Gathering Evidence About Spikes as a Defense (15 min)


 Observing Spikes as a Defense (10 min)


 Creating a Spikes Model (15 min)


 Discussing the Spikes Model (5 min)


On-the-Fly Assessment

Day 11 | Lesson 2.6
Modeling Camouflage

 Observing Camouflage as a Defense (10 min)


 Gathering More Evidence About Camouflage (15 min)


 Creating Camouflage Models (15 min)


 Discussing the Camouflage Model (5 min)


On-the-Fly Assessment

Day 12 | Lesson 2.7
Explaining Defenses

 Explaining a Defense in *Spikes, Spines, and Shells* (20 min)


 Survival Role-Play Movement Routine (5 min)


 Explaining Spruce's Defenses (15 min)


 Reflecting on Being a Scientist (5 min)

On-the-Fly Assessment

Day 13 | Lesson 2.8
Defending the Food Supply

 Introducing the Food Supply Problem (10 min)

 Planning to Defend the Food Supply (10 min)

 Building Food Supply Defenses (25 min)

Critical Juncture Assessment

Chapter 3: The storyline goes deeper

What students investigate:


How can Spruce the Sea Turtle’s offspring survive where there are sharks?


What they figure out:


When sea turtles have offspring, they will not look exactly alike, but they will grow up to have hard shells and camouflage, just like their parents. These structures allow them to defend themselves from predators in the same way that the mother sea turtle does. This is because offspring defend themselves in the same way their parents do.


How they figure it out:


- Using evidence from photos to compare offspring to parent organisms
- Role-playing interactions between parents and offspring
- Comparing and contrasting how the offspring of animals and plants survive during a shared reading of the big book *Parents and Offspring*


 HANDS-ON

 READING


 STUDENT-TO-STUDENT DISCUSSION


 TEACHER


 TEACHER-LED DISCUSSION


 WRITING

Day 14 | Lesson 3.1
Introducing Offspring


 Thinking About Spruce’s Offspring (10 min)


 Exploring Parents and Offspring (10 min)


 Discussing Parents and Offspring (10 min)

 Introducing the Mini-Book (15 min)

Day 15 | Lesson 3.2
Parents and Offspring


 Reading: *Parents and Offspring* (20 min)

 Survival Role-Play Movement Routine (10 min)

 Discussing Parent and Offspring Defenses (15 min)

On-the-Fly Assessment

Day 16 | Lesson 3.3
Offspring Defenses

 Video of Parent and Offspring Defenses (10 min)


 Explaining Parent and Offspring Defenses (10 min)


 Writing About Parent and Offspring Defenses (15 min)


 Writing About the Defenses of Spruce’s Offspring (10 min)

Critical Juncture Assessment

Day 17 | Lesson 3.4
Young Offspring


 Reading: *Parents and Offspring* (20 min)


 Survival Role-Play Movement Routine (10 min)


 Videos of Young Offspring (15 min)


On-the-Fly Assessment

Day 18 | Lesson 3.5
Exploring Parental Care

 Videos of Offspring Signals (10 min)

 Visualizing Offspring Signals (10 min)

 Survival Role-Play Movement Routine (10 min)

 Writing About Parental Care (15 min)

Chapter 4: Application to a new context

What students investigate:


In their new role as aquarium scientists, students 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.


What they figure out:


Models highlight the important parts of what we are trying to explain and help communicate ideas clearly. A model of sea turtle defenses should either show how a hard shell stops a predator from biting and eating a sea turtle or how camouflage makes a sea turtle difficult to see so predators cannot find and eat it. Models do not need to show the parts of a sea turtle that are not part of its defense.


How they figure it out:


- Learning about how scientists use models to explain their ideas during a shared reading of the big book *Frog Models*
- Evaluating models of frog defenses for effectiveness using a Modeling Checklist
- Designing and building their own models that will communicate to visitors how one of four sea animals defends itself
- Showcasing their ideas by explaining their models at an exhibition held for classroom visitors


 HANDS-ON

 READING




 STUDENT-TO-STUDENT DISCUSSION

 TEACHER




 TEACHER-LED DISCUSSION

 WRITING




Day 19 | Lesson 4.1 Frog Models

-  Introducing the Exhibit (10 min)
-  Reading: *Frog Models* (20 min)
-  Evaluating Frog Models (15 min)

Day 20 | Lesson 4.2 Making Models for the Exhibit

-  Preparing to Make Models (10 min)
-  Modeling Defenses (20 min)
-  Writing About the Model (15 min)


Day 21 | Lesson 4.3 Aquarium Animal Exhibit

-  Preparing for the Exhibit (10 min)
-  Aquarium Exhibit (20 min)
-  Reflecting on the Unit (15 min)

On-the-Fly Assessment

On-the-Fly Assessment

Day 22 | Lesson 4.4 End-of-Unit Assessment

-  Talking with Students About Their Animals and Models

End-of-Unit Assessment

All students. All standards.

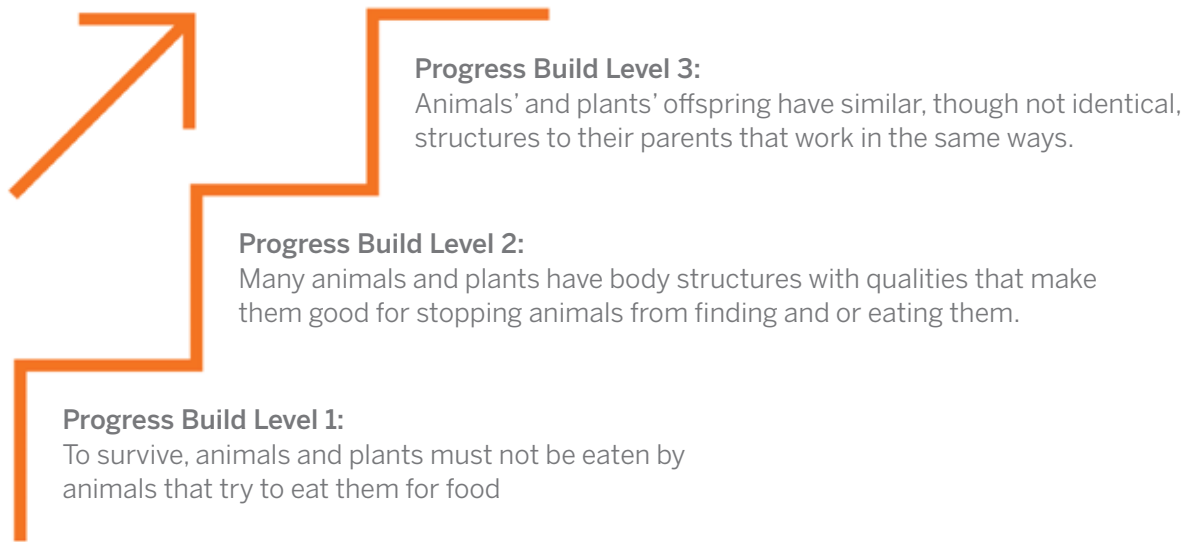
Rather than treating the standards simply as a list of topics to cover, we designed Amplify Science California to allow for truly in-depth and integrated coverage of the disciplinary core ideas (DCIs), science and engineering practices (SEPs), and crosscutting concepts (CCCs). Unlike other programs, however, we successfully made the NGSS' vision of "all students, all standards" a reality by creating a unit-specific learning progression for every unit called a Progress Build.

Each Progress Build defines several levels of understanding of the unit's anchoring phenomenon, with each level integrating and building upon the knowledge and skills from lower levels. In this way, each Progress Build provides a clear roadmap for how a students' understanding of the phenomenon is expected to deepen and develop with each successive chapter and lesson.

What's more, the program's system of assessments is also tied to these Progress Builds. This carefully crafted integration provides teachers with credible, actionable, and timely diagnostic information about student progress toward the unit's learning goals and grade-level performance expectations. Armed with this powerful data, teachers have the ultimate flexibility to decide when to move on and when to slow down and dive deeper.

Animal and Plant Defenses Progress Build

The Progress Build in this unit consists of three levels of understanding. At each level, students add new ideas and integrate them into a progressively deeper understanding of why animals' and plants' offspring are able to survive in areas where there are animals that might eat them.



Examples of differentiation in this unit

In addition to unit-specific Progress Builds that break learning goals into smaller, more achievable levels of understanding, Amplify Science California makes learning accessible for all students through a variety of scaffolds, supports, and differentiation strategies for every lesson. **For a complete list of strategies, see the Differentiation section of every Lesson Brief.**

Below are a few examples of strategies embedded in this unit.

For English learners:

- **Language support (Example from Lesson 4.1)**
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.]

For students needing more support:

- **Alternate means of expressing ideas (Example from Lesson 3.3)**
For students who may have difficulty completing the writing tasks in Activity 1, you could offer additional supports. You may provide these students with additional time to write, or have them draw pictures for the blanks on the writing planning page instead.

For students ready for a challenge:

- **Independent investigation (Example from Lesson 2.2)**
Students who need more challenge can choose another animal and investigate what it eats, how it catches its food, and how it eats it. Encourage students to note if the animal has any sharp structures used for catching or breaking apart its food. Students can gather evidence from classroom or library science books, and/or from photographs in nature magazines or websites, such as zoo websites, and then use the Structure-Function Language Frame to record and share what they have learned.

3-D Statements

In order to help teachers recognize the three-dimensional structure of every unit, chapter, and lesson, each unit contains a 3-D Statement document that makes the integration clear.

The 3-D Statement document is made all the more effective by color-coding the three dimensions for easy recognition.

KEY:

Practices

Disciplinary core ideas

Crosscutting concepts

Animal and Plant Defenses 3-D Coverage

Unit Level

Students investigate how animals and plants, as well as their offspring, use their structures to meet their needs for survival (structure and function). Students apply what they learn by developing models and constructing explanations to communicate their ideas about how aquarium animals use their defenses to survive (cause and effect).

Chapter Level

Chapter 1: How does Spruce the Sea Turtle do what she needs to do to survive?

Students analyze and interpret data to figure out that all animals and plants need air, water, food, and the ability to defend themselves from being eaten in order to survive (cause and effect). Students apply what they learn in order to explain how all plants and animals, as well as Spruce the Sea Turtle, use their specific structures to grow and survive (structure and function).

Chapter 2: How can Spruce the Sea Turtle survive where there are sharks?

Students explore plant and animal defenses by developing and using models and by obtaining information from text, images, and videos about how animals use their structures to defend themselves from predators (structure and function, cause and effect).

Chapter 3: How can Spruce the Sea Turtle's offspring survive where there are sharks?

Students investigate how animal and plant offspring survive (cause and effect). The class constructs an explanation about how Spruce the Sea Turtle's offspring will meet their survival needs by using the same structures as their parent even though the structures may look slightly different (structure and function).

Chapter 4: How can aquarium scientists explain animal defenses to the visitors?

Students develop models of different aquarium animals' defense structures and use them to explain to classroom visitors that spines, shells, and camouflage function to defend animals from predators by making the animals hard to eat or hard to find (cause and effect, structure and function).

To review the 3-D Statements at the lesson level, see the Lesson Brief section of every lesson.

3-D Statements

Animal and Plant Defenses
Teacher References

Lesson 4.2: Making Models for the Exhibit
Students develop models to show how different aquarium animals use their defensive structures to defend themselves from predators (structure and function, cause and effect). Students then use a checklist to evaluate how well their models communicate their ideas.

Lesson 4.3: Aquarium Animals
Students use models to explain (cause and effect, structure and function).

Lesson 4.4: End-of-Unit Assessment
Students meet with the teacher to discuss their models and how they use defenses to survive.

3-D Statements

Animal and Plant Defenses
Teacher References

Lesson 2.6: Modeling Camouflage
Students watch a video and revisit sections of Unit 1 books they have read so far that feature animals and plants that are camouflaged. Students then create physical models that show how camouflage works to defend animals and plants from being eaten (structure and function, cause and effect).

Lesson 2.7: Explaining Defenses
Students construct explanatory models to show how different aquarium animals use their defensive structures to defend themselves from predators (structure and function, cause and effect).

Lesson 2.8: Defending the Food Chain
Students apply their understanding of structure and function as they design solutions to protect the food chain.

Lesson 3.1: Introducing Offspring
Students obtain information about how animals and plants use their structures to defend themselves (structure and function).

Lesson 3.2: Parents and Offspring
Students investigate how parents and offspring use their structures to survive (cause and effect).

Lesson 3.3: Offspring Defenses
Students watch a video to obtain information about how offspring use the same defensive structures as their parents (structure and function).

Lesson 3.4: Young Offspring
Students model—through role play—how offspring use their structures to survive (cause and effect).

Lesson 3.5: Exploring Parental Defenses
Students analyze and interpret data about how parents use their structures to defend their offspring (cause and effect).

Lesson 4.1: Frog Models
Students ask questions and use models to explain how frogs use camouflage to keep from being eaten (structure and function).

3-D Statements

Animal and Plant Defenses
Teacher References

Lesson 1.3: Animal and Plant Structures
Students obtain and evaluate information from reading a book, watching videos, and observing one another to figure out how living things use their structures to meet their survival needs (structure and function). They then use Structure-Function Language Frames to construct explanations that connect specific structures to specific functions (structure and function).

Lesson 1.4: Surviving by Not Being Eaten
Students again play the Survival Game, which requires them to analyze and interpret data about the survival of organisms in different environmental conditions (cause and effect). As students play the game, they access prior knowledge and gain new knowledge about what an animal needs to survive.

Lesson 1.5: Explaining Sea Turtles
Students apply their understanding of structure and function as they construct an explanation about how sea turtles use their structures to survive (cause and effect).

Lesson 2.1: Whose Lunch Is It?
Students obtain and evaluate information about how animals use their structures to defend themselves from predators (structure and function).

Lesson 2.2: Sharp Structures
The class uses a physical model to show how sharp structures (like spines and shells) function to defend animals from predators (structure and function).

Lesson 2.3: Introducing Models
Students create physical models to show how different aquarium animals use their defensive structures to defend themselves from predators (structure and function, cause and effect).

Lesson 2.4: Modeling Shells
Students watch a video and read about how shells function to defend animals from predators (structure and function).

Lesson 2.5: Modeling Spines
Students watch a video and read about how spines function to defend animals from predators (structure and function).

3-D Statements

Animal and Plant Defenses
Teacher References

Key
Practices Disciplinary Core Ideas Crosscutting Concepts

Unit Level
Students investigate how animals and plants, as well as their offspring, use their structures to meet their needs for survival (structure and function). Students apply what they learn by developing models and constructing explanations to communicate their ideas about how aquarium animals use their defenses to survive (cause and effect).

Chapter Level
Chapter 1: How does Spruce the Sea Turtle do what she needs to do to survive?
Students analyze and interpret data to figure out that all animals and plants need air, water, food, and the ability to defend themselves from being eaten in order to survive (cause and effect). Students apply what they learn in order to explain how all plants and animals, as well as Spruce the Sea Turtle, use their specific structures to grow and survive (structure and function).

Chapter 2: How can Spruce the Sea Turtle survive where there are sharks?
Students explore plant and animal defenses by developing and using models and by obtaining information from text, images, and videos about how animals use their structures to defend themselves from predators (structure and function, cause and effect).

Chapter 3: How can Spruce the Sea Turtle's offspring survive where there are sharks?
Students investigate how animal and plant offspring survive (cause and effect). The class constructs an explanation about how Spruce the Sea Turtle's offspring will meet their survival needs by using the same structures as their parent even though the structures may look slightly different (structure and function).

Chapter 4: How can aquarium scientists explain animal defenses to the visitors?
Students develop models of different aquarium animals' defense structures and use them to explain to classroom visitors that spines, shells, and camouflage function to defend animals from predators by making the animals hard to eat or hard to find (cause and effect, structure and function).

Lesson Level
Lesson 1.1: Pre-Unit Assessment
Students play the Survival Game, which requires them to analyze and interpret data about the survival of organisms in different environmental conditions (cause and effect). As students play the game, they access prior knowledge and gain new knowledge about what an animal needs to survive.

Lesson 1.2: Tortoise Parts
Students read the book Tortoise Parts and observe one another using carrots in order to obtain and evaluate information about structures (body parts) that animals use to meet specific survival needs (structure and function).

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