PhD SCIENCE® TIPS FOR FAMILIES

Overview for Families

What is *PhD Science*?

PhD Science® is a knowledge-building, phenomenon-driven curriculum. Each year comprises four units of study called modules. Each module provides students with a real-world context for their learning by focusing on an observable event that can be explained or predicted: the anchor phenomenon. Students explore these compelling phenomena through observing, questioning, modeling, and investigating. Woven throughout each module is a coherent storyline of science concepts that helps students make sense of the phenomena they are exploring.

What will my student do in class?

Students will be working, thinking, and experimenting just like real scientists. Science will involve hands-on investigations that allow students to develop a deep understanding of science concepts. As students uncover information about the anchor phenomenon, they will ask questions, find evidence, generate new ideas, and devise solutions.

Throughout each module, the questions students generate about the anchor phenomenon will be recorded on the *driving question board*—a chart the class will use to organize questions and guide student learning. The class also creates an anchor model and chart to visually express students' ideas. These tools help students see how different concepts fit together and how understanding of the phenomenon is deepening.

Each module offers opportunities for students to use the engineering design process, apply what they have learned to solve real-world problems, and present their ideas. For example, in a module on weather, students design a shelter that provides shade to help archaeologists stay cool.

Discussion and debate will be part of many lessons, as students will make claims, defend them with evidence, and ask questions about the claims of their classmates. At the end of each module, students will participate in a Socratic Seminar that stimulates discussion. During the seminar, students respond to fundamental questions about the anchor phenomenon and broader scientific concepts by thinking critically and applying their learning from the module.

What will be different?

PhD Science lessons are designed to allow students to drive their own learning. Students uncover key concepts by actively engaging in science and engineering practices. In class, they read high-quality, age-appropriate texts that spark curiosity, introduce phenomena, and support the development of scientific understandings. Along the way, students document their learning in a Science Logbook that allows them to review and reflect on how they built their knowledge.

How is science connected to other disciplines?

All *PhD Science* modules make connections across science fields and academic disciplines. The curriculum highlights connections to math, literacy, and social studies so students can practice approaching real-world tasks from an interdisciplinary perspective. For example, while collecting weather data in one module, students practice math skills such as counting and using numbers to identify patterns. Students also connect their new knowledge to geography by comparing the weather at Mesa Verde National Park with their local weather. In addition to cross-curricular connections, all modules include lessons devoted to the application of concepts. In these lessons, students apply science and engineering practices to solve an authentic problem.

How can I help?

With each module, you will receive a Family Tip Sheet that outlines the module concepts and includes ideas on how you can support your student at home. The goal of these suggestions is to help students see science everywhere—not just at school. Talking about science, watching science videos, or visiting a museum, park, or zoo are all ways to support your student's learning.

Is there homework?

PhD Science modules have optional, informal homework assignments to reinforce learning and connect students' understandings to their everyday lives. These assignments often include ideas to discuss with family members or questions that prompt a simple exploration. When applicable, students are encouraged to share their work with the class.

How are students assessed?

Student learning is assessed in informal and formal ways. Throughout each module, students will be informally assessed through questions and classwork. Toward the end of each module, students apply their new knowledge in a science or engineering challenge, an End-of-Module assessment, and the Socratic Seminar, all of which allow for formal evaluation of learning. The balance of ongoing and cumulative assessment allows instruction to be adjusted throughout the module to ensure that students are progressing.

What will my student study in Level K?

Module	Title	Anchor Phenomenon
1	Weather	Cliff Dwellings at Mesa Verde
2	Pushes and Pulls	Tugboats Moving Cargo Ships
3	Life	Life in the Mojave Desert
4	Environments	Life in a Longleaf Pine Forest

PhD SCIENCE® TIPS FOR FAMILIES

Level K Module 1: Weather

CONTENT OVERVIEW

ANCHOR PHENOMENON: Cliff Dwellings at Mesa Verde

Essential Question: How did the cliff dwellings at Mesa Verde protect people from the weather?

By studying how the cliff dwellings at Mesa Verde protected the Ancestral Pueblo people from the weather, we can understand how weather affects people and their surroundings.

CONCEPT 1: Parts of Weather

Focus Question: What is weather?

Observing and describing the parts of weather helps us understand how weather can affect people and their surroundings.

APPLICATION OF CONCEPTS: Designing a Shelter

Using the engineering design process, we will create a model shelter that provides shade for archaeologists working at a dig site.

CONCEPT 2: Weather Data

Focus Question: What does weather data reveal?

Analyzing weather data helps us identify patterns in weather over time and allows us to compare our local weather to the weather at Mesa Verde.

CONCEPT 3: Severe Weather

Focus Question: How does severe weather affect us?

Exploring severe weather patterns and the ways severe weather can affect communities helps us understand how communities prepare for and respond to blizzards, tornadoes, and hurricanes.

SUPPORTING YOUR YOUNG SCIENTIST AT HOME

ONGOING CONVERSATIONS

Support science learning at home by having conversations about weather. Here are some suggestions to get you started:

- Talk about the local weather throughout the year. Extend the conversation by comparing your local weather to the weather in a different location, such as a place you have visited.
- Point out different ways people are protected from the weather. For example, an awning on a building provides people with shade, and a covered bus stop protects people from rain and sun.
- Talk about what people do when there is severe weather. For example, outdoor sports games are canceled when there are thunderstorms, and schools close when there is snow and ice.

ACTIVITIES

These activities support and extend classroom learning:

- Read or watch a local weather forecast. Ask your student to plan an activity that is appropriate for that day's weather.
- Encourage your student to use drawings, words, or photographs to record the weather in a weather journal.
- Collect weather data by using tools such as an outdoor thermometer, rain gauge, or windsock.

BOOKS

Local libraries are a great resource for fiction and nonfiction books related to weather. Browse the library catalog or start with these suggestions:

- *Ten Ways to Hear Snow* by Cathy Camper
- *When Rain Falls* by Melissa Stewart
- *Monsoon Afternoon* by Kashmira Sheth

WEBSITES

Keep the learning going by exploring these internet resources:

- Visit the Mesa Verde National Park website (https://www.nps.gov/meve/) to learn more about the cliff dwellings of the Ancient Pueblo people.
- Visit the Weather Underground website (https://www.wunderground.com/) to review forecasts and past weather data for locations around the world.

Level K Module 2: Pushes and Pulls

CONTENT OVERVIEW

ANCHOR PHENOMENON: Tugboats Moving Cargo Ships

Essential Question: How do tugboats move cargo ships through a harbor?

By exploring how tugboats move cargo ships through a harbor, we learn how pushes and pulls can change the way objects move.

CONCEPT 1: Starting Movement

Focus Question: What causes objects to start moving?

Using a set of toys helps us explore how pushes and pulls can cause objects to start moving. We investigate how the strength of a push or pull on an object affects the speed of the object's movement.

CONCEPT 2: Changing Movement

Focus Question: What causes moving objects to change direction or stop?

Using an interactive map model of New York Harbor helps us investigate how tugboats can use pushes and pulls to change the direction of a cargo ship or cause it to slow down and stop.

APPLICATION OF CONCEPTS: Stopping a Tugboat Close to a Dock

Using the engineering design process, we create a model dock cushion to help a tugboat stop close to its dock.

SUPPORTING YOUR YOUNG SCIENTIST AT HOME

ONGOING CONVERSATIONS

Support science learning at home by having conversations about pushes and pulls. Here are some suggestions to get you started:

- Discuss how pushes and pulls cause objects to move in common activities such as pushing a friend on a swing or pushing and pulling a shopping cart.
- Point out pushes and pulls that occur in sports. Discuss how pushes or pulls can change the movement of a player or an object, such as a ball.
- Talk about tugboats and other machines or tools that use pushes or pulls to change the movement of an object.

ACTIVITIES

These activities support and extend classroom learning:

- Safely explore pushes and pulls with different toys, such as cars, wagons, and balls. Encourage your student to use different pushes and pulls to change a toy's speed and direction.
- Safely explore pushes and pulls by using different objects, such as blocks or toy boats, in a small basin or sink filled with water.
- Visit a harbor or other waterway to observe tugboats pushing or pulling ships.
- Encourage your student to design a carnival game that requires people to use pushes and pulls to play the game, such as a bean bag toss or a game of bowling.

BOOKS

Local libraries are a great resource for fiction and nonfiction books related to pushes and pulls. Browse the library catalog or start with these suggestions:

- *What Do Wheels Do All Day?* by April Jones Prince
- *Come Out and Play: A Global Journey* by Maya Ajmera and John D. Ivanko
- *Good Morning, Snowplow!* by Deborah Bruss

Level K Module 3: Life

CONTENT OVERVIEW

ANCHOR PHENOMENON: Life in the Mojave Desert

Essential Question: How is Mara different from the Wonderland of Rocks?

By studying life in the Mojave Desert, we can understand that plants and nonhuman animals need certain resources to live and grow and can obtain these resources from their environments. We also learn that humans rely on natural resources to meet their needs.

CONCEPT 1: Plants

Focus Question: Why are plants able to live in some environments but not others?

Comparing two desert environments helps us understand that plants live in environments that have the water and light that the plants need.

APPLICATION OF CONCEPTS: Investigating Bean Plants

Investigating what bean plants need to live and grow helps us understand that all plants need water and light to live and grow.

CONCEPT 2: Animals

Focus Question: How do animals get what they need to live?

Observing desert animals helps us understand that animals get what they need from natural resources in their environments.

CONCEPT 3: Humans

Focus Question: How do humans get what they need to live?

Determining how people who lived in the Mojave Desert long ago got what they needed to live helps us understand how people today use natural resources to get what they need to live.

SUPPORTING YOUR YOUNG SCIENTIST AT HOME

ONGOING CONVERSATIONS

Support science learning at home by having conversations about how plants and animals, including humans, get what they need to live and grow. Here are some suggestions to get you started:

- Point out familiar plants and animals, including houseplants and pets, and talk about what the plants and animals need to live and grow.
- Point out plants or animals that live in unexpected places and discuss how the plants or animals might be getting what they need to live and grow.
- Talk about the natural resources your family uses to get what you need to live, such as the foods you eat or the objects around the home that come from wood or metal.

ACTIVITIES

These activities support and extend classroom learning:

- Visit a park or botanical gardens to observe various plants that have different water and light needs.
- Safely observe and record evidence of animals getting what they need to live, such as photographing a bird eating seeds from a feeder or a squirrel eating an acorn.
- Research a favorite animal to find out what it eats.

BOOKS

Local libraries are a great resource for fiction and nonfiction books related to plants and animals and what they need to live and grow. Browse the library catalog or start with these suggestions:

- *A Desert Scrapbook* by Virginia Wright-Frierson
- *The Tinaja Tonight* by Aimée M. Bissonette
- *This Is the Oasis* by Miriam Moss

WEBSITES

Keep the learning about plants and animals and the resources they need to live and grow going by exploring this internet resource:

- Visit the Joshua Tree National Park website (https://www.nps.gov/jotr/index.htm) to learn more about life in the Mojave Desert.

Level K Module 4: Environments

CONTENT OVERVIEW

ANCHOR PHENOMENON: Life in a Longleaf Pine Forest

Essential Question: Why are gopher tortoises disappearing?

By studying life in a longleaf pine forest, we learn that when living things change their environment to get what they need, those changes can affect other living things.

CONCEPT 1: Plants, Animals, and Environments

Focus Question: How do plants and animals change their environment?

Investigating how plants and animals use their environment to get what they need to live helps us understand the ways that plants and animals can change their environment.

CONCEPT 2: Humans and Environments

Focus Question: How do humans change their environment?

Exploring the changes that humans have made to the longleaf pine forest helps us understand that humans can make changes that hurt or help their environment.

APPLICATION OF CONCEPTS: Making a Flower Pot

Using the engineering design process and our knowledge of how humans can change the environment when they throw objects away, we design and create a flower pot made from paper that does not hurt the environment.

SUPPORTING YOUR YOUNG SCIENTIST AT HOME

ONGOING CONVERSATIONS

Support science learning at home by having conversations about environments. Here are some suggestions to get you started:

- Talk about the different kinds of plants and animals in your local area and the changes they make to their environment to get what they need.
- Discuss the ways that people have changed the environment in your local area.
- Talk about your favorite foods and whether those foods come from a garden or farm.
- Point out different objects around the home that are made of wood.

ACTIVITIES

These activities support and extend classroom learning:

- Research an animal that builds a shelter and the changes that occur to the animal's environment when it creates the shelter.
- Take photos or sketch changes made by animals in your neighborhood or a local park.
- Visit a place in your community where people are restoring a local environment, such as a park or wetland.
- Visit a farm or community garden to see the places where people grow food.

BOOKS

Local libraries are a great resource for fiction and nonfiction books related to environments. Browse the library catalog or start with these suggestions:

- *Plant a Pocket of Prairie* by Phyllis Root
- *The Sequoia Lives On* by Joanna Cooke
- *Prairie Dog Song* by Susan L. Roth and Cindy Trumbore

WEBSITES

Keep the learning about environments going by exploring these internet resources:

- Visit the North Carolina Longleaf Coalition website (https://www.nclongleaf.org/llPineForests.html) to learn more about longleaf pine forests.
- Visit the Centennial Forest Big Thicket National Preserve website (https://www.nps.gov/places/centennial-forest.htm) to learn more about the restoration of longleaf pines in Big Thicket National Forest.