Mystery science

Anchor Layer Teacher Guide

A curriculum companion for Anchor Layer users

Grade 4

Animal & Plant Adaptations

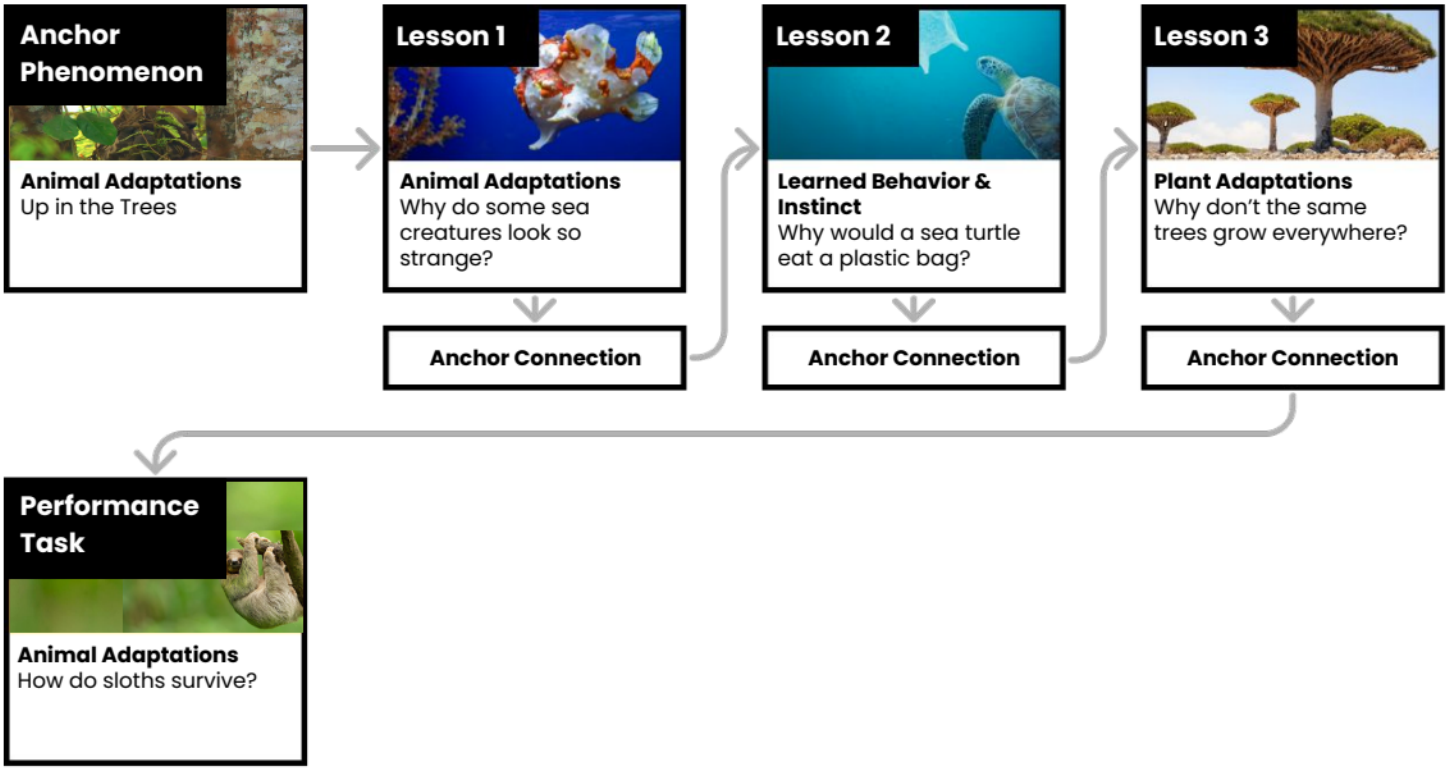
Unit Web Link • Pacing Guide • Other Units

Last Updated 5/31/2024

Unit Summary

In this unit, students explore the adaptations of animals and plants. Students investigate how the external and internal structures of an organism work together as an interconnected system that aids in their growth and survival. They also use models to explore how a combination of instincts and memories influence animal behavior.

Performance Expectations	Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. • 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.	• Engaging in Argument from Evidence • Developing and Using Models • Constructing Explanations and Designing Solutions	• LS1.A: Structure and Function • LS1.D: Information Processing	• Systems and System Models



Anchor Phenomenon Background

How can such a slow-moving animal survive?

The idea of survival of the fittest is one of most widely-known ideas in all of science. It seems so clear that an animal will be more likely to survive if it is big, strong, fast, and aggressive. A sloth seems to defy all of these things: sloths are one of the slowest-moving mammals, and they spend almost all of their time completely still and quiet up in trees. How can an animal like this survive?

It turns out that being the fittest does not always mean that it's better to be big, strong, fast, and aggressive. Sloths have behavioral and physical adaptations that allow them to survive with lower needs.

One of the defining features of sloths is how slowly they move. It may seem like this is a weakness, but it is one of their biggest strengths. By resting frequently and moving slowly, sloths conserve their energy. That means that they don't need to eat much food. Animals that are very large and fast may require huge amounts of food to survive—but not sloths!

Sloths spend almost their entire lives up in the trees. This is where they find leaves and other foods to eat, it's where they hide from predators, and it's where they raise their young. Humans would get very tired trying to hold on and keep their balance up in trees. But sloths have special claws and muscles that allow them to hang upside down from branches nearly indefinitely without getting tired.

Anchor Phenomenon: Up in the Trees
Animal Adaptations

Anchor Phenomenon
15 mins

Guided Inquiry
20 mins

Hands-On Activity
20 mins

Wrap-Up
2 mins

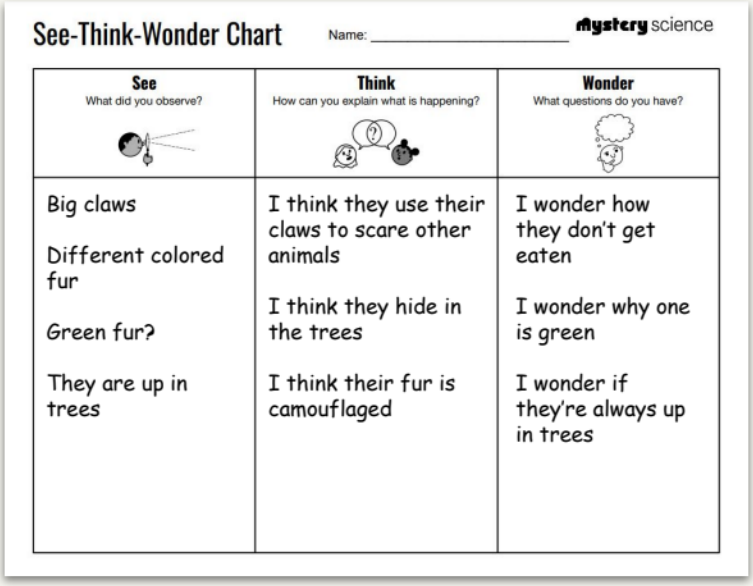
Anchor Phenomenon Lesson Overview

Note: This lesson is part of this unit's Anchor Layer. If you have the Anchor Layer turned on, we recommend teaching all lessons in the remainder of this unit in order.

The anchor phenomenon for this unit is an animal that seems to defy the idea of survival of the fittest: the sloth! How can such a slow-moving animal be so good at survival? Students generate observations and questions about the phenomenon and document their initial thinking about how sloths are able to survive..

Student Work Samples & Notes

Students will gather clues during and after each lesson to help them improve their explanation. It is important to encourage students to recognize that even if they don't know the perfect answer yet, they are going to learn a lot throughout the unit and will have an opportunity to change or add to their first explanation.



See-Think-Wonder Chart Name: _____ Mystery science

See What did you observe?	Think How can you explain what is happening?	Wonder What questions do you have?
Big claws Different colored fur Green fur? They are up in trees	I think they use their claws to scare other animals I think they hide in the trees I think their fur is camouflaged	I wonder how they don't get eaten I wonder why one is green I wonder if they're always up in trees

Lesson 1: Why do some sea creatures look so strange?
Animal Adaptations (pg 1 of 2)

Exploration
10 mins

Hands-On Activity
35 mins

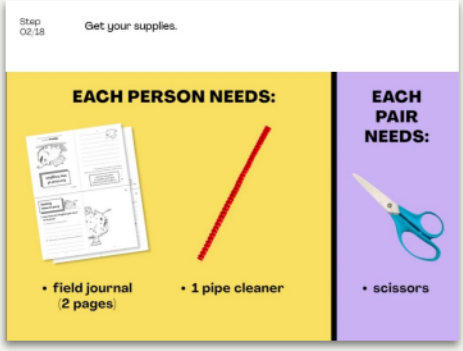
Wrap-Up
10 mins

Anchor Connection
20 mins

Overview

In this lesson, students make observations of an underwater animal, a frogfish, in order to collect evidence that its external structures serve specific functions.

In the activity, Frogfish Finder, students use their observations to construct an argument that the frogfish has external and internal structures that work together as part of a system to support their growth and survival.



Activity Notes

We suggest students work in pairs. Homeschool students can work on their own.

Anchor Connection on Next Page

Lesson 1: Why do some sea creatures look so strange?
Animal Adaptations (pg 2 of 2)

Exploration
10 mins

Hands-On Activity
35 mins

Wrap-Up
10 mins

Anchor Connection
20 mins

Anchor Connection

All animals use their body parts along with specific behaviors in order to support their survival. This is true for frogfish and for sloths.

Sloths hide up in trees and stay very still in order to conserve energy and hide from predators. They have special claws that allow them to hold onto branches securely for very long periods of time. If they didn't have these special body parts, they wouldn't be able to hide up in the trees.

Students revisit the explanation and/or drawing that they worked on during the Anchor Phenomenon. They can revise their thinking by explaining that the their behaviors and body parts work together to allow them to remain in the trees for long periods of time.

Connecting Storyline Question

How do sloths know that they should stay up in the trees?

Lesson 2: Why would a sea turtle eat a plastic bag? (pg 1 of 2)
Learned Behavior & Instinct

Exploration
10 mins

Hands-On Activity
40 mins

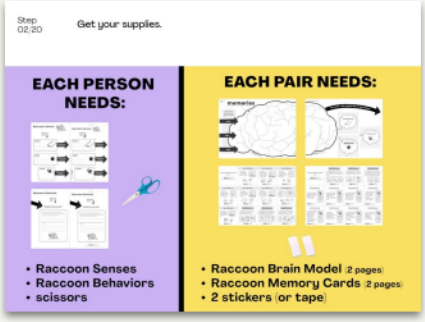
Wrap-Up
10 mins

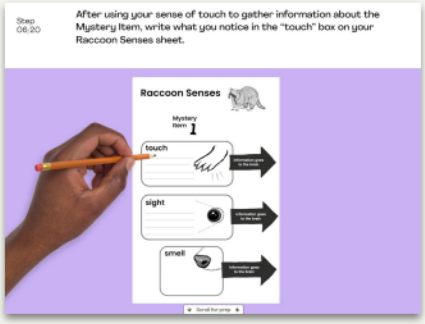
Anchor Connection
20 mins

Overview

In this lesson, students explore how animals receive information through their senses and process that information in their brain, using instincts and memories to guide their behaviors.

In the activity, Raccoon Reactions, students use models to understand how an animal's senses, brain, and memories all work together as a system to influence their behavior and support their survival.





Activity Notes

We suggest students work in pairs. Divide the paper bags into two equal piles. We suggest labeling each bag in the first pile "1" and each bag in the second pile "2." These will correspond to "Mystery Item 1" and "Mystery Item 2" in the activity.

Place one cotton ball into each bag in the first pile. You'll distribute one of these bags to each pair of students in Step 5 of the activity.

Place one small square of aluminum foil into each of the other bags. Try to avoid squeezing the foil into a ball because that will make it difficult for students to feel the texture. You'll distribute one of these bags to each pair of students in Step 15 of the activity.

Ensure that each pair of students has enough space to lay out their Raccoon Brain models and the Memory Cards. Two student desks side-by-side should be sufficient.

Anchor Connection on Next Page

Lesson 2: Why would a sea turtle eat a plastic bag? (pg 2 of 2)
Learned Behavior & Instinct

Exploration
10 mins

Hands-On Activity
40 mins

Wrap-Up
10 mins

Anchor Connection
20 mins

Anchor Connection

All animals learn things over the course of their lives. For many animals, this can include learning complex behaviors, such as how to find and eat the right kinds of food and how to stay safe.

Baby sloths are no exception. They have to learn how to climb in the trees and how to find food to eat. They get help from their mothers while learning these things, and they remember what they have learned throughout their lives. This is an important reason why sloths are such good survivors.

Connecting Storyline Question

Where do sloths live?

Lesson 3: Why don't the same trees grow everywhere?
Plant Adaptations (pg 1 of 2)

Exploration
10 mins

Hands-On Activity
40 mins

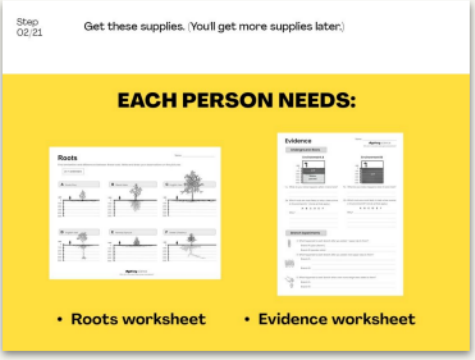
Wrap-Up
20 mins

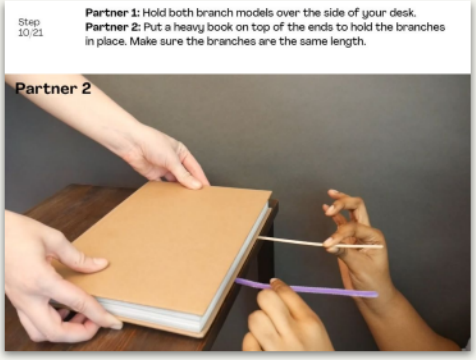
Anchor Connection
20 mins

Overview

In this lesson, students make observations of external and internal parts of trees in order to collect evidence that these structures work together as a system to help plants survive in a particular environment.

In the activity, Tree Detective, students use models of roots and branches to explore their functions and then construct an argument about how these structures must work together in order to support the survival of trees in the unique environment of the frozen taiga.





Activity Notes

We suggest students work in pairs.

This activity involves pairs of students working together to create codes and then separating from one another to communicate those codes over a distance. Ideally student pairs will stand across the room from one another, but you may need to modify depending on your classroom.

You can choose to provide whatever materials you'd like for students to use for their codes. We suggest at least some paper and crayons. But you can include flashlights, musical instruments, or anything you'd like to encourage student creativity in their visual and sound code creation.

Anchor Connection on Next Page

Lesson 3: Why don't the same trees grow everywhere?
Plant Adaptations (pg 2 of 2)

Exploration
10 mins

Hands-On Activity
40 mins

Wrap-Up
20 mins

Anchor Connection
20 mins

Anchor Connection

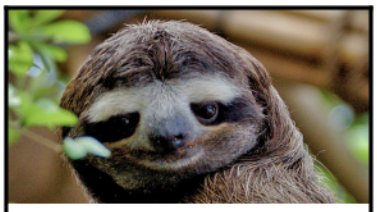
The environment makes a huge difference in which sorts of adaptations plants and animals need to survive. If a plant or animal lives in a place with very cold weather, they need adaptations to help them survive in those conditions. Sloths actually require a warm environment, and it isn't just because they don't like being cold.

One of the most interesting things about sloths is that they can't digest their own food. They rely on microbes in their stomachs to digest their food. And those microbes can't survive if the sloth gets too cold. If the microbes can't survive, then the sloth can't survive either. So, a big part of the reason that sloths survive is because they live in a part of the world where it is warm all year.

Connecting Storyline Question

How do all of the body parts and behaviors of a sloth work together?

Performance Task: How do sloths survive?
Animal Adaptations



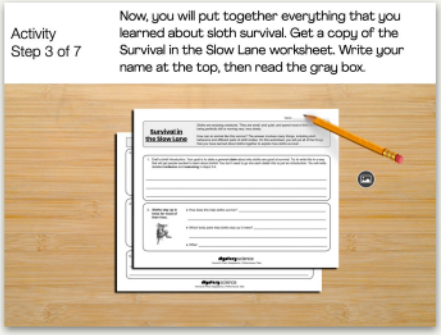
Unit Review
15 mins

Hands-On Activity
60 mins

Overview

In the performance task, students engage in evidence-based argumentation to explain how it is possible for sloths to survive.

The performance task begins with a brief unit review and moves into a step-by-step walkthrough of the student worksheet. At the end of the performance task, you can choose what you would like for your students to do next. You can have them compose a five-paragraph essay as a writing task, create a presentation, or create a poster.



Performance Task Notes

We recommend having students work individually or in groups of two.

The packet serves as an opportunity for students to draft the pieces of their argument. Once they have completed their drafts, you can extend their experience by having them compose a five-paragraph essay as a writing task, create a presentation, or create a poster.

Crosscutting Concepts

Systems and System Models: All living things can be viewed as systems of interacting parts and processes. All animals have physical body parts that work together to support their growth and survival. Sloths are no exception.

Sloths survive because each one of their body parts and behaviors interacts with one another and supports one another within the environment where they live. By understanding each of these aspects of the sloth system, we can explain how they are able to defy the odds and be successful survivors!