

Animal and Plant Defenses Coherence Flowchart

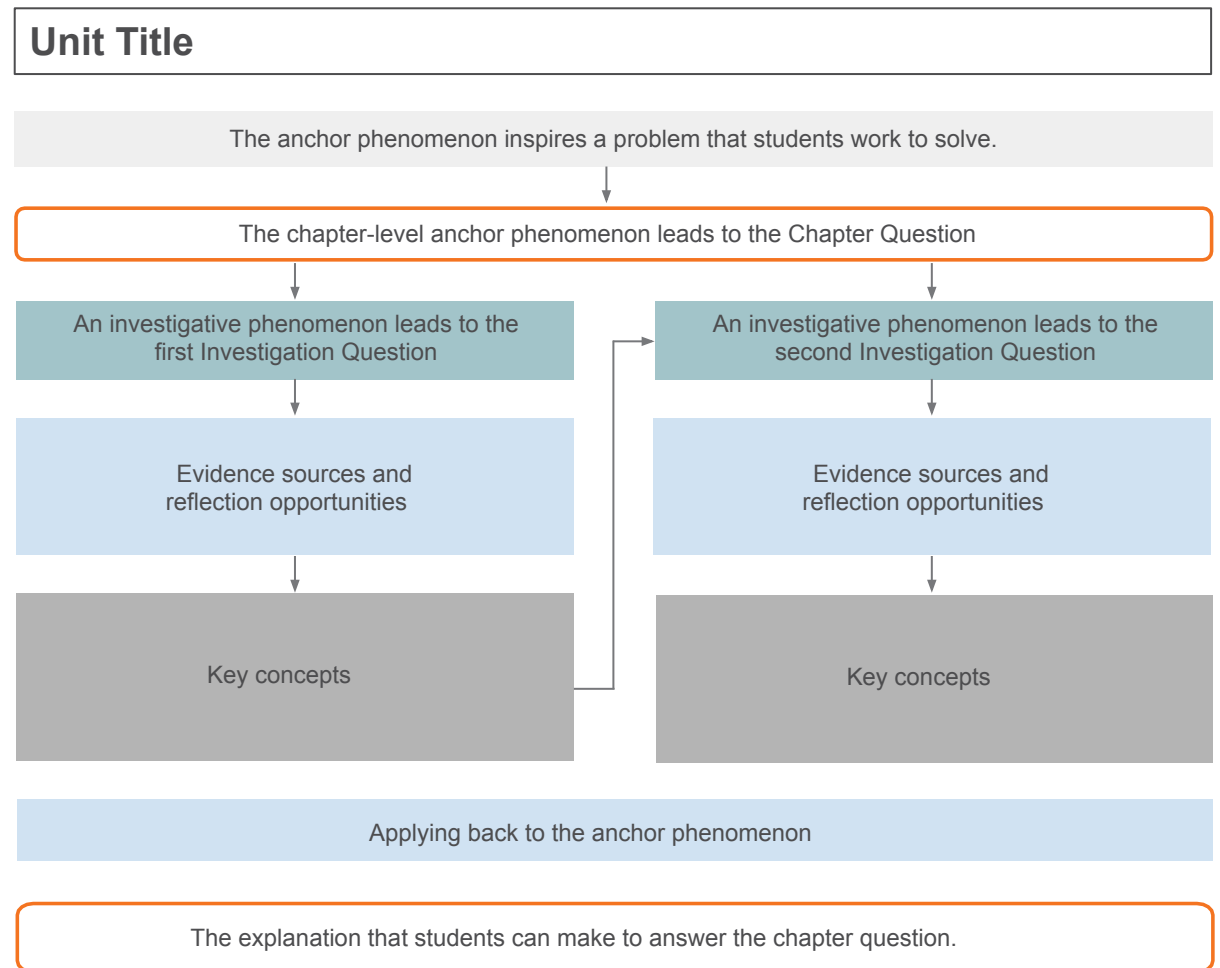
The storyline of the unit

In each Amplify Science unit, students figure out a phenomenon by asking questions, gathering evidence, and coming up with an explanation of how the phenomenon works. The Coherence Flowchart visually represents the storyline of the unit, showing the coherent flow of questions based on phenomena, evidence, and ideas that support students as they build complex explanations of the unit's anchor phenomenon. The Coherence Flowchart on the following pages (one chapter per page) can be used to see the connections between the phenomena and questions that drive students' experiences, the evidence they gather, the ideas they figure out, and the new questions that those ideas generate. The diagram to the right explains the structure of a chapter in the Coherence Flowchart.

In some units a design problem drives the investigations of the unit or of specific lessons. In these cases the design problem will be noted in place of the phenomenon.

Note: The Coherence Flowchart is a tool for teachers and is not meant to be distributed to students.

Typical structure of one chapter in a Coherence Flowchart



Instruction is framed by questions about the unit's anchor phenomenon and the related problem students are solving. Chapter Questions then guide students in figuring out the phenomenon, piece by piece. Within each chapter, investigative phenomena lead to Investigation Questions that focus students on a manageable piece of content that will help them figure out the Chapter Question. Each phenomenon leads to a question which motivates activities, and each activity provides specific evidence related to the Investigation Question. Students synthesize the understanding constructed over multiple activities, and this understanding is formalized through key concepts. Often a key concept leads students to an additional investigative phenomenon and Investigation Question students need to pursue to answer the Chapter Question. At the end of the chapter, students' new understanding is applied back to the unit's anchor phenomenon and leads students to a new Chapter Question or a final explanation.

Unit Anchor Phenomenon

Problem students work to solve

**Chapter-level Anchor Phenomenon
Chapter 1 Question**

**Investigative Phenomena
Investigation Questions**

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to problem

Explanation that students can make to answer the Chapter 1 Question

Animal and Plant Defenses: Spikes, Shells, and Camouflage

Spruce the Sea Turtle and her offspring survive in the ocean.
How can a sea turtle survive in the ocean after being released by an aquarium?

Spruce the Sea Turtle survives in the ocean.
How does Spruce the Sea Turtle do what she needs to do to survive?

Sometimes plants and animals survive.
What do animals and plants need to do to survive? (1.1)

- Play the Survival Game (1.1)

- To survive, animals and plants need to get water, air, and food. (1.1)

Plants and animals get water, air, and food.
How do animals and plants do what they need to do to survive? (1.2, 1.3, 1.4, 1.5)

- Read *Tortoise Parts* (1.2)
- Observe students eating (1.2)
- Describe structures in *Tortoise Parts* (1.3)
- Watch videos of plant and animal structures (1.3)
- Read *Spikes, Spines, and Shells* (1.3)
- Revisit the Survival Game (1.4)
- Write about how animals do what they need to do to survive. (1.4)

- Animals and plants have structures that help them do what they need to do to survive. (1.3)
- To survive, animals and plants need to get water, air, and food, and to not be eaten. (1.4)

- Gather evidence about sea turtle structures and explain how they use those structures to survive (1.5)
- Write about how Spruce does what she needs to do to survive in the ocean (1.5)

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.

Unit Anchor Phenomenon

Problem students work to solve

Animal and Plant Defenses: Spikes, Shells, and Camouflage

Spruce the Sea Turtle and her offspring survive in the ocean.
How can a sea turtle survive in the ocean after being released by an aquarium?

Spruce the Sea Turtle survives in the ocean where there are predators.
How can Spruce the Sea Turtle survive where there are sharks?

Chapter-level Anchor Phenomenon
Chapter 2 Question

Investigative Phenomena
Investigation Questions

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to problem

Explanation that students can make to answer the Chapter 2 Question

Animals eat other living things.
How do animals eat other living things? (2.1, 2.2)

- Read Whose Lunch Is This? (2.1)
- Observe videos of animals eating (2.1)
- Investigate food breaking apart (2.1)
- Act out food being broken apart (2.2)
- Revisit Whose Lunch Is This? (2.2)
- Describe animals' sharp structures for eating (2.2)
- Discuss which structures are and are not used for getting food (2.2)

• Many animals use their sharp structures to make animals and plants easier to eat. (2.2)

Sometimes animals avoid being eaten even when there are predators.
How do animals and plants defend themselves? (2.3, 2.4, 2.5, 2.6, 2.7)

- Revisit Spikes, Spines, and Shells (2.3)
- Create physical models of animal defenses (2.3)
- Observe video of shell defenses (2.4)
- Revisit Tortoise Parts and Spikes, Spines, and Shells (2.4)
- Create and discuss physical shell and armor defense models (2.4)
- Revisit Spikes, Spines, and Shells (2.5, 2.6)
- Observe video of spike defenses (2.5)
- Create and discuss spike defense models (2.5)
- Observe video of camouflage defenses (2.6)
- Create and discuss camouflage models (2.6)
- Write about one defense (2.7)
- Engage in the Survival Role-Play movement routine (2.7)

• Animals and plants have defenses, structures that keep other animals from eating them. (2.7)

Design Problem: We want to protect the aquarium's food supply from animals.
How can we use ideas about animal and plant defenses to solve a problem? (2.8)

- Write a plan to protect food supply (2.8)
- Build defenses for the aquarium food supply (2.8)

• Scientists can make things that copy animal or plant structures to solve human problems. (2.8)

- Write to explain how Spruce can use her defenses to survive once she is back in the ocean (2.7)

Spruce has body structures that function as defenses against being eaten by sharks. Spruce's shell can block a shark's sharp teeth from biting Spruce. Spruce's camouflage colors make it harder for sharks to see her.

Unit Anchor Phenomenon

Problem students work to solve

**Chapter-level Anchor Phenomenon
Chapter 3 Question**

**Investigative Phenomena
Investigation Questions**

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to problem

Explanation that students can make to answer the Chapter 3 Question

Animal and Plant Defenses: Spikes, Shells, and Camouflage

Spruce the Sea Turtle and her offspring survive in the ocean.
How can a sea turtle survive in the ocean after being released by an aquarium?

Spruce the Sea Turtle's offspring survive in the ocean.
How can Spruce the Sea Turtle's offspring survive where there are sharks?

Animal and plant offspring survive when there are predators.
How do animal and plant offspring defend themselves when they grow up? (3.2, 3.3)

- Discuss images of parents and offspring (3.1)
- Write and draw ideas about parents and offspring (3.1)
- Read Parents and Offspring (3.2)
- Engage in Survival Role-Play movement routine (3.2)
- Describe defenses of parents and offspring (3.2)
- Watch a video of parent and offspring defenses (3.3)
- Discuss and write about parent and offspring defenses (3.3)

- When animal and plant offspring grow up, they defend themselves in the same way as their parents. (3.3)

Young animal and plant offspring survive when there are predators.
How do animals and plants survive when they are young? (3.4, 3.5)

- Revisit Parents and Offspring (3.4, 3.5)
- Engage in Survival Role-Play movement routine (3.4, 3.5)
- Watch videos of young animal and plant offspring (3.4)
- Observe and discuss videos of young offspring signaling their parents for help (3.5)
- Draw and write about parental care (3.5)

- Some kinds of young offspring get help from their parents and other kinds of young offspring survive on their own. (3.5)

- Write to explain how Spruce's offspring can use their structures to survive where there are sharks (3.3)

When the sea turtle has 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. Sea turtle offspring survive on their own without help from their parents.

Unit Design Problem

Problem students work to solve

Animal and Plant Defenses: Spikes, Shells, and Camouflage

The aquarium director wants us to make models for an exhibit about how different types of animals in the aquarium defend themselves.
How can we create models that explain animal defenses?

Chapter-level Anchor Phenomenon
Chapter 4 Question

We want to explain animal defenses to aquarium visitors.
How can aquarium scientists explain animal defenses to the visitors?

Design Problem
Investigation Question

Scientists want to use models to explain their ideas to others
How do scientists make and use models to explain their ideas? (4.1, 4.2, 4.3)

Opportunities to engage in practices and apply key concepts

- Read Frog Models (4.1)
- Evaluate Frog Models (4.1)
- Plan, make, evaluate, and update models of an aquarium animal's defense (4.2)
- Write about defense models (4.2)
- Present animal defense models (4.3)

Practice that students can do in response to the Chapter 4 Question

Students can more independently create models to explain animal defenses to the visitors, which highlight the important parts of what they are trying to explain.