# Combined K-5 Mystery Science Planning Guide

Kindergarten Planning Guide | Grade 1 Planning Guide | Grade 2 Planning Guide
Grade 3 Planning Guide | Grade 4 Planning Guide | Grade 5 Planning Guide
Combined K-5 Planning Guide

## What is Included in this Document?

### Grade Level Pacing Guides

The Pacing Guide is a resource to support your year-long planning. The units can be taught in any order. In most units, the lessons build on one another. Therefore, we strongly recommend the lessons within each unit are taught in the sequence they are presented. Extensions are available for each lesson and offer an opportunity for students to continue their science content learning. They include assessments and a curated collection of additional activity suggestions, online resources, project ideas, and readings.

### Mystery Science - NGSS Alignment

Mystery Science is aligned to the Next Generation Science Standards (NGSS). Each lesson is aligned to a topic, performance expectation, science and engineering practice, disciplinary core idea, and crosscutting concept. This document explains how each lesson is aligned to the Next Generation Science Standards. If you are interested in anchoring phenomena, we suggest using our Anchor Layer feature and exploring our NGSS Storylines.

### Generate Activity Supply Lists

To make planning easier, you can generate supply lists by grade, classroom, unit, or lesson using our Supply Calculator.

# Kindergarten

Mystery Science recommends teaching the lessons within each unit in the order they are presented. The units themselves can be taught in any order. The lesson (exploration & activity) is designed to take 30-45 minutes per week. Extensions can expand upon each lesson. The Read-Along lessons offer an opportunity to develop students' literacy as they learn science.

| | Animal Secrets (4-8 weeks) | Plant Secrets (3-6 weeks) | Wild Weather (3-6 weeks) | Circle of Seasons (3-6 weeks) | Sunny Skies (3-6 weeks) | Force Olympics (6-9 weeks) |
|---|---|---|---|---|---|---|
| **Week 1** | Lesson 1: Why do woodpeckers peck wood? ***(K-LS1-1)*** | ✨**New!**✨ Lesson 1: Are plants alive? ***(K-LS1-1)*** | Lesson 1 Read-Along: How can you get ready for a big storm? ***(K-ESS3-2)*** | Lesson 1 Read-Along: How do you know what to wear for the weather? ***(K-ESS2-1)*** | Lesson 1 Read-Along: How could you walk barefoot across hot pavement without burning your feet? ***(K-PS3-1, K-PS3-2)*** | Lesson 1: What's the biggest excavator? (***Foundational for K-PS2-1, K-PS2-2)*** |
| **Week 2** | Lesson 2 Read-Along: Where do animals live? ***(K-ESS3-1)*** | Lesson 2: How do plants and trees grow? ***(K-LS1-1)*** | Lesson 2: Have you ever watched a storm? ***(K-ESS2-1)*** | Lesson 2: What will the weather be like on your birthday? ***(K-ESS2-1)*** | Lesson 2: How could you warm up a frozen playground? (***K-PS3-1, K-PS3-2, K-2-ETS1-2, K-2-ETS1-3)*** | Lesson 2 Read-Along: Why do builders need so many big machines? (***Foundational for K-PS2-1, K-PS2-2)*** |
| **Week 3** | Lesson 3: How can you find animals in the woods? ***(K-LS1-1)*** | Lesson 3 Read-Along: Why would you want an old log in your backyard? ***(K-ESS3-3)*** | Lesson 3: How many different kinds of weather are there? ***(K-ESS2-1)*** | Lesson 3: Why do birds lay eggs in the spring? ***(K-ESS2-1, K-ESS2-2)*** | Lesson 3: Why does it get cold in winter? ***(K-PS3-1,)*** | Lesson 3: How can you knock down a wall made of concrete? ***(K-PS2-1 and K-PS2-2)*** |
| **Week 4** | Lesson 4 Read-Along: How do animals make their home in the forest? ***(K-ESS2-2)*** | | | | | Lesson 4 Read-Along: How can you knock down the most bowling pins? ***(K-PS2-1)*** |
| **Week 5** | | | | | | Lesson 5: How can we protect a mountain town from falling rocks? ***(K-PS2-2, K-2-ETS1-2, K-2-ETS1-3)*** |
| **Week 6** | | | | | | Lesson 6 Read-Along: How could you invent a trap? ***(K-PS2-2, K-2-ETS1-2)*** |

***Lesson Extensions.*** Extensions are available for each lesson and offer an opportunity for students to continue their science content learning. They include assessments and a curated collection of additional activity suggestions, online resources, project ideas, and readings.

| More Science each week | Longer Science units | Cross Curricular Integration |
|---|---|---|
| Use items from the Extensions if you have more time. | Add a week after each lesson to teach items from the Extensions. | If you want to extend the lesson during literacy time, use reading and writing Extensions. |

# Animal Secrets (4-8 weeks)

*Animal Needs*

## Kindergarten Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students use observations to understand what animals need to survive. Students explore how animals need things to eat and a safe place to live.

| Kindergarten Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>Why do woodpeckers peck wood? | K-LS1-1 | Animal Needs: Food | All animals need to find food in order to survive. They go about finding food in different ways, but all animals have this need in common. Knowing that animals have this need can help you find animals where you live, as well as help you make sense of their behaviors.<br><br>**DCIs: LS1.C** | Students **obtain information through observations** of different animal behaviors. They use evidence from their observations to **argue** for their **explanation** of why animals are acting in these ways. Students act out the behaviors of different animals. | Students study animal behaviors to identify the **pattern** that all animals have behaviors that include seeking out food to survive. |
| Lesson 2 Read-Along<br>Where do animals live?<br>📖 | K-ESS3-1 | Animal Needs: Shelter | Living things need food, water, shelter, and many other resources to survive! All living things live in places that provide the needs they have to survive. Not all living things live in a house, like humans do. Animals live in many different types of homes close to their resources.<br><br>**DCIs: ESS3.A** | Students **obtain information** through media about how different animal homes are built. They **communicate this information** in order to identify patterns in the natural world. | Students identify the **pattern** that all living things live where their needs are met. They recognize that plants, animals, and their surroundings make up a **system** as parts that work together. |
| Lesson 3<br>How can you find animals in the woods? | K-LS1-1 | Animal Needs: Safety | All animals need to find safety (protection) in order to survive. They go about finding safety in different ways, but all animals have this need in common. Knowing that animals have this need can help you find animals where you live, as well as help you make sense of their behaviors.<br><br>**DCIs: *Extends* LS1.C** | Students **obtain information through observations** of different animal behaviors. They use evidence from their observations to **argue** for why animals are acting in these ways. Students act out the behaviors of different animals. | Students study animal behaviors to identify the **pattern** that all animals have the behavior seeking out safety to survive. |
| Lesson 4 Read-Along<br>How do animals make their home in the forest?<br>📖 | K-ESS2-2 | Animals & Changing the Environment | All living things need food and safety to survive. Animals can't always find shelter or something to eat lying around, so they have to change their environment to meet their needs. Animals change the environment in many ways - they dig for food, build homes, create hiding spots, and much more!<br><br>**DCIs: ESS2.E** | Students take a nature walk to **carry out an investigation** exploring which types of animals live around them and what their homes are like. They **analyze and interpret data** by using their observations to describe the patterns they see. | Students begin to recognize that plants, animals, and their surroundings make up a **system** as parts that work together. |

# Plant Secrets (3-6 weeks)

*Plant Needs*

## Kindergarten Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students use observations to understand what plants need to survive. Students explore how plants need water and sunlight. They also observe how plants grow from seed to seedling.

| Kindergarten Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| ✨**New!**✨<br>Lesson 1<br>Are plants alive? | K-LS1-1 | Living vs Non-Living | All living things have needs. Animals need food and water in order to stay healthy. Even though their needs are different, plants also have needs. Plants need water and sunlight. Therefore, plants are alive! Non-living things like rocks don't have needs.<br><br>**DCIs: LS1.C** | Students observe plants when their needs are met and when their needs aren't met. They **analyze and interpret** these observations to understand that plants need water and sunlight. And, because they have needs, plants are living things. | Students discover the **pattern** that living things have needs (food & water for animals; water & sunlight for plants). Non-living things like rocks don't have needs. |
| Lesson 2<br>How do plants and trees grow? | K-LS1-1 | Plant Needs: Water & Light | Plants are alive, just like animals. They grow over time, and have similar needs (like water). However, there are some big differences between plants and animals. Plants don't have legs… so you won't see them walking around. They also don't have mouths or eat food the way we do. They need water *and* sunlight.<br><br>**DCIs: LS1.C** | Students **carry out an investigation** to determine what plants need to grow. They grow radish seeds and **make observations** of their plants. Students **analyze and interpret** their observations of what the plants need, but also how they respond to light. | Students study plant growth to identify the **pattern** that all plants need water. They also observe the **pattern** that plants lean towards the light. |
| Lesson 3 Read-Along<br>Why would you want an old log in your backyard?<br>📖 | K-ESS3-3 | Animal Needs & Changing the Environment | People make changes to their environment so that they can live comfortably. They cut down trees, use energy to produce materials and products, and much more. When people make changes to their environment they use resources needed by other living things. It is important to make choices that reduce our impact on the habitat we share.<br><br>**DCIs: ESS3.C** | Students **obtain and evaluate information** by virtually keeping watch on a log and reporting about the living things that visit it. They **communicate information** by drawing a log and the animals that would use it as their habitat. | Students consider the **cause and effect** relationship between the changes people make to their environment and the impact it has on other living things that share their habitat. |

# Wild Weather (3-6 weeks)

*Severe Weather & Weather Forecasting*

## Kindergarten Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

In this unit, students explore storms and severe weather! They obtain information from weather forecasts to prepare for storms and stay safe. They also practice describing the various characteristics of weather (wind, clouds, temperature, and precipitation) in order to make their own predictions about storms.

| Kindergarten Earth and Space Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1 Read-Along<br>How can you get ready for a big storm?<br>📖 | K-ESS3-2 | Severe Weather & Preparation | Weather is usually mild but it can quickly become severe. Weather tracking helps us know when to prepare for severe weather. Weather forecasting provides information about approaching storms and severe weather so that we can be prepared and stay safe.<br><br>**DCIs: ESS3.B** | Students **obtain information** through virtual observations of different types of severe weather - thunderstorms, hurricanes, tornadoes, and blizzards. They use this information to **ask questions** about what is needed in order to be prepared and stay safe during these different types of severe weather. | Students explore the **cause and effect** relationship between weather tracking and storm preparation. |
| Lesson 2<br>Have you ever watched a storm? | K-ESS3-2<br>K-ESS2-1 | Wind & Storms | One of the ways to forecast weather is to pay close attention to the sky, clouds, and wind. You can usually tell when a thunderstorm is approaching because the sky gets darker and the wind starts to blow harder. You can use information about the wind to describe the weather and prepare for approaching storms.<br><br>**DCIs: ESS3.B, ESS2.D** | Students create a Breeze Buddy, a simple tool that allows them to observe how hard the wind is blowing. They use this tool to **obtain information** about the wind and **ask questions** about other ways to forecast the weather. | Students explore the **cause and effect** relationship between weather tracking and storm preparation. |
| Lesson 3<br>How many different kinds of weather are there? | K-ESS2-1 | Weather Conditions | The weather is always changing around us! For example, sometimes we need a coat, or an umbrella, and other days we don't. Weather isn't just one thing, there are different factors that affect the weather. When you are a weather watcher, you observe the weather around you.<br><br>**DCIs: ESS2.D** | Students **obtain information** through observations of the weather. They **communicate the information** by acting as a weather watcher and creating drawings of the weather conditions. | Students observe weather **patterns**. They understand weather as a pattern in the natural world. |

# Circle of Seasons (3-6 weeks)

*Weather Patterns & Seasons*

## Kindergarten Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

In this unit, students gather evidence in order to identify daily and seasonal weather patterns. They use those patterns to explain mysteries like why you might lose your jacket during the day or why birds lay their eggs at certain times of the year.

| Kindergarten Earth and Space Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1 Read-Along<br>How do you know what to wear for the weather?<br>📖 | K-ESS2-1 | Local Weather & Daily Patterns | Weather changes exhibit patterns over time and one such pattern is the change throughout the day. It is usually cooler in the mornings and evenings when the Sun isn't out, and warmer in the afternoon when the Sun is shining high above us.<br><br>**DCIs: ESS2.D** | Students track the weather daily and **analyze the data** by collecting, recording, and sharing their observations. They act as weather reporters and **ask questions** based on observations of weather to find out more information about the natural world. | Students observe weather **patterns**. They understand temperature changes throughout the day as a **pattern** in the natural world. |
| Lesson 2<br>What will the weather be like on your birthday? | K-ESS2-1 | Seasonal Patterns | Weather has patterns throughout each day, but there are also patterns throughout the year. Each season has its own type of weather! Winter is cold, snowy, and trees are bare; spring is warmer, rainy, and new leaves begin to grow; summer is hot and trees have a lot of leaves; autumn is chilly and the leaves begin to fall. These seasons repeat in a cyclical pattern.<br><br>**DCIs: ESS2.D** | Students **obtain and evaluate information** in a series of unnamed drawings of each season. They use clues in the picture to **argue** for the season they think the picture represents. Next, they use these clues to sequence the seasons in the correct cycle. | Students use their observations of the weather in each season to identify **patterns**. They determine the order of the seasons, and notice the **pattern** that all four seasons repeat each year. |
| Lesson 3<br>Why do birds lay eggs in the spring? | K-ESS2-1<br>K-ESS2-2 | Animals Changing Their Environment | Seasonal weather patterns affect the environment and the organisms that live in those environments. For example, birds lay their eggs in the spring. Birds do this because there is enough food available in the spring and summer and this allows enough time for the eggs to hatch and the chicks to grow. They construct their nests using materials that are available in their surrounding environment.<br><br>**DCIs: ESS2.D, ESS2.E** | Students **develop** a bird nest **model**. They use this model to **construct an argument** that birds use material around them to change their environment to keep their eggs and baby birds safe. | Students observe how the **structure** of a bird nest enables them to **function** in keeping eggs and baby birds safe. |

# Sunny Skies (3-6 weeks)

*Sunlight & Warmth*

## Kindergarten Mystery Science & NGSS Alignment - Physical Science (PS)

In this unit, students make observations to explore how sunlight warms the Earth's surface. The Sun's energy heats up the pavement, keeps us warm, and can even melt marshmallows. Using what they learn, students think about ways that shade and structures can reduce the warming effect of the Sun.

| Kindergarten Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1 Read-Along<br>How could you walk barefoot across hot pavement without burning your feet?<br>📖 | K-PS3-1<br>K-PS3-2<br>K-2-ETS1-1<br>K-2-ETS1-3 | Sunlight, Heat, & Earth's Surface | The Sun warms Earth's surface. Keya observes this when she's at the pool one day and needs to get to the ice cream truck without her shoes! She realizes that places which get a lot of sunlight have warmer temperatures, and shaded places that get less sunlight have cooler temperatures. She uses that information to find a cool path to the ice cream!<br><br>**DCI's: PS3.B, ETS1.A, ETS1.C** | Students make observations to define the problem that Farmer Josie's cows need shade in order to stay cool. Then, through a series of steps,they **design a solution** to build a shade structure that can reduce the warming effect of sunlight for the cows. | Students consider the **effect** of direct sunlight on an area and how that **causes** surfaces to heat up. They also examine how shade structures can reduce the warming **effect** of the Sun. |
| Lesson 2<br>How could you warm up a frozen playground? | K-PS3-1<br>K-PS3-2*<br>K-2-ETS1-2<br>K-2-ETS1-3 | Sunlight, Warming, & Engineering | The Sun gives off *so* much light and heat that it warms the Earth's surface. If a place doesn't get enough sunlight, it becomes very cold. Engineers can solve this problem by designing a tool that increases the warming effect of the sun on a specific place.<br><br>*This lesson uses an activity that *increases* the warming effect of sunlight on an area.<br><br>**DCI's: PS3.B, ETS1.B, ETS1.C** | Students **define the problem** that Chill City, a valley town surrounded by mountains, does not get enough sunlight in the winter. Using various materials, they **carry out an investigation** to test which materials can redirect sunlight. Using this information, they **design a solution** to help bring sunlight to various locations in Chill City. | Students consider the **cause and effect** relationship between sunlight exposure and the temperature on Earth's surface. |
| Lesson 3<br>Why does it get cold in winter? | K-PS3-1<br>K-PS3-2 | Sunlight & Warmth | The Sun warms Earth's surface throughout the year. The pattern of the arc of the Sun in the Sky and the duration of time the Sun is in the sky throughout the day is part of the reason why it's warm during the summer and cold during the winter.<br><br>**DCI's: PS3.B** | Students **construct an explanation** for why marshmallows melt in one car and not in another car. Then, to test this explanation, they **conduct a** virtual **investigation** to determine that the warmth of the Sun is the cause of the melted marshmallows. | Students consider the **effect** of parking a car in a sunny area and how the heat of the Sun can **cause** things to heat up and melt. |

# Force Olympics (6-9 weeks)

*Forces, Machines, & Engineering*

## Kindergarten Mystery Science & NGSS Alignment - Physical Science (PS)

In this unit, students are introduced to pushes and pulls and how those affect the motion of objects. Students observe and investigate the effects of what happens when the strength or direction of those pushes and pulls are changed.

| Kindergarten Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>What's the biggest excavator? | Foundational for<br>K-PS2-1<br>K-PS2-2 | Pushes & Pulls | Machines multiply the work a human can do - making the work easier! A machine's force is stronger than a human's force. For example, digging a hole takes less work with a shovel than it does with your hands. It takes even less work if you use a bigger machine, like a bulldozer!<br><br>**DCIs: *Foundational* for PS2.A, PS2.B, PS2.C** | Students **obtain information** through observations of different machines. They use evidence from their observations to **argue** for their **explanation** of why machines make work easier. Students act out the "work words" of different machines. | Students consider the **effects** that machines can have when completing a task. |
| Lesson 2 Read-Along<br>Why do builders need so many big machines?<br>📖 | Foundational for<br>K-PS2-1<br>K-PS2-2 | Pushes, Pulls & "Work Words" | There are many different types of machines and each one has a unique job. Machines help people by making their work faster and easier. Machines help people do things like dig, lift, dump, push, and mix! Without machines, it would take a lot longer to build new things.<br><br>**DCIs: *Foundational* for PS2.A, PS2.B, PS2.C** | Students **obtain information** through footage of different construction equipment being used in different ways. Student **communicate about the information** by discussing what each machine does using "work words". | Students consider the **cause and effect** relationship between the movement of a machine and the work it can do. |
| Lesson 3<br>How can you knock down a wall made of concrete? | K-PS2-1<br>K-PS2-2 | Motion, Speed, & Strength | Machines create pushes and pulls, or "forces". A wrecking ball is a machine that uses a push to knock things over. By changing the strength and direction of the push, you can make the force larger or smaller.<br><br>**DCIs: PS2.A, PS2.B, *Foundational* PS3.C and ETS1.A** | Students **carry out an investigation** to determine how far back they should pull their **model** wrecking ball to knock down a wall, but not the houses behind it. They **analyze the data** collected in their investigation to discuss how the force of the wrecking ball changes when you change the strength and direction of its push. | Students analyze the **effect** of changing the strength and direction of a wrecking ball's push. They experiment with different heights to determine how the push, or force, is changed. |

*(continued)*

# Force Olympics (6-9 weeks)

*Forces, Machines, & Engineering*

## Kindergarten Mystery Science & NGSS Alignment - Physical Science (PS)

| Kindergarten Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4 Read-Along<br>How can you knock down the most bowling pins?<br>📖 | K-PS2-1 | Speed & Direction of Force | To move an object farther or faster, a bigger push or pull is needed. When objects collide they push on one another causing a change in direction and speed. By changing the force acting on an object, you can change the motion of the object.<br><br>**DCIs: PS2.A, PS2.B, *Foundational PS3.C*** | Students **carry out an investigation** by 'bowling' with solo cups (pins), a tennis ball (bowling ball), and pool noodles (bumpers). They explore the forces at work when one thing hits another, and how changing the size of the force affects the motion of an object. | Students analyze the **cause and effect** relationship between the size of the force on an object and the direction or speed it goes. |
| Lesson 5<br>How can we protect a mountain town from falling rocks? | K-PS2-1<br>K-PS2-2<br>K-2-ETS1-2<br>K-2-ETS1-3 | Direction of Motion & Engineering | Pushes and pulls can have different strengths. The faster an object moves, or the larger it is, the stronger it pushes on something when it bumps into it. Sometimes a push or pull is so strong that it makes an object start moving, or stop moving! Pushing or pulling on an object can even change the direction an object is going. We can use scientific knowledge to help people solve a problem.<br><br>**DCIs: PS2.A, PS2.B, PS3.C, ETS1.B, ETS1.C** | Students use a **model** of a mountain town, Tiny Town, to **conduct an investigation** of how to protect the town from a falling boulder. They **design a solution** to safely guide a boulder down the hill so it doesn't hit the town and rolls into a dump truck. Using pushpin poles, students change the direction the boulder is rolling. | Students consider the **cause and effect** relationship between a force and an object's speed or direction. |
| Lesson 6 Read-Along<br>How could you invent a trap?<br>📖 | K-PS2-2<br>K-2-ETS1-2 | Forces & Engineering | Inventors design solutions to solve problems. Anyone can be an inventor! Inventors create new ideas, and many use engineering and design to help them. Inventors use their knowledge to create something new. In this story, two inventors use a pull to help them solve a problem.<br><br>**DCIs: PS2.A, ETS1.A, ETS1.B, ETS1.C** | Students **design a solution** to help the boo characters solve a problem. Then, they **define a problem** by choosing a chore they don't like doing. Next, they **design solution** by sketching a machine that could help them. They compare their solutions with a partner. | Students consider the **structure and function** of existing materials and tools in order to create new uses for them in order to solve a problem. |

# Grade 1

Mystery Science recommends teaching the lessons within each unit in the order they are presented. The units themselves can be taught in any order. The lesson (exploration & activity) is designed to take 30-45 minutes per week. Extensions can expand upon each lesson. The Read-Along lessons offer an opportunity to develop students' literacy as they learn science.

| | Animal Superpowers (5-10 weeks) | Plant Superpowers (3-6 weeks) | Sun & Shadows (4-8 weeks) | Moon & Stars (3-6 weeks) | Lights & Sounds (6-9 weeks) |
|---|---|---|---|---|---|
| **Week 1** | ✨New!✨ Lesson 1: How can you help a lost baby animal find its parents? ***(1-LS3-1)*** | ✨New!✨ Lesson 1: What will a baby plant look like when it grows up? ***(1-LS3-1)*** | Lesson 1: Could a statue's shadow move? ***(1-ESS1-1)*** | ✨New!✨ Lesson 1: When can you see the full moon? ***(1-ESS1-1)*** | Lesson 1: How do they make silly sounds in cartoons? ***(1-PS4-1)*** |
| **Week 2** | Lesson 2: Why do birds have beaks? ***(1-LS1-1)*** | Lesson 2: Why don't trees blow down in the the wind? ***(1-LS1-1, K-2-ETS1-2, K-2-ETS1-3)*** | Lesson 2 Read-Along: What does your shadow do when you're not looking? ***(1-ESS1-1)*** | Lesson 2: Why do the stars come out at night? ***(1-ESS1-1)*** | Lesson 2 Read-Along: Where do sounds come from? ***(1-PS4-1)*** |
| **Week 3** | Lesson 3 Read-Along: Why do baby ducks follow their mother? ***(1-LS1-2)*** | Lesson 3 Read-Along: What do sunflowers do when you're not looking? ***(1-LS1-1)*** | Lesson 3: How can the sun help you if you're lost? ***(1-ESS1-1)*** | Lesson 3 Read-Along: How can stars help you if you get lost? ***(1-ESS1-1)*** | Lesson 3: What if there were no windows? ***(1-PS4-3)*** |
| **Week 4** | Lesson 4: Why are polar bears white? ***(1-LS1-1)*** | | Lesson 4 Read-Along: Why do you have to go to bed early in the summer? ***(1-ESS1-2)*** | | Lesson 4 Read-Along: Can you see in the dark? ***(1-PS4-2)*** |
| **Week 5** | Lesson 5 Read-Along: Why do family members look alike? ***(1-LS3-1)*** | | | | Lesson 5: How could you send a secret message to someone far away? ***(1-PS4-4, K-2-ETS1-2)*** |
| **Week 6** | | | | | Lesson 6 Read-Along:How do boats find their way in the fog? ***(1-PS4-4)*** |

***Lesson Extensions.*** Extensions are available for each lesson and offer an opportunity for students to continue their science content learning. They include assessments and a curated collection of additional activity suggestions, online resources, project ideas, and readings.

| More Science each week | Longer Science units | Cross Curricular Integration |
|---|---|---|
| Use items from the Extensions if you have more time. | Add a week after each lesson to teach items from the Extensions. | If you want to extend the lesson during literacy time, use reading and writing Extensions. |

# Animal Superpowers (5-10 weeks)

*Animal Traits & Survival*

## Grade 1 Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students explore how parts of animals are essential for survival. Students also make observations of parents and their offspring, determining how they are similar and how their behaviors help offspring survive.

| Grade 1 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| ✨New!✨<br>Lesson 1<br>How can you help a lost baby animal find its parents? | 1-LS3-1 | Parent & Offspring Traits | Observing baby animals together with their parents provides evidence for the similarities, but also the differences between them. Some animals are born looking extremely similar to their parents, while others take a while to grow and develop. Close observations of traits is fun, but also imperative for animal rescue organizations that need to identify and care for lost baby animals.<br><br>**DCIs: LS3.A, LS3.B** | Students make close observations of baby bird images in order to examine their traits. They use this information to **construct an explanation** that the young birds have some similar traits to their parent birds, but there are many traits that also differ between them. | After students look closely at several different examples of baby animals and their parents, they observe the **pattern** that offspring do not look exactly the same, but do have many traits in common with their parents. |
| Lesson 1<br>Why do birds have beaks? | 1-LS1-1 | Animal Structures & Survival | All living things have body parts that help them survive and grow. Each kind of animal has special body parts that help them get the food they need to survive. Some animals use their hands, mouth, beaks, trunks, or tongues to eat their food. The shape of the body part they use to get food is best suited for the type of food the animal eats.<br><br>**DCIs: LS1.A** | Students **model** how different bird beaks are well suited for eating different kinds of foods. Students **conduct an investigation** to figure out how much food (straw pieces) they can pick up using each beak. **Analyzing these results**, students construct **arguments using their evidence** about which beak would help the birds survive in different environments. | Students consider the relationship between the shape of a bird's beak **(structure)**, and the food it eats **(function)**.They begin to observe the **pattern** that all animals have structures that help them accomplish unique functions. |
| Lesson 2 Read-Along<br>Why do baby ducks follow their mother?<br>📖 | 1-LS1-2 | Animal Behavior & Offspring Survival | Offspring, the children of living things, need to get their needs met in order to survive. All offspring need food, shelter, protection, and comfort. They also need to learn how to survive on their own. Animal parents (including humans) have the important job of teaching their offspring how to survive before they grows up. Offspring learn from their parents and rely on them to meet their survival needs when they are young.<br><br>**DCIs: LS1.B** | Students **obtain information** about different animal mothers engaging in behavior to help their offspring survive. They **evaluate and communicate the information** by discussing why each animal mother does each behavior for her offspring. | Students consider the **patterns** in behavior of parents and offspring that help offspring survive. |

*(continued)*

# Animal Superpowers (5-10 weeks)

*Animal Traits & Survival*

## Grade 1 Mystery Science & NGSS Alignment - Life Science (LS)

| Grade 1 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4<br>Why are polar bears white? | 1-LS1-1 | Camouflage & Animal Survival | This lesson continues the exploration that animals have body parts to help them survive and grow. Animals have different behaviors and body parts that help protect themselves from danger. The color of an animal's fur, feather, skin, or scales can help them blend in with their habitat. Camouflage helps both prey and predators survive!<br><br>**DCIs: LS1.A** | Students **model** how camouflage helps moths survive by **carrying out an investigation** with differently patterned paper moths and trees. They see how many moths they can find in the paper forest. Moths that match the pattern of the tree will be harder to see, while moths that are patterned differently than the tree will be much more visible. Students make an **argument** about which moths a hungry bird would eat first based on **evidence** from their investigation. Next, they choose a place in the classroom and design their own moth that will camouflage into the area. | Students consider the relationship between the color of an animal's fur, feathers, or skin **(structure)**, and how this helps it survive in its habitat **(function)**.They begin to observe the **pattern** that all animals have structures that help them survive. |
| Lesson 5 Read-Along<br>Why do family members look alike?<br>📖 | 1-LS3-1 | Inheritance & Variation of Traits | All living things share similar characteristics with their parents. For example, a baby duckling looks like a duck, not a cow! You'll notice that young animals and plants look similar to their parents, but not identical.<br><br>**DCIs: LS3.A, LS3.B** | Students use observations of animal parents and their offspring to **construct an explanation** about young plants and animals being similar, but not identical, to their parents. They play the game MatchUp, between mother and baby animals, using their knowledge of similar characteristics. | Students consider shared characteristics between parents and their offspring as a **pattern**. |

# Plant Superpowers (3-6 weeks)

*Plant Traits & Survival*

## Grade 1 Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students explore how parts of plants are essential for survival. Students also make observations of plant parents and their offspring, determining how they are alike and different.

| Grade 1<br>Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs)<br>(Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| ✨New!✨<br>Lesson 1<br>What will a baby plant look like when it grows up? | 1-LS3-1 | Plant Traits & Offspring | Plants have specific parts such as roots, stems, and leaves. Examining these traits can help to identify a plant. To know what a baby plant (seedling) will look like when it grows up into an adult plant, you can observe traits of the parent plant because young plants look very similar to their parent plant.<br><br>**DCIs: LS3.A** | Students make observations from images and videos of plants to examine their traits. They use this information to **construct an explanation** that the young plants have similar traits to their parent plants. | As students examine the leaves and stems of plants, students discover the **pattern** that offspring look similar to their parent plants. |
| Lesson 2<br>Why don't trees blow down in the wind? | 1-LS1-1<br>K-2-ETS1-2<br>K-2-ETS1-3 | Plant Survival & Engineering | All living things have structures, or external parts. Animals use their body parts to help them survive, grow, and communicate. Plants also have external parts that help them to survive. Humans can mimic the structure and function of an animal or plant's external parts to design solutions to their problems.<br><br>**DCIs: LS1.A, ETS1.A, ETS1.B, ETS1.C** | Students **develop a model** of an umbrella and **conduct an investigation** to test wind's effect on it. Students **design a solution** to solve the problem of needing a shade structure that won't blow over in the wind, by mimicking a tree's external part. | Students observe the relationship between a tree's roots and leaves (**structure**) and how they help the tree stand in the wind (**function**). They apply this relationship in a natural object to a designed object. |
| Lesson 3 Read-Along<br>What do sunflowers do when you're not looking?<br>📖 | 1-LS1-1 | Plant Movement & Survival | Sunflowers move throughout the day so that they are always facing the sun! Their stem bends so that the sunflower always gets as much sun as possible to help it grow. The flower starts the day facing east, where the sun rises, and ends the day facing west, where the sun sets.<br><br>**DCIs: LS1.A, LS1.D** | Students **conduct an investigation** to test how plants respond to light. They observe how the direction a plant grows depends on the position of the light. | Students observe the relationship between a sunflower's flower and stem **(structure)** and how the flower parts bend to get as much sun as possible throughout the day **(function)**. This response to the environment helps sunflowers grow. |

# Sun & Shadows (4-8 weeks)

*Day Patterns*

## Grade 1 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

In this unit, students observe that the Sun and shadows seem to move in patterns. The make observations of the Sun and shadows throughout the day and across the seasons.

| Grade 1 Earth & Space Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>Could a statue's shadow move? | 1-ESS1-1 | Sun, Shadows, & Daily Patterns | Patterns of motion are all around us; they're even in the sky! If you observe a still object throughout the day, you'll see that its shadow changes. The Sun doesn't stay in the same place all day. It is the Sun's movement across the sky that changes the shape of an object's shadow.<br><br>**DCIs: ESS1.A** | Students **conduct two investigations**. In the first, they place a gnome in the sun and trace its shadow. They **observe** how the shadow changes as time passes, or as the sun moves across the sky. In their second **investigation**, they use model gnomes to **analyze** how to move a light source to change the shape and length of the shadow of the gnome. **Interpreting this data**, they **construct an explanation** about what causes a shadow to move. | Students consider the movement of shadows to be caused by the **pattern** of the sun's movement across the sky. |
| Lesson 2 Read-Along<br>What does your shadow do when you're not looking?<br>📖 | 1-ESS1-1 | Sun, Shadows, & Daily Patterns | Each day, the Sun moves across the sky in an arch shape. It is low in the mornings, high in the afternoon, and low again in the evenings. When the Sun is low in the sky, it makes shadows long. When it is high in the sky, shadows are short. If you look closely, you'll notice your shadow also changes sides in the morning and evening.<br><br>**DCIs: ESS1.A** | Students **conduct an investigation** to gather information about how their shadow changes throughout the day. They trace their shadow in the morning and afternoon, then **analyze the data** to identify differences in the shadows. Using the data, they **construct an explanation** about why their shadows point in different directions. | Students explain changes in shadows by considering the **patterns** in the Sun's movement across the sky. They identify the **cause and effect** relationship between the height of the Sun in the sky and a shadow's length and direction. |
| Lesson 3<br>How can the sun help you if you're lost? | 1-ESS1-1 | Sun & Daily Patterns | The Sun's movement across the sky is a pattern! We can use its path to help us figure out the direction we're headed. Since we know the Sun always rises in the east, moves across the sky, and sets in the west, we can use the time of day and the Sun's position to figure out which way is east and which way is west.<br><br>**DCIs: ESS1.A** | Students develop a Sun Finder, a **model** of the Sun's movement across the sky. **Using the model**, they reason about how the sun can help guide them during the day. Since they know that they walked toward the Sun to get to their friend's house in the morning, they must use **evidence to argue** whether they should walk toward or away from the Sun to get home in the afternoon. | Students analyze the **pattern** of the Sun's movement across the sky each day. |

*(continued)*

# Sun & Shadows (4-8 weeks)

*Day Patterns*

## Grade 1 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

| Grade 1 Earth & Space Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4 Read-Along<br>Why do you have to go to bed early in the summer?<br>📖 | 1-ESS1-2 | Daylight & Seasonal Patterns | Depending on the season, it takes different amounts of time for the Sun to move across the sky. This makes it seem like some seasons have longer days, and others have shorter days. During the summer, the Sun rises earlier and sets later - there are *more* hours of daylight. In the winter, the Sun rises later and sets earlier - there are *less* hours of daylight.<br><br>**DCIs: ESS1.B** | Students **obtain information** about the seasonal patterns of sunrise and sunset through a printable student reader. Students read the text independently to determine seasonal daylight patterns. | Students consider the **pattern** that there are more hours of daylight during the summer than there are in the winter. |

# Moon & Stars (3-6 weeks)

*Night Patterns*

## Grade 1 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

In this unit, students observe that the Moon and stars seem to move in patterns in the sky. They also determine why stars are only visible at night.

| Grade 1 Earth & Space Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| ✨New!✨<br>Lesson 1<br>When can you see the full moon? | 1-ESS1-1 | Moon Phases & Patterns | When the Moon appears as a full moon, it looks like a large bright circle in the sky. But the Moon doesn't always appear to be this shape. The bright part of the Moon can appear as different shapes. But is there a pattern to the shapes - do they follow a cycle? If so, then we can use that information to predict when the next full moon will appear.<br><br>**DCIs: ESS1.A** | Students make observations of the Moon's appearance over the course of four weeks, drawing pictures of each moon phase. Then, students **analyze the data** they've gathered in order to answer the question of when the full moon will appear. | Students discover that the Moon's phases follow a cyclical **pattern** that repeats every four weeks (each month). |
| Lesson 2<br>Why do the stars come out at night? | 1-ESS1-1 | Stars & Daily Patterns | It seems that stars only come out at night, but they are actually always there. It's just that we can only *see* them at night. We can't see stars during the day because the Sun is out and its brightness outshines the stars. When the Sun sets, the stars are not outshone and you can see them. It isn't just the Sun that outshines stars, this is true about any bright light. If the moon is very bright, or there are bright city lights, it will be harder to see stars.<br><br>**DCIs: ESS1.A** | Students **develop and use a model** of the Big Dipper in the night sky. They **carry out an investigation** to determine why stars are only visible in the night sky. Students **construct an explanation** about the stars being outshone by the Sun in the daytime sky, and then being visible again when the Sun sets. | Students consider the **pattern** that the stars are only visible in the night sky. They explore the **cause and effect** relationship between the Sun's brightness and the visibility of the stars. |
| Lesson 3 Read-Along<br>How can stars help you if you get lost?<br>📖 | 1-ESS1-1 | Stars & Seasonal Patterns | There are groups of stars in the sky that form a pattern; they are called constellations. One constellation, the Big Dipper, can help us find where the North Star is! Even though the Big Dipper changes its spot in the sky in different seasons, it always points to the North Star.<br><br>**DCIs: ESS1.A** | Students **obtain, evaluate, and communicate information** about the cardinal directions. They **conduct an investigation** to determine which direction each part of their classroom is facing. | Students consider the **pattern** that stars are in different places in the sky during different seasons. They consider the **pattern** that the Big Dipper help us find the North Star. |

# Lights & Sounds (6-9 weeks)

*Properties of Light & Sound*

## Grade 1 Mystery Science & NGSS Alignment - Physical Science (PS)

In this unit, students investigate light and sound! They explore how materials vibrate and how vibrating materials can make sounds. They also investigate light and illumination and use those investigations to create simple devices that allow them to communicate across a distance.

| Grade 1 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>How do they make silly sounds in cartoons? | 1-PS4-1 | Sounds & Vibrations | There are so many different types of sounds! Some are loud, soft, high, low, or even silly. People are capable of making a lot of different sounds. Each sound is made with a back and forth movement, called a vibration. Different vibrations make different sounds.<br><br>**DCIs: PS4.A** | Students **carry out investigations** exploring how to make different sounds. First, they use their hands and feet to make the sounds of a rain storm. Next, they use the vibration of a ruler to create a 'boing' sound as the soundtrack to a bouncing ball animation. Students **construct the explanation** that objects vibrate when they make a sound, and if the vibration stops, the sound stops as well. | Students consider the relationship between vibrations **(cause)** and sound **(effect)**. |
| Lesson 2 Read-Along<br>Where do sounds come from?<br>📖 | 1-PS4-1 | Sounds & Vibrations | Sounds are caused by an object vibrating. If a vibration stops, then the sound will stop too. Musical instruments make many unique and interesting sounds! When an instruments makes music, it comes from a part of the instrument vibrating.<br><br>**DCIs: PS4.A** | Students **carry out investigations** to explore different sounds and how they are created. They create three different sound makers and **construct an explanation** about where the vibrations are happening in each sound experiment. | Students consider the relationship between vibrations **(cause)** and sound **(effect)**. |
| Lesson 3<br>What if there were no windows? | 1-PS4-3 | Light, Materials, Transparent & Opaque | Glass is a transparent material, it is see-through and light can pass through it. Imagine what life would have been like with no glass. There would have been no windows, no eyeglasses, and even no windshields in a car! There are also materials that are *somewhat* see-through (some light can pass through) called translucent materials. Materials that are not see-through at all (no light can pass through) are called opaque materials.<br><br>**DCIs: PS4.B** | Students **investigate** the difference between transparent, translucent, and opaque materials by sorting them. They determine whether a material is transparent, translucent or opaque. Students then create a stained glass window using tissue paper. In this activity, they **construct an argument** to answer what happens to tissue paper when it is layered. | Students reason about the **cause and effect** relationship between the type of material (cause) and the amount of light that can pass through it (effect). |

*(continued)*

# Lights & Sounds (6-9 weeks)

*Properties of Light & Sound*

## Grade 1 Mystery Science & NGSS Alignment - Physical Science (PS)

| Grade 1 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4 Read-Along<br>Can you see in the dark?<br>📖 | 1-PS4-2 | Light & Illumination | If you've ever been in a completely dark space, you know you can't see anything! Even the slightest bit of light helps us see our surroundings. In a dark room there is often light from the hallway coming in through the crack under the door. The night sky is full of bright stars, and roads have street lights. Objects can only be seen if they are illuminated or give off their own light.<br><br>**DCIs: PS4.B** | Students **carry out an investigation** using a Mystery Box. They look inside the completely dark box to see if they can see the shape of the object inside. They allow more light in through peepholes to illuminate the object and allow them to see it. Students use their observations to **construct the explanation** that objects need light to be seen. | Students consider the **cause and effect** relationship between light (cause) and being able to see objects (effect). |
| Lesson 5<br>How could you send a secret message to someone far away? | 1-PS4-4<br>K-2-ETS1-2 | Light, Communication, & Engineering | People use many different devices to communicate over long distances. Cell phones and iPads help us communicate with people far away, but they had to be invented. People don't just communicate with sound, we can also use light. A great example is a traffic light which tells cars to go, slow down, or stop using light signals.<br><br>**DCIs: PS4.C, ETS1.B** | Students are presented with the problem that they need to send a message at night, without using noise. They **design a solution** with a partner by correlating light colors to a specific message. Using their secret code, partners take turns communicating information across the room with light signals. | Students consider light signals and their understood meaning as a **pattern**. |
| Lesson 6 Read-Along<br>How do boats find their way in the fog?<br>📖 | 1-PS4-4 | Lights, Sounds, & Communication | Colors, lights, and sounds help us communicate over long distances. Sounds can even help us communicate when it is difficult to see. People who drive cars and boats use colors, lights, and sounds to help them find their way around the road or sea.<br><br>**DCIs: PS4.C** | Students **obtain information** about light and sound signals. They play red light/green light to practice responding to common signals.<br><br>Students **conduct an investigation** of different sounds. They find their 'sound partner'--the student who has the same sound object in their cup.<br><br>Students **analyze** different sounds with their eyes closed. They determine which type of sound they heard. | Students consider that different light and sound signals form a **pattern** used for communication. |

# Grade 2

Mystery Science recommends teaching the lessons within each unit in the order they are presented. The units themselves can be taught in any order. The lesson (exploration & activity) is designed to take an hour per week. Extensions can expand upon each lesson.

| | Animal Adventures (4-8 weeks) | Plant Adventures (5-10 weeks) | Work of Water (5-10 weeks) | Material Magic (6-12 weeks) |
|---|---|---|---|---|
| **Week 1** | Lesson 1: How many different kinds of animals are there? ***(2-LS4-1)*** | ✨New!✨ Lesson 1: How did a tree travel halfway around the world? ***(2-LS2-2)*** | Lesson 1: If you floated down a river, where would you end up? ***(2-ESS2-2, 2-ESS2-3)*** | Lesson 1: Why do we wear clothes ***(2-PS1-1, 2-PS1-2, K-2-ETS1-2, K-2-ETS1-3)*** |
| **Week 2** | Lesson 2: Why would a wild animal visit a playground? ***(2-LS4-1)*** | Lesson 2: Could a plant survive without light? ***(2-LS2-1)*** | Lesson 2: Why is there sand at the beach? ***(2-ESS2-2)*** | Lesson 2: Can you really fry an egg on a hot sidewalk?***(2-PS1-1, 2-PS1-2)*** |
| **Week 3** | Lesson 3: Why do frogs say “ribbit”? ***(2-LS4-1)*** | Lesson 3: Why do trees grow so tall? ***(2-LS2-1)*** | ✨New!✨ Lesson 3: Where do flash floods happen? ***(2-ESS2-2, 2-ESS1-1)*** | Lesson 3: Why are so many toys made out of plastic? ***(2-PS1-1, 2-PS1-2 and foundational for 2-PS1-4)*** |
| **Week 4** | Lesson 4: How could you get more birds to visit a bird feeder? ***(2-LS4-1, K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3 )*** | Lesson 4: Should you water a cactus? ***(2-LS2-1, -LS4-1)*** | Lesson 4: What’s strong enough to make a canyon? ***(2-ESS1-1, 2-ESS2-1, 2-ESS2-2)*** | Lesson 4: What materials might be invented in the future? ***(2-PS1-1, 2-PS1-2, K-2-ETS1-2, K-2-ETS1-3)*** |
| **Week 5** | | Lesson 5: Where do plants grow best? ***(2-LS2-1, 2-LS4-1)*** | Lesson 5: How can you stop a landslide? ***(2-ESS2-1, K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3)*** | Lesson 5: Could you build a house out of paper? ***(2-PS1-1, 2-PS1-3, K-2-ETS1-2, K-2-ETS1-3)*** |
| **Week 6** | | | | ✨New!✨ Lesson 6: How do you build a city out of mud?***(2-PS1-1, 2-PS1-2)*** |

***Lesson Extensions.*** Extensions are available for each lesson and offer an opportunity for students to continue their science content learning. They include assessments and a curated collection of additional activity suggestions, online resources, project ideas, and readings.

| More Science each week | Longer Science units | Cross Curricular Integration |
|---|---|---|
| Use items from the Extensions if you have more time. | Add a week after each lesson to teach items from the Extensions. | If you want to extend the lesson during literacy time, use reading and writing Extensions. |

# Animal Adventures (4-8 weeks)

*Biodiversity & Habitats*

## Grade 2 Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students begin to develop an understanding of the world's animal biodiversity. They explore animal classification and the traits that define each group. Students then turn their focus to habitats and how the surrounding environment affects what organisms live in a particular environment.

| Grade 2 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>How many different kinds of animals are there? | 2-LS4-1 | Biodiversity & Classification | There are *so many* different kinds of animals--even today, we haven't discovered all of them! Before it was easy to travel and visit each other's continents, people only knew about the types of animals from where they grew up. Early scientists eventually started exploring different places and learning about new animals. They discovered the wide variety of living things in habitats, called biodiversity. Scientists organized the animals they discovered into groups based on their shared characteristics.<br><br>**DCI: LS4.D** | Students **evaluate and communicate information** by sorting animals based on their traits and explaining their choices. Then, students sort the animals based on the traits scientists use to classify the animals as mammals, birds, reptiles, and invertebrates. Students determine which group 'challenge animals' belong to, based on their characteristics. | Students identify **patterns** in animal's characteristics in order to group them. |
| Lesson 2<br>Why would a wild animal visit a playground? | 2-LS4-1 | Habitat Diversity | There are *many* different kinds of habitats--deserts, oceans, rainforests, even playgrounds. One group of bighorn sheep spend their days visiting a playground, but in the evening they travel back to the adjacent desert habitat. Why do they come to the playground? And why do they always leave at night? Habitats meet the needs of all the organisms that live there. The playground is covered with grass so the bighorn sheep have plenty of food to eat. But at night, the desert habitat provides protection from predators because of the rocky cliffs and the ability of the bighorn sheep to camouflage with their surroundings.<br><br>**DCI: LS4.D** | Students **make observations from media** of the animals and plants in two different habitats--a playground and a desert--to compare the diversity. Students **carry out this investigation by collecting data** in the form of counts of organisms in each habitat. Then, they compare and analyze the data to determine which habitat is more diverse. | Students identify **patterns** in the data they collect in order to determine that the desert habitat is more diverse than the playground habitat. |

*(continued)* **Animal Adventures (4-8 weeks)**

*Biodiversity & Habitats*

**Grade 2 Mystery Science & NGSS Alignment - Life Sciences (LS)**

| Grade 2 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 3<br>Why do frogs say “ribbit”? | 2-LS4-1 | Biodiversity, Habitats, & Species | Frogs are a really neat example of the biodiversity in North America! In just one habitat, there can be many different frog species. Scientists study frog biodiversity by analyzing the different frog sounds they hear in a habitat--each frog species has a unique call. The variety of frog species in a habitat, depends on the amount of resources a habitat has. The more resources, the more types of frogs!<br><br>**DCI: LS4.D** | Students listen to a variety of frog calls, then **analyze** the sounds from two different habitats to determine which frogs are there. They then construct an **argument from evidence** about which habitat is more biodiverse based on the amount of different frog calls. | Students identify **patterns** in frog calls in order to determine how biodiverse a habitat is. |
| Lesson 4<br>How could you get more birds to visit a bird feeder? | 2-LS4-1<br>K-2-ETS1-1<br>K-2-ETS1-2<br>K-2-ETS1-3 | Biodiversity & Engineering | Not all bird feeders are created equally! Bird feeders come in all shapes, sizes, and colors--they even hold different types of food. Different bird feeders attract different bird species. People like to see different birds up close, so engineers designed bird feeders to help solve this problem. There are so many different bird feeders and each one has strengths and weaknesses, depending on what type of bird you want to attract!<br><br>**DCI: LS4.D** | Students **define a problem** by stating which type of bird they want to design a bird feeder for, and what its needs are. Each student **designs a solution** by comparing multiple sketches and **developing a model** of a bird feeder that best meets the needs of the bird they want to attract. Students reflect on how to improve their prototype. | Students explore the **cause and effect** relationship between bird feeder design and the type of food in it and the types of birds that visit it. |

# Plant Adventures (6-12 weeks)

*Structure, Function & Adaptations*

## Grade 2 Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students continue to explore the needs of plants through hands-on investigations. They explore why and how plants disperse their seeds, what those seeds need in order to grow, and what the adult plants need in order to survive and thrive.

| Grade 2<br>Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs)<br>(Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| ✨**New!**✨<br>Lesson 1<br>How did a tree travel halfway around the world? | 2-LS2-2 | Seed Dispersal | Many plants start as seeds! There are a lot of different types of seeds, all with unique shapes. In order for more plants to grow, seeds need to move away from the parent plant and grow into a new plant. Plants depend on wind, water, and animals to disperse their seeds.<br><br>**DCIs: LS2.A** | Students **model** seed dispersal by creating three different seed flyers. They **investigate** how each seed flyers' structure helps the seed disperse. | Students explore how the **structure** of a seed helps it disperse (**function**). |
| Lesson 2<br>Could a plant survive without light? | 2-LS2-1 | Water, Sunlight, & Plant Growth | When a seed is in soil, the first thing to grow are its roots. The seed needs water to grow, but does it also need soil? Making careful observations of plants that are grown with and without soil, we can observe that plants grown in soil look healthier. But can a plant survive without sunlight? Although seeds can sprout without sunlight, they need light to be healthy and survive. Plants need sunlight and water to grow.<br><br>**DCIs: LS2.A** | Students **plan and carry out an investigation** to determine how light affects plant growth. They grow some radish seeds in light conditions and some radish seeds in dark conditions and then **analyze their data** through close observations of the plants after several days. | Students observe the **effects** of plants grown in the dark and in the light. They observe that when plants are grown in the dark, it **causes** them to be less healthy (and eventually those plants cannot survive). |
| Lesson 3<br>Why do trees grow so tall? | 2-LS2-1 | Light, Leaves, & Competition | We've learned that plants need water and minerals to survive, but they also need light! It's possible to watch plants grow *toward* light following the sun throughout the day. The leaves of a plant soak up the sun and deliver it to the rest of the plant. Trees compete for sunlight, so their leaves are at the top of the tree and they grow as tall as possible.<br><br>**DCIs: LS2.A** | Students make a Grass Head and **conduct an investigation** to determine the sun's impact on the direction plants grow. **Analyzing data** from, students predict growth patterns of plants. | Students consider the **effect** sunlight has on plant growth. Students analyze the role of the leaves (**structure**) in helping the plant capture sunlight (**function**). |
| Lesson 4<br>Should you water a cactus? | 2-LS2-1<br>2-LS4-1 | Adaptations & Habitat | All plants need sunlight and water to survive, but they don't need the *same* amount of them. There are plants that like shade, and live on the forest floor. There are even plants that need small amounts of water and can survive in the hot and dry desert.<br>**DCIs: LS2.A, LS4.D** | Students **analyze the data** from their Grass Head in Lesson 3. They compare their growth pattern prediction with the actual results to determine if the grass grew in the direction of the sunlight. | Students consider the **cause and effect** relationship between a plant's needs and the habitat it survives best in. Students consider how plants have **structures** that help them survive in their environment (**function**). |

*(continued)*

# Plant Adventures (6-12 weeks)

*Structure, Function & Adaptations*

## Grade 2 Mystery Science & NGSS Alignment - Life Sciences (LS)

| Grade 2 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 5<br>Where do plants grow best? | 2-LS2-1<br>2-LS4-1 | Adaptations & Habitat | In order to grow a plant successfully, it's important to know its needs! We've learned that plants need different amounts of sunlight and water. If you planted a cactus in an area that got a lot of rain, it probably wouldn't survive. Knowing a plant's needs helps gardeners and farmers grow plants.<br><br>**DCIs: LS2.A, LS4.D** | Students engage in a **model** simulation of a farm with different growing conditions in different areas of the farm. Students consider the needs of a plant in order to determine where it will grow best. | Students consider the **cause and effect** relationship between a plant's needs and the habitat it survives best in. |

# Work of Water (5-10 weeks)

*Earth's Surface Processes*

## Grade 2 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

In this unit, students explore how water shapes the Earth's surface. Students construct and use models of mountains to demonstrate that water flows downhill, and in the process, transforms huge rocks into the tiny grains of sand we find at the beach. Students also construct and use model hills to determine the causes of erosion, and to design solutions to problems caused by erosion.

| Grade 2 Earth Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>If you floated down a river, where would you end up? | 2-ESS2-2<br>2-ESS2-3 | Mapping & Earth's Surface Features | Rivers are bodies of water that are moving! When we look at a map of the earth's surface, we see that big rivers empty into the ocean. Earth's surface looks flat on a map, but we know that it is actually *quite* hilly. If we looked at a map with texture we'd see that rivers begin at points of high land, flow to points of low land and then into the ocean.<br><br>**DCIs: ESS2.B, ESS2.C** | Students **develop a model** of the earth's surface and **carry out an investigation** to discover how rivers flow. They **construct an explanation** about where on the earth's surface rivers start and end. | Students identify **patterns** about where rivers start and end on earth's surface. |
| Lesson 2<br>Why is there sand at the beach? | 2-ESS1-1<br>2-ESS2-1<br>2-ESS2-2 | Rocks, Sand, & Erosion | In the last lesson, we explored how rivers flow from high points of the earth's surface to low points and into the ocean. Oceans are usually next to sandy beaches - but how did all of that sand get there? As the rivers flow toward the ocean, rocks collide into one another causing them to break into smaller pieces. By the time those rocks reach the end of the river, they are *tiny* rocks - or sand!<br><br>**DCIs: ESS1.C, *Foundational for* ESS2.A, ESS2.B** | Students **conduct an investigation by modeling** how rocks tumble through a river and break. Students **construct an explanation** for why there is sand at the beach. | Students reason about the **cause and effect** of rocks tumbling in a river (cause) and turning into sand (effect).<br><br>Students begin to explore that **changes** to the earth's surface can happen slowly through the process of erosion. |
| ✨**New!**✨<br>Lesson 3<br>Where do flash floods happen? | 2-ESS2-2<br>2-ESS1-1 | Mapping & Severe Weather | Flash floods tend to happen repeatedly in certain areas. Several factors contribute to flash floods including the shape of the land, the type of soil in an area, and the frequency of heavy rainstorms. One particular area in Texas, known as Flash Flood Alley, has more flash floods than any other place in the United States.<br><br>**DCIs: ESS2.B** | Students **develop a model (a map)** of Texas that displays the types of land, the distribution of clay soil, the location of major cities, and the occurrence of major rainstorms. They use this map to describe Flash Flood Alley's location in the state. | Students identify **patterns** of the types of land that are associated with the locations of where flash floods occur. |

*(continued)* **Work of Water (5-10 weeks)**

*Earth's Surface Processes*

**Grade 2 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)**

| Grade 2 Earth Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4<br>What's strong enough to make a canyon? | 2-ESS1-1<br>2-ESS2-1<br>2-ESS2-2 | Erosion, Earth's Surface, & Landforms | Water is incredibly powerful - even powerful enough to move the earth's surface! Heavy rains wash away dirt and rocks, creating canyons - this process is called erosion. Most canyons have rivers flowing from them, and as time passes the water continues to carry away dirt, rocks, and sand. Because of this, canyons continue to grow deeper and wider over time.<br><br>**DCIs: ESS1.C, ESS2.A, ESS2.B, ESS2.C** | Students **conduct an investigation** by **modeling** what happens to land when it rains over and over. Students **construct an explanation** for how the water changed the land. | Students consider the **cause and effect** of how heavy rains (cause) create canyons on earth's surface (effect).<br><br>Students begin to explore that **changes** to the earth's surface can happen slowly through the process of erosion. |
| Lesson 5<br>How can you stop a landslide? | 2-ESS1-1<br>2-ESS2-1<br>K-2-ETS1-1<br>K-2-ETS1-2<br>K-2-ETS1-3 | Erosion & Engineering | Landslides - when the earth loosens and is washed away down a hill - is more likely to happen after a wildfire! The fire burns the plants, which soak up rainwater and stabilize the soil with their roots. After a heavy rain, the water loosens the soil and washes the soil away, causing a landslide. Landslides pose many dangers for people!<br><br>**DCIs: ESS1.C, ESS2.A, ETS1.A, ETS1.B, ETS1.C** | Students **define the problem** that landslides create. They **design solutions** to stabilize soil and prevent landslides. Students compare their solutions and engage in argument from this evidence to determine which designs are most effective. | Students apply the concept that **changes** to earth's surface can happen rapidly during a landslide.<br><br>Students mimic natural **structures** and their **functions** to create a design solution that lessens the impact of landslides. |

# Material Magic (6-12 weeks)

*Properties & Phases of Matter*

## Grade 2 Mystery Science & NGSS Alignment - Physical Science (PS)

In this unit, students explore the properties of materials and matter! They describe and classify different types of materials by properties like hardness, flexibility, and absorbency, and they investigate how those properties are useful in meeting basic human needs (such as clothing and cooking). They also investigate how heating and cooling affect the properties of materials.

| Grade 2 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>Why do we wear clothes? | 2-PS1-1<br>2-PS1-2<br>K-2-ETS1-1<br>K-2-ETS1-2<br>K-2-ETS1-3 | Material Properties & Engineering | Materials have a set of unique properties that determine their use. Clothes are made of material, and we wear them to protect us. We choose clothing based on its properties. For example, if it was hot outside we would wear something light and opaque to protect us from the sun.<br><br>**DCIs: PS1.A, ETS1.A, ETS1.B** | Students **define the problem** that a hat is needed to shade the sun. They **carry out an investigation** of the properties of the provided materials. Next, each student **designs a solution** by selecting materials to create a hat that blocks the sun. | Students consider the **pattern** that different materials share similar properties. Students test the **effect** a material's properties have on its function. |
| Lesson 2<br>Can you really fry an egg on a hot sidewalk? | 2-PS1-1<br>2-PS1-2 | Classify Materials, Insulators, Properties | One interesting property of materials is whether they are an insulator (a material that does not allow the movement of heat) or a conductor (a material that moves heat easily). If you know which property a material has, you can choose the best one for your purpose!<br><br>**DCIs: PS1.A** | Students **carry out an investigation** to test if a material is an insulator. **Analyzing the data**, they determine which material they would use to pick up something hot. | Students consider the **pattern** that different materials share similar properties. Students test the **effect** a material's properties have on its function. |
| Lesson 3<br>Why are so many toys made out of plastic? | 2-PS1-1<br>2-PS1-2<br>Foundational for 2-PS1-4 | Heating, Cooling, & Phases of Matter | Another property of materials is if they are meltable or not. If a material is meltable, it melts into a liquid when you heat it up! All meltable material melts at different temperatures. Some may melt in your hands, while others need fire. This property is useful because you can heat a substance, melt it, pour the liquid into any mold, let it cool and harden again to make different shapes.<br><br>**DCIs: PS1.A, PS1.B** | Students **conduct an investigation** to determine which type of candy will melt in hot water. **Analyzing the data**, students compare their predictions to what actually occurred. Students **engage in an argument** as to which candy to mail using **evidence** from the investigation to support their claim. | Students observe the **pattern** that different materials share similar properties. Students consider the **cause and effect** of heat being added to meltable substances. They observe that when heat (**energy**) is applied to a meltable substance (**matter**) it changes shape. |

*(continued)*

# Material Magic (6-12 weeks)

*Properties & Phases of Matter*

## Grade 2 Mystery Science & NGSS Alignment - Physical Science (PS)

| Grade 2 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4<br>What materials might be invented in the future? | 2-PS1-1 2-PS1-2 K-2-ETS1-1 K-2-ETS1-2 | Inventions & Engineering | Over time, inventions of materials with new properties have helped solve problems. New materials are constantly being invented and made into products that could be available in the future.<br><br>**DCIs: PS1.A, ETS1.A, ETS1.B, *Foundational* ETS1.C** | Students use a new material to **design solutions** to solve a real life problem. Students **engage in an argument** for the merits of their design. | Students observe the **pattern** that different materials share similar properties. Some materials have properties that **cause** them to be better suited to a purpose. They begin to explore how the **structure** of a designed object relates to its **function**. |
| Lesson 5<br>Could you build a house out of paper? | 2-PS1-1 2-PS1-3 K-2-ETS1-2 K-2-ETS1-3 | Materials, Properties, & Engineering | Building materials--like wood, concrete, and steel-- all share an important property, strength. They are easy to build with because you can combine many small pieces and make a bigger structure. But those aren't the only materials you can use to build! Paper doesn't seem like it has the right properties for building--it's flexible and isn't strong. Surprisingly, you can change the properties of paper to make it stronger and a better building material.<br><br>**DCIs: PS1.A, ETS1.B, ETS1.C** | Students **design a solution** to building a tall tower and a strong tower out of paper. They change the properties of paper by folding, bending and cutting paper.. Students **model** the building process by assembling small pieces in order to build an object. | Students consider that **matter**, in this case paper, can be broken into smaller pieces or change shapes.<br><br>Students consider the **cause and effect** relationship between a material's properties and its uses. |
| ✨**New!**✨<br>Lesson 6<br>How do you build a city out of mud? | 2-PS1-1 2-PS1-2 | Soil Properties | Cities and structures made primarily from mud have lasted for hundreds of years. But how could mud (a mix of soil and water) be so durable? And can you take mud from any place to build a city? The properties of mud depend on the properties of the soil that it's made from.<br><br>**DCIs: PS1.A** | Students **conduct an investigation** where they examine the color and texture of three dry soil models. Then, they mix each soil model with water to create models of mud. Students put each type of mud through three separate tests and **analyze their data** to determine which mud would be best to build an adobe house. | Students observe the **pattern** that only certain types of soil have the properties that make them good for building adobe homes. |

# Grade 3

Mystery Science recommends teaching the lessons within each unit in the order they are presented. The units themselves can be taught in any order. The lesson (exploration & activity) is designed to take an hour per week. Extensions can expand upon each lesson.

| | Animals Through Time (7-14 weeks) | Circle of Life (3-6 weeks) | Power of Flowers (4-8 weeks) | Stormy Skies (5-10 weeks) | Invisible Forces (5-10 weeks) |
|---|---|---|---|---|---|
| **Week 1** | Lesson 1: Where can you find whales in a desert? ***(3-LS4-1, 3-LS4-4)*** | ✨**New!**✨ Lesson 1: How is your life like an alligator's life? ***(3-LS1-1)*** | Lesson 1: Why do plants grow flowers? ***(3-LS1-1)*** | Lesson 1: Where do clouds come from? ***(Foundational 3-ESS2-1)*** | Lesson 1: How could you win a tug-of-war against a bunch of adults? ***(3-PS2-1)*** |
| **Week 2** | Lesson 2: How do we know what dinosaurs looked like? ***(3-LS4-1)*** | Lesson 2: What's the best way to get rid of mosquitos? ***(3-LS4-3, 3-LS4-4, 3-5-ETS1-2)*** | Lesson 2: Why do plants give us fruit? ***(3-LS1-1)*** | Lesson 2: How can we predict when it's going to storm? ***(Foundational 3-ESS2-1)*** | Lesson 2: What makes bridges so strong? ***(3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3, Foundational 3-PS2-1)*** |
| **Week 3** | Lesson 3: Can you outrun a dinosaur? ***(3-LS4-1)*** | ✨**New!**✨ Lesson 3: Why are there so many different kinds of flowers? ***(3-LS1-1)*** | Lesson 3: Why are some apples red and some green? ***(3-LS3-1)*** | ✨**New!**✨ Lesson 3: Where's the best place to build a snow fort? ***(3-ESS2-1)*** | Lesson 3: How can you go faster down a slide? ***(3-PS2-1, 3-PS2-2)*** |
| **Week 4** | Lesson 4: What kinds of animals might there be in the future? ***(3-LS3-1, 3-LS4-2)*** | | Lesson 4: How could you make the biggest fruit in the world? ***(3-LS3-1)*** | Lesson 4: Why are some places always hot? ***(3-ESS2-1, 3-ESS2-2)*** | Lesson 4: What can magnets do? ***(3-PS2-3, 3-PS2-4)*** |
| **Week 5** | Lesson 5: Can selection happen without people? ***(3-LS3-1, 3-LS4-2, 3-LS4-3, 3-LS4-4)*** | | | Lesson 5: How can you keep a house from blowing away in a windstorm? ***(3-ESS3-1, 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3)*** | Lesson 5: How could you unlock a door using a magnet? ***(3-PS2-3, 3-PS2-4, 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3)*** |
| **Week 6** | Lesson 6: Why do dogs wag their tails? ***(3-LS2-1)*** | | | | |
| **Week 7** | Lesson 7: How long can people (and animals) survive in outer space?***(3-LS3-2)*** | | | | |

***Lesson Extensions.*** Extensions are available for each lesson and offer an opportunity for students to continue their science content learning. They include assessments and a curated collection of additional activity suggestions, online resources, project ideas, and readings.

| More Science each week | Longer Science units | Cross Curricular Integration |
|---|---|---|
| Use items from the Extensions if you have more time. | Add a week after each lesson to teach items from the Extensions. | If you want to extend the lesson during literacy time, use reading and writing Extensions. |

# Animals Through Time (8-16 weeks)

*Habitats, Heredity, & Change Over Time*

## Grade 3 Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students develop an understanding of how animals and their environments change through time. Fossils provide a window into the animals and habitats of the past. Analyzing the traits of animals provides evidence for how those traits vary, how they are inherited, and how they have changed over time. Students also examine how the environment can affect inherited traits and determine which animals will survive in a particular environment.

| Grade 3 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>Where can you find whales in the desert? | 3-LS4-1<br>3-LS4-3 | Habitats, Fossils, & Environments Over Time | Fossils provide evidence of the types of organisms that lived long ago and also about the environments in which they lived. Digging into the ground, you can sometimes find fossil shark teeth or whale bones - even when the land isn't anywhere near an ocean!. Examining fossils and their traits can help us understand the environments in which those organisms lived and how that environment has changed over time.<br><br>**DCIs: LS2.C, LS4.A, LS4.C, LS4.D** | Students embark on a pretend fossil dig where they **analyze and interpret data** from fossils. Students examine fossils and gather information about traits of these organisms of the past to infer what environments looked like long ago. Then, students use this evidence to **engage in an argument** and decide where some Mystery Fossils came from in the fossil dig based on their traits. | Students observe that organisms have traits (**structures**) that help them survive **(function)** in a particular environment. Students also consider the **stability and change** of an environment over time based on the different types of fossils found in one particular area. |
| Lesson 2<br>How do we know what dinosaurs looked like? | 3-LS4-1 | Fossil Evidence & Classification | Fossils are clues to the past! They can tell us what an organism looked like on the outside, the habitat it lived in, and even the food it ate. Dinosaur skeletons helped us learn that dinosaurs looked a lot like lizards do today. Fossils of their teeth helped us determine if they were carnivores (meat-eaters) or herbivores (plant-eaters).<br><br>**DCIs: LS4.A** | Students **analyze and interpret data** from fossil records to determine what type of food an organism ate/eats. They use the fossil evidence to **engage in an argument** for why they chose each food source. | Students consider that fossilized evidence of organism's teeth (**structure**) can determine which type of food they ate (**function**) and the type of environment they inhabited. |
| Lesson 3<br>Can you outrun a dinosaur? | 3-LS4-1 | Fossil Evidence, Trace Fossils, & Animal Behavior | Dinosaur footprints are a type of fossil, meaning they can help us learn about the past. When footprints are farther apart, an organism is moving faster. When footprints are closer together, the organism is moving slower. Some dinosaurs are faster than others and we can use their footprints to figure out how their speeds were different.<br><br>**DCIs: LS4.A** | Students **carry out an investigation** where they see how far they can run in eight steps and compare this to how far dinosaurs ran in eight steps, based on fossil evidence. Using **mathematics and computational thinking,** they first measure their leg length and then record how far they run for eight steps. They use this information and compare it to the dinosaur fossil data. | Students examine **patterns** of dinosaur leg lengths and footprints. They find that when footprints are farther apart, this indicates that an organism is moving at a faster speed. They also observe that dinosaurs were able to run much faster than humans. |

*(continued)* **Animals Through Time (8-16 weeks)**

*Habitats, Heredity, & Change Over Time*

## Grade 3 Mystery Science & NGSS Alignment - Life Science (LS)

| Grade 3 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4<br>What kinds of animals might there be in the future? | 3-LS3-1<br>3-LS4-2 | Trait Variation, Inheritance, & Artificial Selection | People want their pets to look a certain way--they want them to have desirable traits. Since many characteristics of organisms are inherited from their parents, people can change organisms to have the traits they want! This is called selection. If people want an animal to have a specific trait -like, a dog to be small - they will breed two of the smallest dogs they can over and over again!<br><br>**DCIs: LS3.A, LS3.B** | Students **analyze** the traits of parent dogs to determine which puppy they could have. They **construct explanations** about which traits the puppy gets from each parent. | Students recognize **patterns** in traits between parents and offspring. |
| Lesson 5<br>Can selection happen without people? | 3-LS3-1<br>3-LS4-2<br>3-LS4-3<br>3-LS4-4** | Trait Variation, Natural Selection, & Survival | It isn't just people that can change the traits of animals over time--nature can too! When the environment changes, like the introduction of a new predator, some organisms survive well and reproduce, some have traits that help them survive less well, and some cannot survive at all. Over time, most offspring will be born with the trait that helps them survive well. This is because offspring inherit their traits from their parents--and the ones that survive well and reproducing!<br><br>**End of Unit Project in Extensions<br><br>**DCIs: LS2.C, LS3.A, LS3.B, LS4.B, LS4.C, LS4.D** | Students c**arry out an investigation** by using a **model** to simulate the introduction of a predator species on Lizard Island. Students simulate multiple generations of lizards, **analyzing and interpreting the data** after each one. They use this data to **engage in argument from evidence** to support their claim about how the offspring change from the original lizards. | Students recognize the **cause and effect** relationship between a change in the environment and the survival of organisms that inhabit it. They recognize environments as a **system**, made up of interdependent parts that function as a whole. They can be **stable and change** over time at different rates of speed. |
| Lesson 6<br>Why do dogs wag their tails? | 3-LS2-1 | Animal Groups & Survival | Dogs, descendants of wolves, are different than other pets because of how they interact with us. Wolves live in groups, work together, and communicate with one another. Being in a group helps wolves survive because they are able to catch more prey in a pack than when they are alone. There are other types of animals that also live in groups to help them survive. Being part of a group can help animals defend themselves from predators, obtain food, and cope with environmental changes. Animals living alone have a much harder time surviving.<br><br>**DCIs: LS2.D** | Students carefully observe animals that live in groups in order to **obtain, evaluate, and communicate information** about animal social behavior. Using the **evidence** from their observations, students **engage in an argument** to support their claim that animals form groups to help them survive. | Students recognize the **cause and effect** relationship between animals living in a group and the members of that group surviving. |
| Lesson 7<br>How long can people (and animals) survive in outer space? | 3-LS3-2 | Traits & Environmental Variation | The environment can influence an organism's physical traits. Consider the effects that living in space can have on an astronaut. Astronauts wear space suits to protect themselves from the extreme temperatures of outer space. But how does the low gravity of space affect our bodies? After a year of living in space, the low gravity of the environment causes a decrease in our arm strength, a reduction in our ability to balance, and even an increase in our height!<br><br>**DCIs: LS3.A, LS3.B** | Students measure their own physical traits (arm strength, balance, and height) and then make predictions about how these traits would change after living in outer space for a year. Students use this information to **construct an explanation** for how the environment can influence and change physical traits. | Students recognize the **cause and effect** relationship between the environment and its influence on physical traits (physical characteristics). |

# Circle of Life (3-6 weeks)

*Life Cycles*

## Grade 3 Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students develop an understanding of life cycles. Students explore how both animal life cycles and plant life cycles can look very different, but they all have in common birth, growth, reproduction, and death. Changes to one stage of the life cycle can affect all of the following stages.

| Grade 3 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| ✨**New!**✨<br>Lesson 1<br>How is your life like an alligator's life? | 3-LS1-1 | Animal Life Cycles | If you were to track all the animals born on the same day that you were born, you would notice lots of differences in the lives of those animals! But you would also notice some similarities. No matter just how different they are, all animals are born, grow, can have babies (reproduce), and eventually die.<br>**DCIs: LS1.B** | Students **create models** of several animal life cycles. They **use these models** to compare the differences between the life cycles, but also the similarities of birth, growth, reproduction, and death that all animals go through. | Students search for **patterns** of what all animals share (birth, growth, reproduction, death) across their unique and diverse life cycles. |
| Lesson 2<br>What's the best way to get rid of mosquitoes? | 3-LS4-3<br>3-LS4-4<br>3-5-ETS1-2 | Environmental Change & Engineering | Mosquitoes suck blood and spread diseases. Mosquitoes live all over the world, but there are more in the tropics where the environment is warm and wet. This is because adult mosquitoes lay their eggs in water and need warm weather to survive. When the environment changes with increased rainfall, there will be more mosquitoes because they can survive and reproduce in greater numbers. Scientists and engineers can use this information to design solutions that help reduce the population of mosquitoes in certain areas. When there are fewer mosquitoes, then there will be a reduction in the number of people infected with the diseases that they spread.<br><br>**DCIs: LS2.C, LS4.C, LS4.D, ETS1.B** | Students **obtain and evaluate information** from different people who live in Pondville, a town with a severe mosquito problem. Then, using this information, students **design solutions** that will reduce the number of mosquitoes that live in Pondville. | Students recognize the **cause and effect** relationship between a change in the environment and the survival of organisms that live there. They recognize environments as a **system**, made up of interdependent parts that function as a whole. |
| ✨**New!**✨<br>Lesson 3<br>Why are there so many different kinds of flowers? | 3-LS1-1 | Plant Life Cycles | Flowers come in all shapes and sizes, but they all have things in common. For example, every flowering plant started out as a seed. In order to reproduce and make more seeds, plants need to be pollinated. Most flowering plants depend on pollinators to carry pollen from one flower to another.<br>**DCIs: LS1.B** | Students play a game that **models** a small garden with annual flowering plants. Students **use the models** to discover that pollinators (bees) are needed to pollinate plants for future growing seasons. | Students discover the **pattern** that without bees in their model garden game, plants cannot reproduce, and therefore the garden will not have flowers or fruits in future growing seasons. |

# Power of Flowers (4-8 weeks)

*Life Cycle, Traits, & Heredity*

## Grade 3 Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students discover how plants reproduce by exploring the process of pollination and fruiting. They also investigate how plant traits are inherited from parent plants, and how favorable plant traits can be enhanced by humans via artificial selection.

| Grade 3 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>Why do plants grow flowers? | 3-LS1-1 | Pollination & Plant Reproduction | All plants grow from a seed, which is a baby plant. Just like animals, *some* plants--all flowering plants--need two parent plants to create a seed. Flowering plants make seeds through a process called pollination. Pollination happens when pollen from one flower gets transferred to a special part of another flower - the stigma. Flowers make seeds! These plants have a unique life cycle that start with pollination.<br><br>**DCIs: *Foundational LS1.B*** | Students **develop a model** of a flower and bee to simulate pollination. With a partner, they **carry out an investigation** to determine how bees fly between flowers and cause pollination. Students an**alyze their data** and **construct an explanation** for if their flower will produce seeds or not. | Students explore the **pattern** of similarities in life cycles among organisms.<br><br>Students observe that a plant's stigma (**structure**) is sticky to 'catch' pollen (**function**). |
| Lesson 2<br>Why do plants give us fruit? | 3-LS1-1 | Seed Dispersal & Plant Life Cycle | We learned in the last lesson that pollen travels to the stigma of a flower to make a seed. But it isn't that simple - the pollen travels down the stigma, and into the flower's ovary. Then a seed is made! Some plants grow fruit next. Fruit, a yummy 'container' for seeds, is eaten by animals! They swallow the seeds and excrete them away from the parent plant. This helps the seeds spread to new places and grow new plants. A lot of vegetables have seeds, but to plant scientists they are actually fruits!<br><br>**DCIs: LS1.B** | Students **carry out an investigation** to determine if a food is a science fruit or vegetable. They cut open each food to determine if there are seeds. Students **analyze this data** to determine if the food is a fruit or vegetable. | Students use **patterns** to sort food as a science fruit or a science vegetable.<br><br>Students learn that fruit (**structure**) contains seeds and helps them spread (**function**). |
| Lesson 3<br>Why are some apples red and some green? | 3-LS3-1 | Trait Variation, Inheritance, & Artificial Selection | Apples, like all living things, inherit their characteristics from their parents. Sweet apples grow from the seeds of sweet apples, and sour apples grow from the seeds of sour apples. While offspring have similar traits as their parents and siblings, they are not *exactly* the same. There are over 2,000 varieties of apples, each with unique traits. Farmers choose people's favorites, plant that type of seed over and over, and grow more of them. This is called selection.<br><br>**DCIs: LS3.A, LS3.B** | Students **carry out an investigation** to determine the sweetness of different apple varieties. | Students identify the similarities and differences shared between offspring and their parents, or among siblings as a **pattern**. |
| Lesson 4<br>How could you make the biggest fruit in the world? | 3-LS3-1 | Trait Variation, Inheritance, & Artificial Selection | No two individual offspring are exactly alike! Organisms inherit their traits from their parents which is why they are similar but not identical. Selection is when a desired trait is chosen to reproduce. It is used to change any trait of a plant. Plant-growers watch closely for changes in traits so that they can create new varieties of plants. Many fruits and vegetables we eat today were created through selection.<br><br>**DCIs: LS3.A, LS3.B** | Students **engage in argument from evidence** about which plants and fruits are related to one another. Students **obtain, evaluate, and communicate information** by sorting plant cards into groups based on similar traits. They determine which plants share wild parents and are varieties of each other. | Students recognize similarities and differences among the traits of different plants as a **pattern**. |

# Stormy Skies (5-10 weeks)

*Weather, Climate, & Water Cycle*

## Grade 3 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

In this unit, students investigate and make predictions about the weather through careful observation of the clouds and wind. Students also learn to differentiate between weather and climate and use models to reveal global climate patterns.

| Grade 3 Earth Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>Where do clouds come from? | Foundational for 3-ESS2-1 | Water Cycle & Phases of Matter | Clouds may look like white, fluffy, cotton, but they are actually made of water! When liquid water is heated it turns into gas water. This process is called evaporation. Some liquid water from Earth's surface (like oceans and lakes) is heated and turns into invisible water gas. It rises up into the atmosphere and becomes trapped! These trapped water droplets make clouds.<br><br>**DCIs: *Foundational* ESS2.D** | Students **carry out an investigation** by **using a model** to observe evaporation. They **engage in argument from evidence** using observations from their investigation to explain what clouds are. | Students consider the **cause and effect** relationship between heated liquid water and the evaporation of gas water that forms into clouds. |
| Lesson 2<br>How can we predict when it's going to storm? | Foundational for 3-ESS2-1 | Local Weather Patterns & Weather Prediction | There are many different types of clouds! Knowing what types of clouds bring stormy weather (and the wind's direction) can help you prepare for a rainstorm. Understanding this patterns help scientists, and you, predict what kind of weather might happen next!<br><br>**DCIs: *Foundational* ESS2.D** | Students **obtain and communicate information** about different types of clouds by creating a Storm Spotter's Guide. They **engage in argument from evidence** by using this information to analyze multiple scenarios and determine if a storm will occur and why. | Students explore **patterns** of changing clouds as a way to predict weather. |
| ✨**New!**✨<br>Lesson 3<br>Where's the best place to build a snow fort? | 3-ESS2-1 | Regional Weather Patterns | Weather changes from day to day and from season to season, but examining patterns of weather in the past can help predict future weather. Looking at regional temperature patterns during one season can inform what weather we might expect in future years during that season.<br><br>**DCIs: ESS2.D** | Students obtain past winter weather information from three different locations. They **organize the data into a table** so that they can compare the locations. Then, they **analyze the data** to decide on the best location for a snow fort festival the following year. | Students explore temperature **patterns** of the past to predict temperatures and weather conditions that will occur in the future for particular regions. |

*(continued)*

## Stormy Skies (5-10 weeks)

*Weather, Climate, & Water Cycle*

**Grade 3 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)**

| Grade 3 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4<br>Why are some places always hot? | 3-ESS2-1<br>3-ESS2-2 | Climate, Geography, & Global Weather Patterns | Weather conditions that are predictable and occur over long periods of time are called climates. There are 5 climates--tropical, polar, temperate, mild, and desert. Each climate occurs in a specific part of the world, depending on how much sunlight and rain it gets throughout the year.<br><br>**DCIs: ESS2.D** | Students **obtain and evaluate information** about multiple location's weather. They **communicate the information** by color coding a map based on climate. Students **analyze and interpret the data** to determine climate patterns across the world. | Students recognize climate across the world as an observable **pattern**. |
| Lesson 5<br>How can you keep a house from blowing away in a windstorm? | 3-ESS3-1<br>3-5-ETS1-1<br>3-5-ETS1-2<br>3-5-ETS1-3 | Natural Hazards & Engineering | Strong winds can cause different types of natural hazards such as hurricanes, dust storms, and tornadoes. Strong winds can cause a lot of problems--they blow down all kinds of things! Engineers design solutions for the damage strong winds can cause. They identify problems and brainstorm a lot of different ideas until they find a solution.<br><br>**DCIs: ESS3.B, ETS1.A, ETS1.B, ETS1.C** | Students **define problems** that strong winds cause. They **develop and use a model** of a home in order to **design a solution** that keeps the roof attached to the home and stops the home from blowing away in the wind. They test and improve their prototype. | Students identify the **cause and effect** relationship between strong winds and the problems they cause. |

# Invisible Forces (5-10 weeks)

*Forces & Motion, Magnetism*

## Grade 3 Mystery Science & NGSS Alignment - Physical Science (PS)

In this unit, students explore the forces all around them. They investigate the effects of balanced and unbalanced forces, the pushes and pulls of bridge structures, and the effects of friction on the motion of objects. Students also explore the power of magnetic forces and investigate firsthand how these forces can be used to help us in our everyday lives.

| Grade 3 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>How could you win a tug-of-war against a bunch of adults? | 3-PS2-1 | Balanced & Unbalanced Forces | Every action is either a push or a pull, or what we call a 'force'. Forces each have a strength and a direction. When objects are in contact, they exert a force on each other. When a force is greater than the opposite force, it causes the object to move in its direction.<br><br>**DCIs: PS2.A, PS2.B** | Students build a Hopper Popper to **carry out an investigation** about force and motion. They c**onstruct an explanation** for which direction the forces act on the object, causing it to hop. | Students recognize the **cause and effect** relationship between the forces acting on an object and the direction of its motion. |
| Lesson 2<br>What makes bridges so strong? | 3-5-ETS1-1<br>3-5-ETS1-2<br>3-5-ETS1-3<br><br>Foundational for 3-PS2-1 | Balanced Forces & Engineering | Engineers build bridges to join two pieces of land that are split by a body of water. Building a bridge is no easy task! Engineers had to try lots of different solutions, most that didn't work, and learn from them. Possible solutions to a problem can be limited by available resources and materials--we call these constraints. All engineers communicate with their peers, test their prototypes, learn from their failures, and improve their designs. Being an engineer is exciting and full of learning!<br><br>**DCIs: ETS1.A, ETS1.B, ETS1.C, Foundational PS2.A** | Students **define a problem -** designing a bridge that will hold the most weight - and its constraints, it can only be made of paper. They collaborate with peers to **design multiple solutions**. They **carry out investigations** to test each of their prototypes, determine how to improve their design. | Students explore the relationship between the **structure and function** of different bridge designs. |
| Lesson 3<br>How can you go faster down a slide? | 3-PS2-1<br>3-PS2-2 | Friction & Pattern of Motion | A special type of 'push' force is called friction. This force occurs when two objects are in contact and push against each other. When an object has less friction, it moves easier. If an object has more friction, it is moves slower. Objects with smooth surfaces have less friction, and objects with rougher surfaces have more friction.<br><br>**DCIs: PS2.A, PS2.B** | Students **use a model** of a slide to **carry out an investigation.** They **ask questions** about different materials and weights and test their ideas to explore which combinations move the fastest down the slide. Students then complete a fair test to determine which material has the least friction. They **engage in argument from evidence** to share their findings. | Students consider the **cause and effect** relationship between a material's surface and the amount of friction it has. |

*(continued)* **Invisible Forces (5-10 weeks)**

*Forces & Motion, Magnetism*

**Grade 3 Mystery Science & NGSS Alignment - Physical Science (PS)**

| Grade 3 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4<br>What can magnets do? | 3-PS2-3<br>3-PS2-4 | Magnets & Forces | Magnetism is another special kind of force. Magnets can pull on things without actually touching them--the force can even go right through a solid object. But not all objects are affected by magnetism, only objects that contain iron. Magnets have a lot of interesting properties. The closer a magnet is to a magnetic object, the stronger its force will be.. Also, magnets have two sides. When two magnets line up at the same side, they will push away from each other. When they are lined up at different sides, they will pull toward each other.<br><br>**DCIs: PS2.B** | Students **ask questions** about magnets and **develop and carry out investigations** to observe the different properties of them. | Students consider the **cause and effect** relationship between this distance of a magnet and the strength of the force.<br><br>Students consider the **cause and effect** relationship between which direction two magnets are facing and if they will push or pull on one another. |
| Lesson 5<br>How can you unlock a door using a magnet? | 3-PS2-3<br>3-PS2-4<br>3-5-ETS1-1<br>3-5-ETS1-2<br>3-5-ETS1-3 | Magnets & Engineering | We've learned that magnets have a lot of interesting properties! One of them, is that magnets can push and pull on each other. In fact, they can do this even with space or another object between them! Since magnets have many useful properties, they can be used to design solutions to a variety of problems.<br><br>**DCIs: PS2.B, ETS1.A, ETS1.B, ETS1.C** | Students **design a solution** for a magnetic lock by **developing a model**. | Students consider the **cause and effect** relationship between two magnets as a way to so design solutions using the engineering process. |

# Grade 4

Mystery Science recommends teaching the lessons within each unit in the order they are presented. The units themselves can be taught in any order. The lesson (exploration & activity) is designed to take an hour per week. Extensions can expand upon each lesson.

| | Human Machine (4-8 weeks) | Birth of Rocks (5-10 weeks) | Waves of Sound (3-6 weeks) | Energizing Everything (8-16 weeks) |
|---|---|---|---|---|
| **Week 1** | Lesson 1: Why do your biceps bulge? ***(4-LS1-1)*** | Lesson 1: Could a volcano pop up where you live? (***4-ESS1-1, 4-ESS2-2)*** | Lesson 1: How far can a whisper travel? (***4-PS4-1, 4-PS4-3)*** | Lesson 1: How is your body similar to a car? (***4-PS3-1, 4-PS3-4)*** |
| **Week 2** | Lesson 2: What do people who are blind see? ***(4-LS1-1, 4-LS1-2, 4-PS4-2)*** | Lesson 2: Why do some volcanoes explode? (***4-ESS1-1)*** | Lesson 2: What would happen if you screamed in outer space? (***4-PS4-1)*** | Lesson 2: What makes roller coasters go so fast? (***4-PS3-1, 4-PS3-3)*** |
| **Week 3** | Lesson 3: How can some animals see in the dark? ***(4-LS1-1, 4-LS1-2, 4-PS4-2)*** | Lesson 3: Will a mountain last forever? (***4-ESS1-1, 4-ESS2-1)*** | Lesson 3: Why are some sounds high and some sounds low? (***4-PS4-1)*** | Lesson 3: Why is the first hill of a roller coaster always the highest?***(4-PS3-3)*** |
| **Week 4** | Lesson 4: How does your brain control your body? (***4-LS1-1, 4-LS1-2)*** | ✨**New!**✨ Lesson 4: What did your town look like 100 million years ago? ***(4-ESS1-1)*** | | Lesson 4: Could you knock down a building using only dominoes? (***4-PS3-4, 3-5-ETS1-1)*** |
| **Week 5** | | Lesson 5: How could you survive a landslide? ***(4-ESS2-1, 4-ESS3-2)*** | | Lesson 5: Can you build a chain reaction machine? (***4-PS3-4, 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3)*** |
| **Week 6** | | | | Lesson 6: What if there were no electricity? (***4-PS3-2, 4-PS3-4)*** |
| **Week 7** | | | | Lesson 7: How long did it take to travel across the country before cars and planes? (***4-PS3-2, 4-PS3-4)*** |
| **Week 8** | | | | Lesson 8: Where does energy come from? (***4-ESS3-1)*** |

***Lesson Extensions.*** Extensions are available for each lesson and offer an opportunity for students to continue their science content learning. They include assessments and a curated collection of additional activity suggestions, online resources, project ideas, and readings.

| More Science each week | Longer Science units | Cross Curricular Integration |
|---|---|---|
| Use items from the Extensions if you have more time. | Add a week after each lesson to teach items from the Extensions. | If you want to extend the lesson during literacy time, use reading and writing Extensions. |

# Human Machine (4-8 weeks)

*Body, Senses, & the Brain*

## Grade 4 Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students investigate structures and functions of the human body. Students explore how our bones and muscles are interconnected, how our eyes interact with light and impact our vision, and how our brain responds to stimuli in our environment.

| Grade 4 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>Why do your biceps bulge? | 4-LS1-1 | Muscles & Skeleton | Like a machine or robot, the body has parts, or structures, for moving around (e.g. the limbs). In order to move (one of the body's functions), the body needs at least two things: muscles and bones. The contraction of your muscles pulls on tendons, which in turn pull on the bones, causing you to move. Your external parts (such as appendages) are controlled by your brain like a marionette puppet (a topic we explore in Lesson 4).<br><br>**DCIs: LS1.A** | Students **build a model** of a finger that they then use to **construct an explanation** for how fingers move. | Students consider how human motion is made possible by a **system** of muscles, tendons and bones. Students consider the **cause and effect** relationship between tendons and the muscles and bones that they move. |
| Lesson 2<br>What do people who are blind see? | 4-LS1-1<br>4-LS1-2<br>4-PS4-2 | Light, Eyes, & Vision | Continuing the analogy of the body as a machine or robot, we now consider its "sensors"--the sensory organs, in this lesson focusing specifically on the eyes. Students discover the basics of how their eyes work, and figure out some of the causes of vision problems.<br><br>**DCIs: LS1.A; *Foundational for* LS1.D, PS4.B** | Students **build a model** of a eyeball that they then use to **construct an explanation** of why some people have blurry vision. | Students think about how the eye works as a **system** of different parts that interact to facilitate vision. Students consider how light interacts with the system to determine what images we see (**cause and effect**.) |
| Lesson 3<br>How can some animals see in the dark? | 4-LS1-1<br>4-LS1-2<br>4-PS4-2 | Structure & Function of Eyes | Students delve further into the workings of the eye, exploring the function of their iris and pupil.<br><br>**DCIs: LS1.A; *Extends* LS1.D, PS4.B** | Students **conduct an investigation** to see how pupils change in response to light. Students **build a model** of an eye (extending the model they built in Lesson 2) to **explain** how changes in pupil size changes the image that appears on the retina. | Students continue to think about how the eye works as a **system** and how changes to each part impact the system as a whole. Students also reason about the effect of changes in pupil size (**cause and effect).** |
| Lesson 4<br>How does your brain control your body? | 4-LS1-1<br>4-LS1-2 | Brain, Nerves, & Information Processing | Continuing the analogy of the body as a machine or robot, we finally consider the body's 'build-in computer' or central processor: the brain, and its accompanying nerves. Students explore the brain's role in receiving information from the senses, processing that information, and controlling the muscles to enable movement.<br><br>**DCIs: LS1.A, LS1.D** | Students **conduct investigations** to explore how the brain processes information and responds to that information. Students **analyze and interpret data** from the investigations to determine how fast their reflexes are. | Students identify **patterns** based on how their brains process information. |

# Birth of Rocks (5-10 weeks)

*Rock Cycle, Erosion, & Natural Hazards*

## Grade 4 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

In this unit, students investigate features and processes of the Earth's surface. Students explore the rapid process of volcanic eruptions! In contrast, students also explore the gradual Earth processes of weathering and erosion. Students apply their knowledge and design solutions to mitigate the impacts of these processes on humans.

| Grade 4 Earth Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>Could a volcano pop up where you live? | 4-ESS1-1<br>4-ESS2-2 | Volcanoes & Patterns of Earth's Surface | Rocks begin as lava--volcanic rocks are lava that has been frozen in time. Volcanoes don't just exist--they *form*, or 'pop up'. There is a pattern to where most volcanoes exist today on the earth. And yet dead volcanoes--and volcanic rock they erupted--can be found in *lots* of places. (So the pattern today isn't necessarily what it used to be.) You can look for volcanic rocks near you.<br>**DCIs: ESS1.C, ESS2.B** | Students **analyze and interpret data** from recent volcanic eruptions. They use their findings as **evidence for an argument** that volcanoes are (or are not) likely to erupt in their backyard. | Students identify **patterns** about the location of the world's volcanoes and use these patterns as evidence to support an argument about why a volcano may or may not erupt in their backyard. |
| Lesson 2<br>Why do volcanoes explode? | 4-ESS1-1 | Volcanoes & Rock Cycle | Volcanic rocks are lava frozen in time. There are two primary types of lava, each of whose thickness explains two major differences in a volcano's shape & style of eruption. These two lavas also account for two commonly observed volcanic rocks that you might find.<br>**DCIs: *Foundational for* ESS2.B; *Extends* ESS2.B** | Student **conduct an investigation** to **construct an explanation** for why some volcanoes explode and why some do not. Students **model** thick and thin lava to conduct their investigations. | Students reason about the **cause and effect** of the type of lava (cause) and the nature of the eruption (effect) as well as the shape of the volcano (effect). |
| Lesson 3<br>Will a mountain last forever? | 4-ESS2-1 | Weathering & Erosion | Rock does not stay as massive monoliths of volcanoes--it tends to get broken into smaller pieces (sediments) over time due to natural forces (weathering), and tumble downhill (erosion). You can look for evidence of this where you live.<br><br>**DCIs: ESS2.A** | Students **conduct an investigation** by **modeling** how rocks weather away over time. Students **construct an explanation** for why rocks look smoother at the bottom of a mountain compared to the top of a mountain. | Students consider the **cause and effect** of ice and root wedging on rock as it is broken down into small pieces. |
| ✨**New!**✨<br>Lesson 3<br>What did your town look like 100 million years ago? | 4-ESS1-1 | Sedimentary Rock & Fossils | Change is constant. Sediments are continually moving (erosion) and settling in locations (deposition). These sediments can bury the remains of animals and plants that transform into fossils over time. We can use the location patterns of fossils within rock layers to understand the history of the organisms that lived there, but also of the land formation within an area.<br>**DCIs: ESS1.C** | Students create a model canyon and explore the fossils found within each rock layer. They use this model to **construct an explanation** that the landscape has changed multiple times and that older rock layers, and therefore older fossils, are found at the bottom of the canyon. | Students use their canyon model to examine **patterns** of fossils in each layer to support the explanation that the environment has changed multiple times. |
| Lesson 4<br>How could you survive a landslide? | 4-ESS2-1<br>4-ESS3-2 | Erosion, Natural Hazards, & Engineering | The erosion process is not benign; it creates some of the worst natural hazards, including rock falls, landslides, and debris flows. If we are to be safe from these hazards, we have to design solutions to protect us.<br>**DCIs: ESS3.B** | Students **design solutions** to protect their "homes" from rock slides. Students **argue** for the merits of their design. | **Engineering** a solution to landslide hazards **depends on scientific knowledge** about the causes of landslides. |

# Waves of Sound (3-6 weeks)

*Sound, Waves, & Communication*

## Grade 4 Mystery Science & NGSS Alignment - Physical Science (PS)

In this unit, students investigate the science of sound. Students construct physical devices to feel the vibrations that allow us to communicate across distances. Students also use digital devices to visualize the characteristics of different sound waves that cause us to hear different things.

| Grade 4 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>How far can a whisper travel? | 4-PS4-1<br>4-PS4-3 | Sound, Vibrations, & Engineering | Sounds aren't something we can see or touch, and so it's easy to dismiss them as not fully real. But if you've experienced an echo before, then clearly there is something interesting and very real about sound--we can even feel and see that sound has something to do with vibrations. Students observe a relationship between sound and vibration, and through the activity, discover evidence that sound isn't merely related to vibrations, but perhaps, *is* a vibration.<br><br>**DCIs: *Foundational for* PS4.A** | Students document their understanding of how vibrations travel using a **model** of their paper cup telephones. Students then **design their own series of investigations** to figure out how to make their telephone work better in different circumstances. Students **construct an explanation** of how the telephone works. Students extend the lesson by developing a way to send a message using a pattern of sounds. | Students identify **patterns** about the relationship between the tension of the string and the quality of the sound it produces. Students also investigate **patterns** in the how different materials affect the quality of the sound that is transmitted. |
| Lesson 2<br>What would happen if you screamed in outer space? | 4-PS4-1 | Sound & Vibrations | Sound can travel through lots of different materials: through water, through string… it's possible to even *feel* the vibrations in the string, pinch the string, and stop the vibrations from reaching the other side. It would seem that sound is a vibration that must travel from one place to another. So does that mean sound is vibrating the air? (It is.) And what happens if there is no air? (There is no sound!)<br><br>**DCIs: PS4.A** | Students **conduct investigations** with balloons to experience the vibrations caused by sound of their voices. Students **construct an explanation** that sound is a vibration. Students then **develop a model** to explain how sound travels through a medium and how it can cause distant objects to move. | Students consider the **effect** of vibrations on the movement of distant objects. |
| Lesson 3<br>Why are some sounds high and some sounds low? | 4-PS4-1 | Sound Waves & Wavelength | Some sounds are very high-pitched, while others are low-pitched. For example, young people can even hear certain high-pitched sounds that adults can no longer hear. What makes one sound high and another low? By examining some musical instruments played in slow motion, we can begin to detect some differences in the vibrations. Special instruments enable us to visualize the resulting air vibrations, and reveal that sound vibrations travel as waves in the air. Students discover that the difference between high and low-pitched sounds has to do with the length of these waves ("wavelength").<br><br>**DCIs: PS4.A** | Students **analyze and interpret data** from oscilloscopes to determine how wavelengths differ between high and low pitch sounds. Students make claims and **argue from evidence** about which wavelength patterns were generated from different pitches. Students then use a rope to **model** waves created by different pitches and begin to explore the relationship between wavelength and frequency. | Students identify and analyze the oscilloscope **patterns** made by sounds with low and high pitches. |

# Energizing Everything (8-16 weeks)

*Energy & Motion*

## Grade 4 Mystery Science & NGSS Alignment - Physical Science (PS)

In this unit, students explore energy! Students investigate how energy is stored, how it can make objects move, and how collisions transfer energy between objects. Students also construct devices that convert energy from one form into another, such as heat into motion and electricity into light.

| Grade 4 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>How is your body similar to a car? | 4-PS3-1<br>4-PS3-4 | Speed & Energy | When something is moving, it has energy. Moving things get their energy from stored energy, and energy can be *stored* in different ways (gasoline, batteries, food, springs, and rubber bands). Students discover that the faster an object is moving, the more energy it has. They compare models that use thin rubber bands and thick rubber bands to determine how differences in stored energy directly relate to the speed of the object.<br><br>**DCIs: PS3.B, Foundational for PS3.A** | Students **build a model** of an amusement park ride called the Twist-o-Matic. They use the model to **carry out an investigation** to examine the relationship between energy and speed. Students **analyze and interpret data** from their models, comparing the speed of the ride using a thin versus thick rubber band. | Students explore how **energy** can be stored and released using a rubber band. The amount of **energy** that is put into the **system** is related to the speed of the model spinning around. |
| Lesson 2<br>What makes roller coasters go so fast? | 4-PS3-1<br>4-PS3-3 | Collisions & Energy Transfer | Giving something "height" (putting it up high) is another way to store energy. When the object falls or drops, that stored energy is released: this explains why roller coasters work, but also bicycling downhill or skiing. The higher up you place an object, the more energy you store in it, and the faster it goes when released or dropped. When an object collides with another object, some of its energy is transferred to the object and some is transferred to the air.<br><br>**DCIs: PS3.A** | Students **build a model** of a roller coaster and carry out an investigation using marbles. Students **analyze and interpret data** from the model to explain the connection between height, energy, and speed. Students also start to build an understanding of energy transfer as they observe what happens when additional marbles (additional collisions) are added to the model. | Students consider how **energy** is stored, released, and transferred in a **system** as they experiment with their marble roller coasters. |
| Lesson 3<br>Why is the first hill of a roller coaster always the highest? | 4-PS3-3 | Energy Transfer & Engineering | Something that's falling only has as much energy as was stored in it in the first place. This is why you can notice a pattern with roller coasters - the first hill is always the highest. When an object collides with another object, some of its energy is transferred to the object and some is transferred to the air.<br><br>**DCIs: PS3.B** | Students **conduct an investigation** using a model roller coaster to determine how energy can be stored in the hills of the coaster. Students **analyze and interpret data** from the model to understand that marbles must start at the tops of hills so that they will have enough energy to reach the goal at the end of the track. | Students consider how **energy** is stored and released in a system as they experiment with their marble roller coasters. |
| Lesson 4<br>Could you knock down a building using only dominoes? | 4-PS3-4<br>3-5-ETS1-1 | Energy Transfer & Engineering | We can invent devices that convert stored energy into movement, and transfer that energy to various other objects along a pathway.<br><br>**DCIs: PS3.A, PS3.C, ETS1.A** | Students begin to **design** a chain reaction machine. They start by figuring out how to connect two components of the chain reaction: the lever and the slide. This is the basis of the machine they will further develop in Lesson 5. | Students consider the ways in which **energy** can be stored, released, and transferred as they trace the path of energy through a chain reaction. |

*(continued)*

## Energizing Everything (8-16 weeks)

*Energy & Motion*

**Grade 4 Mystery Science & NGSS Alignment - Physical Science (PS)**

| Grade 4 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 5<br>Can you build a chain reaction machine?<br>(continuation of Lesson 4) | 4-PS3-4<br>3-5-ETS1-1<br>3-5-ETS1-2<br>3-5-ETS1-3 | Energy Transfer & Engineering | Engineers are people who design or invent solutions to problems by using knowledge of science. All engineers think about what their goal is, come up with multiple ideas, test those ideas out, and repeatedly fail until they figure out what works.<br><br>**DCIs: PS3.A, PS3.C, ETS1.A** | Students **design** a chain reaction machine that displays a message at the end. The chain reaction machines use multiple components that transfer energy from one part to the next. | Students consider the ways in which energy can be stored and released as they trace the path of energy through a chain reaction. |
| Lesson 6<br>What if there were no electricity? | 4-PS3-2<br>4-PS3-4 | Electrical Energy | Electricity--the stuff from our outlets and batteries--is a form of energy that we use to produce *movement*, but also light, heat, and more. Just like the energy in a chain reaction machine, electricity moves along a path and so can be transferred from one place to another. We can use such knowledge about electrical energy to design solutions to problems (such as flashlights for seeing in the dark).<br><br>**DCIs: PS3.B, ETS1.A** | Students **design** a flashlights using batteries, flights and tin foil. Students experiment with different ways of constructing their flashlights so that they turn on and off. | Electricity is a form of **energy** that can be stored (such as in batteries) and transferred via wires, where it is used to produce not only movement, but also light, heat, and more. |
| Lesson 7<br>How long did it take to travel across the country before cars and planes? | 4-PS3-2<br>4-PS3-4 | Heat Energy & Energy Transfer | The invention of the engine was a monumental step forward for human transportation; it used heat energy released from burning fuel to move people and goods over long distances much more safely, cheaply, and quickly. Engines are chain reaction machines--heat is transferred through a device to create movement!<br><br>**DCIs: PS3.B, PS3.D** | Students build a paper spinner and **conduct an investigation** to explain how heat makes things move. | Heat is a form of **energy** that can be transferred to create movement. |
| Lesson 8<br>Where does energy come from? | 4-ESS3-1 | Renewable Energy & Natural Resources | Some natural resources such as wood, coal, and natural gases can be burned to release energy. Unfortunately, burnable sources of energy release smoke and cause air pollution. Many scientists are exploring alternative natural sources of energy such as solar, wind, and water. These natural sources don't require burning to release energy.<br><br>**DCIs: PS3.D, ESS3.A** | Students evaluate the advantages and disadvantages of alternative energy sources to power a town. They **obtain and evaluate information** about the needs of each source of energy and **analyze and interpret data** about the town's resources. | Natural resources such as coal, the sun, wind, and wood can be used for **energy**. Using these resources **(cause)** can damage the **environment (effect)**. |

# Grade 5

Mystery Science recommends teaching the lessons within each unit in the order they are presented. The units themselves can be taught in any order. The lesson (exploration & activity) is designed to take an hour per week. Extensions can expand upon each lesson.

| | Web of Life (6-12 weeks) | Watery Planet (5-10 weeks) | Spaceship Earth (8-16 weeks) | Chemical Magic (5-10 weeks) |
|---|---|---|---|---|
| **Week 1** | Lesson 1: Why would a hawk move to New York City? ***(5-LS2-1)*** | Lesson 1: How much water is in the world? (***5-ESS2-2)*** | Lesson 1: How fast does the Earth spin? (***5-ESS1-2)*** | Lesson 1: Are magic potions real? (***5-PS1-1, 5-PS1-2)*** |
| **Week 2** | Lesson 2: What do plants eat? ***(5-LS1-1, 5-LS2-1)*** | Lesson 2: How much salt is in the ocean? ***(5-PS1-2)*** | Lesson 2: Who set the first clock? (***5-ESS1-2)*** | Lesson 2: Could you transform something worthless into gold? (***5-PS1-1, 5-PS1-2)*** |
| **Week 3** | Lesson 3: Where do fallen leaves go? ***(5-LS2-1)*** | Lesson 3: When you turn on the faucet, where does the water come from? ***(5-ESS2-2)*** | Lesson 3: How can the Sun tell you the season? (***5-ESS1-2)*** | Lesson 3: What would happen if you drank a glass of acid? (***5-PS1-3)*** |
| **Week 4** | Lesson 4: Do worms really eat dirt? ***(5-LS2-1)*** | Lesson 4: Can we make it rain? ***(5-ESS2-1)*** | Lesson 4: Why do the stars change with the seasons? (***5-ESS1-2)*** | Lesson 4: What do fireworks, rubber, and silly putty have in common? (***5-PS1-4)*** |
| **Week 5** | Lesson 5: Why do you have to clean a fish tank but not a pond? ***(5-LS2-1)*** | Lesson 5: How can you save a town from a hurricane? ***(5-ESS2-1, 5-ESS3-1), 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3)*** | Lesson 5: Why does the Moon change shape? (***5-ESS1-2)*** | Lesson 5: Why do some things explode? (***5-PS1-1)*** |
| **Week 6** | Lesson 6: Why did the dinosaurs go extinct? ***(5-PS3-1)*** | | ✨**New!**✨ Lesson 6: How can the Sun help us explore other planets? (***5-ESS1-1)*** | |
| **Week 7** | | | Lesson 7: Why is gravity different on other planets? (***5-PS2-1)*** | |
| **Week 8** | | | Lesson 8: Could there be life on other planets? (***5-ESS1-1)*** | |

***Lesson Extensions.*** Extensions are available for each lesson and offer an opportunity for students to continue their science content learning. They include assessments and a curated collection of additional activity suggestions, online resources, project ideas, and readings.

| More Science each week | Longer Science units | Cross Curricular Integration |
|---|---|---|
| Use items from the Extensions if you have more time. | Add a week after each lesson to teach items from the Extensions. | If you want to extend the lesson during literacy time, use reading and writing Extensions. |

# Web of Life (6-12 weeks)

*Ecosystems and the Food Web*

## Grade 5 Mystery Science & NGSS Alignment - Life Science (LS)

In this unit, students explore how organisms depend on one another and form an interconnected ecosystem. Students investigate food chains, food webs, and the importance of producers, consumers, and decomposers.

| Grade 5 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>Why would a hawk move to New York City? | 5-LS2-1 | Food Chains, Predators, Herbivores, & Carnivores | Animals are all around us--even in cities. We can learn to spot them by bearing in mind of one of the most basic relationships that all animals have with each other: some of them are predators and others are prey. (Where there are prey, there are predators, and vice versa.)<br><br>**DCIs: LS2.A, Foundational for LS1.C** | Students **construct models** of different food chains by linking cards representing different organisms. The chains are used to explain the relationship between predators and prey. Students **argue using evidence and reasoning** about which organisms can be linked together and in what order. | This lesson begins to lay the foundation for thinking about **systems and energy/matter flow.** By constructing chains of relationships between organisms, students are exposed to an example of a system. Food chains set students up for considering energy & matter flow in future Mysteries in this unit. |
| Lesson 2<br>What do plants eat? | 5-LS1-1<br>5-LS2-1 | Plant Needs: Air & Water | Because predators depend on prey, all animals ultimately depend on plants--even carnivores that do not eat plants. Plants in turn derive their growth material primarily from water and air.<br><br>**DCIs: LS1.C, Foundational for LS2.B** | Students **plan an investigation** to determine whether or not air has weight. As a whole class, students **conduct an investigation** to compare the weights of balloons with and without air. Students **analyze and interpret data** from the investigation to **explain** what happened and how the evidence may **explain** how plants gain weight. | Students observe that deflating a balloon **causes** the balloon to weigh less, leading to the conclusion that air has weight. This lesson also lays the foundation for an understanding of **conservation of matter** by considering how plants gain weight as they grow due to the air they absorb. |
| Lesson 3<br>Where do fallen leaves go? | 5-LS2-1 | Decomposers & Matter Cycle | Decomposers are yet another category of living thing, which consume dead plant and animal material and produce soil. Fungi--of which mushrooms and mold are types--is a conspicuous decomposer found everywhere, even in your home.<br><br>**DCIs: LS2.A, Foundational for LS2.B** | Students **ask questions** about what conditions they think will induce and prevent the growth of mold. Students **plan and conduct an investigation** to test different conditions. Students **analyze and interpret data** that they record from their experiments to **explain** how different conditions impact mold growth. | Students observe **patterns i**n the rates of **change** in the mold terrariums. They note similarities and differences to analyze how mold grows on different foods under different conditions. |

*(continued)* **Web of Life (6-12 weeks)**

*Ecosystems and the Food Web*

## Grade 5 Mystery Science & NGSS Alignment - Life Science (LS)

| Grade 5 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4<br>Do worms really eat dirt? | 5-LS2-1 | Decomposers, Nutrients, & Matter Cycle | Earthworms aren't pests, they are decomposers! They eat dead and decaying matter, bacteria, and animal waste that is in soil. Worm castings (their excretions) release the nutrients from their food back into the soil. In addition to water and carbon dioxide from the air, plants need these nutrients to grow. Worms help gardens, not hurt them.<br><br>**DCIs: LS2.A, LS2.B, *Supplementary* LS1.C** | Students observe worm behavior to help them determine a worm's role in a garden. Then, they **conduct an investigation** to test if worms prefer damp or dry places. They **create an argument** using the investigations results as **evidence** to support a claim about the worm's preferences. Lastly, students **plan and carry out an investigation** to answer a question they have about worms. | Students recognize that earthworms are part of a **system,** a food chain, with other organisms. Earthworms help **matter** flow back into the food chain. |
| Lesson 5<br>Why do you have to clean a fish tank but not a pond? | 5-LS2-1 | Ecosystems & Matter Cycle | All living things in an ecosystem depend on one another. In a pond, fish depend on plants as food and as a source of oxygen. Decomposers break down dead plant and animal matter, releasing micronutrients into the water. They also give off carbon dioxide. Plants take in carbon dioxide and give off oxygen. If one part is removed, the ecosystem would not function.<br><br>**DCIs: LS2.A, LS2.B** | Students **develop a model** to show the flow of energy and matter within an ecosystem. Then, students **develop a model** of a pond ecosystem. They add different living things to the pond, considering what each organism needs to eat and how much carbon dioxide each organism adds or removes from the ecosystem. | Students recognize the living organisms in a habitat as a **system**, an ecosystem. If one organism were to disappear, the whole ecosystem would break down. |
| Lesson 6<br>Why did the dinosaurs go extinct? | 5-PS3-1 | Food Webs & Flow of Energy | It is believed that an asteroid impact *could* have caused the dinosaurs to go extinct. When the asteroid hit the earth it filled the sky with dust, ash and debris which blocked sunlight. Plants all over the world couldn't get the sun's energy they needed to grow. When plants died out, the herbivores would eventually die as well, followed by the carnivores. Ultimately, the asteroid collapsed the dinosaur's food web causing a mass extinction.<br><br>**DCIs: PS3.D, LS1.C** | Students **develop a model** of a dinosaur food web to show how all animals get their energy. They use the model to help **construct an explanation** about how an asteroid killed all of the dinosaurs. | Students identify the sun as the ultimate source of **energy** in an ecosystem. The sun's energy is used by plants to grow and transferred through an ecosystem in the form of food. |

# Watery Planet (5-10 weeks)

*Water Cycle, Resources, & Systems*

## Grade 5 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

In this unit, students consider the profound importance of water as a natural resource. Students investigate the distribution of water, how it cycles through Earth's systems, and explore how it affects human societies.

| Grade 5 Earth Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>How much water is in the world? | 5-ESS2-2 | Hydrosphere & The Roles of Water | Water is our most basic human need. Despite the fact that Earth is a watery planet, Earth's water is mostly salt water--a form not fit to drink. Easily accessible fresh water is a surprisingly small amount by comparison. Of that fresh water, much of it is frozen in glaciers and ice caps.<br><br>**DCIs: ESS2.C** | Students **analyze and interpret data** from world maps to determine the relative amounts of fresh, salt and frozen water. Students **use mathematics and computational thinking** to calculate areas on a map and graph values to compare and graph quantities of fresh, salt and frozen water on Earth. | Students use standardized units of area to compare the **quantity** of fresh, salt and frozen water on Earth. Students use **proportional reasoning** to represent **quantities** in their graph comparing different types of water. |
| Lesson 2<br>How much salt is in the ocean? | 5-PS1-2 | Mixtures, Solutions, & Conservation of Matter | The ocean is a giant mixture of water and all the creatures that live in it! But what about the salt in the ocean? Why can't we see it? Salt water is a special type of mixture, called a solution. Even though the salt seems to vanish, it is actually still there. We can prove this by smelling the salt, tasting the salt, and even weighing the salt. You can also prove that the salt is in the ocean by letting some of that ocean water evaporate--you'll see all the salt left behind!<br><br>**DCIs: PS1.A** | Students **create a model** ocean to explore the properties of salt water. They **use mathematics and computational thinking** to calculate the weight of the water and salt, before and after mixing. Students analyze their graphs to provide evidence that the weight of the substances stays the same. Finally, students **create model** salt flats, letting their oceans evaporate, leaving the salt behind. | Students use standardized units of weight to compare the **quantity** of water, salt, and salt water before and after mixing. |
| Lesson 2<br>When you turn on the faucet, where does the water come from? | 5-ESS2-2 | Groundwater as a Natural Resource | Most people get their drinking water from water that's located underground, where there turns out to be a surprisingly large amount within structures called "aquifers." People use science ideas about the location of aquifers to make decisions about where to build communities.<br><br>**DCIs: ESS2.C, Foundational for ESS3.C & ESS2.A** | Students are asked to determine where is the best place to settle a new town by considering features of the landscape and what they know about where to find water. Students **obtain, evaluate and communicate** information from different sources about topography, plants and soil to inform their decision. Students **argue using evidence** to justify where their town should be built. | Students reason about information they get about natural patterns to determine where underground water is most likely to be found. These **patterns** involve correlations between elevation and water depth as well as how plant and soil **patterns** can give clues about where drinkable water may be found. |

*(continued)*

# Watery Planet (5-10 weeks)

*Water Cycle, Resources, & Systems*

## Grade 5 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

| Grade 5 Earth Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 3<br>Can we make it rain? | 5-ESS2-1 | Water Cycle | Evaporation of ocean water is the ultimate source of rain, and thus all our easily accessible fresh water. (All water on Earth's surface is part of an interconnected system, the hydrosphere.)<br><br>**DCIs: Foundational for ESS2.A** | Students create a **model** of the ocean and sky (hydrosphere and atmosphere). Students use the model to **plan and carry out an investigation** to determine how temperature influences evaporation and condensation. | Students reason about how the hydrosphere and atmosphere **systems** interact to produce rain. Students model the systems to explain how rain is created. |
| Lesson 4<br>How can you save a town from a hurricane? | 5-ESS2-1<br>5-ESS3-1<br>3-5-ETS1-1<br>3-5-ETS1-2<br>3-5-ETS1-3 | Natural Disasters & Engineering | Hurricanes start out as small storms over the ocean. As they move across the ocean, warm water evaporates into the storm cloud, making the hurricane grow bigger and bigger. Hurricanes bring tons of rain, flooding entire cities. Engineers design solutions to protect towns from extreme flooding.<br><br>**DCIs: ESS2.A, ESS3.C, ETS1.A, ETS1.B, ETS1.C** | Students **define the problem** that a town needs protection from flooding. They **obtain and communicate information** about different types of engineers and work as a team to design solutions using their different types of flood protection. Students use **mathematics and computational thinking** design a solution under budget. | Students reason about how the hydrosphere and atmosphere **systems** interact to produce hurricanes and extreme flooding. They also consider the impact of hurricanes on the biosphere and geosphere system. |

# Spaceship Earth (8-16 weeks)

*Sun, Moon, Stars & Planets*

## Grade 5 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

In this unit, students explore the Earth, Sun, Moon, and stars using observations of shadows and changing patterns in the sky. Students also explore the planets of our Solar System and begin to consider what might lie beyond.

| Grade 5 Space Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>How fast does the Earth spin? | 5-ESS1-2 | Day, Night, & Earth's Rotation | The Sun appears to move across the sky each day, creating an observable pattern. It rises in the morning, and sets in the evening. It is natural for us to assume that the Sun is moving--this is what we believed for most of human history. But scientists have have figured out that the Earth is spinning. The Earth's spinning is the cause of day and night and the length of a day is a result of the speed of the Earth spinning on its axis.<br><br>**DCIs: ESS1.B** | Students explore the phenomena of the Sun appearing to move across the sky. They use their own bodies as a **model** for the Earth to explain why the Sun rises and sets. Then students use **mathematics and computational thinking** to figure out the length of a day on hypothetical planets that spin faster and slower than the Earth. | Students recognize that the Sun moving across the sky is a **pattern** that can be explained by the Earth spinning. Students investigate this pattern to realize that the Earth spinning **causes** the **effect** of the Sun appearing to move across the sky. |
| Lesson 2<br>Who set the first clock? | 5-ESS1-2 | Earth's Rotation & Daily Shadow Patterns | A long time ago, our ancestors divided the day into 24 hours. Clocks measure the Sun's apparent movement. But before clocks existed, the change in shadows helped us measure the Sun's movement. The sun's position causes the length and direction of an object's shadow. Since the Sun moves across the sky each day in a pattern, shadow clocks (sundials) can be used to tell the time of day.<br><br>**DCIs: ESS1.B** | Students create a shadow clock, to observe how shadows change throughout the day. Students **carry out an investigation** to determine how the position of the sun changes the direction of the shadow at different times of day. Then, they go outside and **interpret data** from their shadow clock to determine what time of day it is. | Students observe **patterns** in the **change** of shadow length and position throughout the day. They use shadow **patterns** to determine what time of day it is, without the use of a clock. |
| Lesson 3<br>How can the Sun tell you the season? | 5-ESS1-2 | Seasonal Changes & Shadow Length | The sun's path changes with the seasons. Summer days are longer and warmer, because the Sun follows a higher path across the sky. Winter days are shorter and colder, because the Sun follows a low path across the sky. In the summer, shadows are shorter because the Sun is high. In the winter, they are longer because the Sun is low.<br><br>**DCIs: ESS1.B** | Students **analyze and interpret data** from photographs taken during different seasons and times of day, to determine how the sun's path affects Earth's surface. Students use **evidence** from the photos-- such as weather, shadow length, and sunrise/sunset time-- to **construct an argument** as to which season it is. | Students observe the **pattern** of seasons **caused** by the sun's path. The unique characteristics of each season are **caused** by the sun's position in the sky. Each season repeats each year. |

*(continued)*

# Spaceship Earth (8-16 weeks)

*Sun, Moon, Stars & Planets*

## Grade 5 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

| Grade 5 Space Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4<br>Why do the stars change with the seasons? | 5-ESS1-2 | Seasonal Patterns & Earth's Orbit | The night sky is full of stars that are grouped into constellations. The stars are seasonal, which means we only see certain stars depending on the season. As the Earth orbits around the sun, its position in the universe changes and we see different parts of the night sky. The seasonal patterns of the constellations repeat each year.<br><br>**DCIs: ESS1.B** | Students **develop a model** of the universe, in order to **construct an explanation** for why we see different stars during different seasons. Using **evidence** from their **model**, students make an **argument** that supports the claim that the Earth orbits around the sun. | Students observe the seasonal **pattern** of stars. They note the **change** of constellations that are visible in the night sky, based on the season. This pattern is used as evidence to argue that Earth is orbiting the Sun, and we only see a part of the night sky at a time. |
| Lesson 5<br>How does the Moon change shape? | 5-ESS1-2 | Moon Phases, Lunar Cycle | If you look up at the night sky and see the Moon, then do it again a week later- it will be a different shape! But the Moon isn't actually changing shape, it's always a sphere. The Moon orbits Earth. When the sun is shining on the side of the Moon that faces Earth, it's a bright, round, full moon. When the sun is shining on the side of the Moon that faces away from Earth, the Moon looks dark--it's a new moon. The Moon's phases are a pattern that go in a very certain order. Just like other sky patterns we've learned about, the cycle of the Moon is used to measure time. A full cycle takes about 28 days, or about a month, to repeat!<br><br>**DCIs: ESS1.B** | Students **develop a model** of the Sun and Moon to **carry out an investigation** of the Moon's orbit and the different moon phases. Through this investigation, they **obtain information** about how the Moon goes through each phase. Then, they **communicate this information** by constructing an explanation about what causes the Moon's phases for someone who doesn't already know. | Students consider the phases of the Moon as a **pattern**. They learn that the orbit of the Moon around Earth **causes** each different phase. The phases repeat in the same order every 14 days, and then reverse in the same order for another 14 days. The total orbit of the Moon around the Earth takes 28 days, and then the **pattern** repeats. |
| ✨**New!**✨<br>Lesson 6<br>How can the Sun help us explore other planets? | 5-ESS1-1 | Solar System & Sun Brightness | Exploring other planets in our solar system can be challenging for humans, but we can use technology to help us get there. Solar-powered rovers can use the Sun's energy and explore those planets for us. But how does the Sun's apparent brightness vary with distance? Will a solar-powered rover work equally well at all distances from the Sun?<br><br>**DCIs: ESS1.A** | Students **develop a model** of our solar system and use a flashlight as a model of the Sun. They use this model system to evaluate how bright or dim the Sun appears from different distances. Students then **use this evidence to engage in an argument** and justify their choice of which planet would be best to visit using a solar-powered rover. | Students use a scale model of our solar system to gain an understanding of the immense **scale** of distance between the planets. |

*(continued)*

# Spaceship Earth (8-16 weeks)

*Sun, Moon, Stars & Planets*

## Grade 5 Mystery Science & NGSS Alignment - Earth & Space Science (ESS)

| Grade 5 Space Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 7<br>Why is gravity different on other planets? | 5-PS2-1 | Gravity | When we walk on the Earth, we know gravity is the invisible force that pulls us down. Humans have also walked on the Moon so we know the Moon has gravity too. But the Moon has less gravity than the Earth. Gravity is a property of every planet and moon in our Solar System. Students discover that the amount of gravity depends on how massive a planet is. Unlike magnetism, gravity is a force that pulls on all objects. It always pulls them "down", meaning towards the center of the planet.<br><br>**DCIs: PS2.B** | Students **use mathematics and computational thinking** to calculate how high they could jump on planets and moons in our Solar System. They **analyze and interpret this data** to construct an explanation for why the amount of gravity is different on other planets. | Students observe the **pattern** that the more massive a planet is, the more gravity it has. Students figure out that the amount of gravity a planet has (**cause**) will impact the height that they are able to jump (**effect**). |
| Lesson 8<br>Could there be life on other planets? | 5-ESS1-1 | Star Brightness & Habitable Planets | Earth is the only planet in our solar system in the "Goldilocks Zone" -- a distance from the Sun with the right amount of light and heat for life to exist. But we have discovered thousands of exoplanets - planets outside our solar system. These exoplanets, and the stars they orbit, range greatly in their distances from Earth. Could any of these exoplanets be in the "Goldilocks Zone"? Students evaluate star brightness, temperature, and distance from our solar system to plan an exoplanet space mission. As they imagine looking back at Earth from the surface of the exoplanet, they will come to realize that our Sun only appears larger and brighter than other stars because it is so close to Earth.<br><br>**DCIs: ESS1.A** | Students **obtain, evaluate, and communicate** information about temperature and light conditions that a planet must have for humans to survive. Students then **use this evidence to engage in an argument** and justify their choice for an exoplanet space mission. Students consider what our Sun looks like when viewed from the surface of the far-away exoplanet. | Students consider how the conditions of the Sun and planets in our solar system can be extended to learn about other similar, but separate **systems** (other solar systems). Through this, students start to build an understanding of the **scale** of our solar system and beyond. |

# Chemical Magic (5-10 weeks)

*Chemical Reactions & Properties of Matter*

## Grade 5 Mystery Science & NGSS Alignment - Physical Science (PS)

In this unit, students investigate the properties of matter by dissolving everyday chemicals to make solutions and by exploring simple yet surprising chemical reactions. Through these investigations, students begin to build conceptual models for the particulate nature of matter.

| Grade 5 Life Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 1<br>Are magic potions real? | 5-PS1-1<br>5-PS1-2 | Chemistry & Conservation of Matter | The alchemists were a historic group of people who experimented with mixing different substances together to make a potion. They wondered if their potions could transform materials.<br><br>**DCIs: *Foundational PS1.A and PS1.B*** | Students **plan and carry out an investigation** to see which solution will turn a dull penny into a shiny penny. Students **develop a conceptual model** in order to **construct an explanation** for their test results. They revise their conceptual **model** as they develop a more sophisticated understanding of particles. | Students observe the **effect** of solutions on a dull penny. Students explore that substances undergo **change**. |
| Lesson 2<br>Could you transform something worthless into gold? | 5-PS1-1<br>5-PS1-2 | Dissolving & Particulate Nature of Matter | The alchemists were on a quest to transform ordinary metal into gold, so that they could become rich. To do this, the alchemists observed and investigated the many materials around them--the substances which things are made of. They discovered that substances are able to change form, and that some substances may even *appear* to vanish, almost like magic.<br><br>**DCIs: *Foundational PS1.A and PS1.B*** | Students **carry out an investigation** to determine what happens when they place a steel object in the same solution that turned their pennies shiny in Lesson 1. Students **construct an explanation** by **developing a conceptual model** to show how the solution affects the steel nail. | This lesson lays the foundation for an understanding of **conservation of matter** by considering that the copper from the penny did not disappear, but only dissolved into the solution.<br><br>Students consider the variety of **scale** within natural objects. They understand that there are extremely small, to small to see, copper particles dissolved in their solution. |
| Lesson 3<br>What would happen if you drank a glass of acid? | 5-PS1-3 | Acids, Reactions & Properties of Matter | The alchemists discovered acids--a set of substances that is extremely *reactive* (undergoes chemical changes easily). A chemical *reaction* happens when different substances are mixed and it causes some kind of change. We can tell a chemical change is happening by observing indications such as fizzing, a color change, or dissolving.<br><br>**DCIs: PS1.A** | Students **conduct an investigation** to discover if a reaction occurs when mixing two substances. **Analyzing the data**, students determine which substances react with acid. Next, students decide how to test unknown liquids to see if they are acids. | Students consider the **cause and effect** relationship when combining chemicals to produce reactions.<br><br>Students consider that combining two chemicals may result in a **change** in the substance. |

*(continued)*

# Chemical Magic (5-10 weeks)

*Chemical Reactions & Properties of Matter*

## Grade 5 Mystery Science & NGSS Alignment - Physical Science (PS)

| Grade 5 Physical Science | Performance Expectations | Focus | Disciplinary Core Ideas (DCIs) (Lesson Conceptual Flow) | Scientific & Engineering Practices (SEPs) | Crosscutting Concepts (CCC) |
|---|---|---|---|---|---|
| Lesson 4<br>What do fireworks, rubber, and silly putty have in common? | 5-PS1-4 | Chemical Reactions | The alchemists were not successful in finding an easy way to make gold, but all of their observations and experimenting with substances turned out to be hugely important.<br><br>For example, when acids react with other substances, they form entirely new substances. The new substance will have different properties from the original substances. Some of these properties are useful. Chemical reactions are how we get new substances and discover new properties!<br><br>**DCIs: PS1.B** | Students **conduct an investigation** to see which chemicals, when combined, result in a chemical reaction. They **construct an explanation** to share which chemicals reacted and formed a new substance with a goo consistency. In Part 2 of the activity, students make their own goo by mixing the two chemicals which formed a goo-like substance in Part 1. | Students consider the **cause and effect** relationship between chemicals that are combined to form new substances.<br><br>Students consider that combining two chemicals may result in a **change** when a substance with unique properties is created. |
| Lesson 5<br>Why do some things explode? | 5-PS1-1 | Gases & Particle Models | Not all explosions are big and fiery, they can be small too! The alchemists were the first to discover these small explosions. They noticed small bubbles forming when some substances and objects were placed in an acid. The substance, gas, was hard to capture--it would escape the container, or make it burst. Gases can be visible or invisible and are made up of many tiny particles that you can't see. All explosions are caused by a buildup of gas moving outward that bursts the container they are in.<br><br>**DCIs: PS1.A** | Students **conduct an investigation** to see what happens when baking soda and vinegar react inside a closed ziplock bag. They **develop a particle model** to explain their results--that gas particles are created and move outward, causing the ziplock bag to expand or even burst. | Students consider that combining two chemicals may result in a **change** when a substance with unique properties is created.<br><br>Students understand that particles are very small, to small to see, compared to other natural objects. |