

Hands-on investigations in Amplify Science

Featured activities



authored by



THE LAWRENCE
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Hands-on investigation

Hands-on learning is an essential part of Amplify Science, and is integrated into every unit. Students actively participate in science, acting like scientists and engineers as they gather evidence, think critically, solve problems, and develop and defend claims about the world around them. Every unit includes hands-on investigations which are critical to achieving the unit's learning goals.

This brochure will walk you through example activities from each of the Amplify Science K–5 units. For complete materials lists please visit amplify.com/sciencek5.

FLEX

Hands-on Flextensions

Hands-on Flextensions are additional, optional investigations that are included at logical points in the learning progression and give students an opportunity to dig deeper if time permits. These activities offer teachers flexibility to choose to dedicate more time to hands-on learning. These activities will be designated as *FLEX* in this brochure.

Materials referenced in Hands-on Flextension activities will either be included in the unit kit or easily sourced. Supporting resources such as student sheets will be included as downloadable PDF files.

All hands-on investigations included in the program are developed by UC Berkeley's Lawrence Hall of Science.

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Quantity and materials in each kit are subject to change. For current lists of all materials in each kit, please visit amplify.com/science.

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KINDERGARTEN

Needs of Plants and Animals

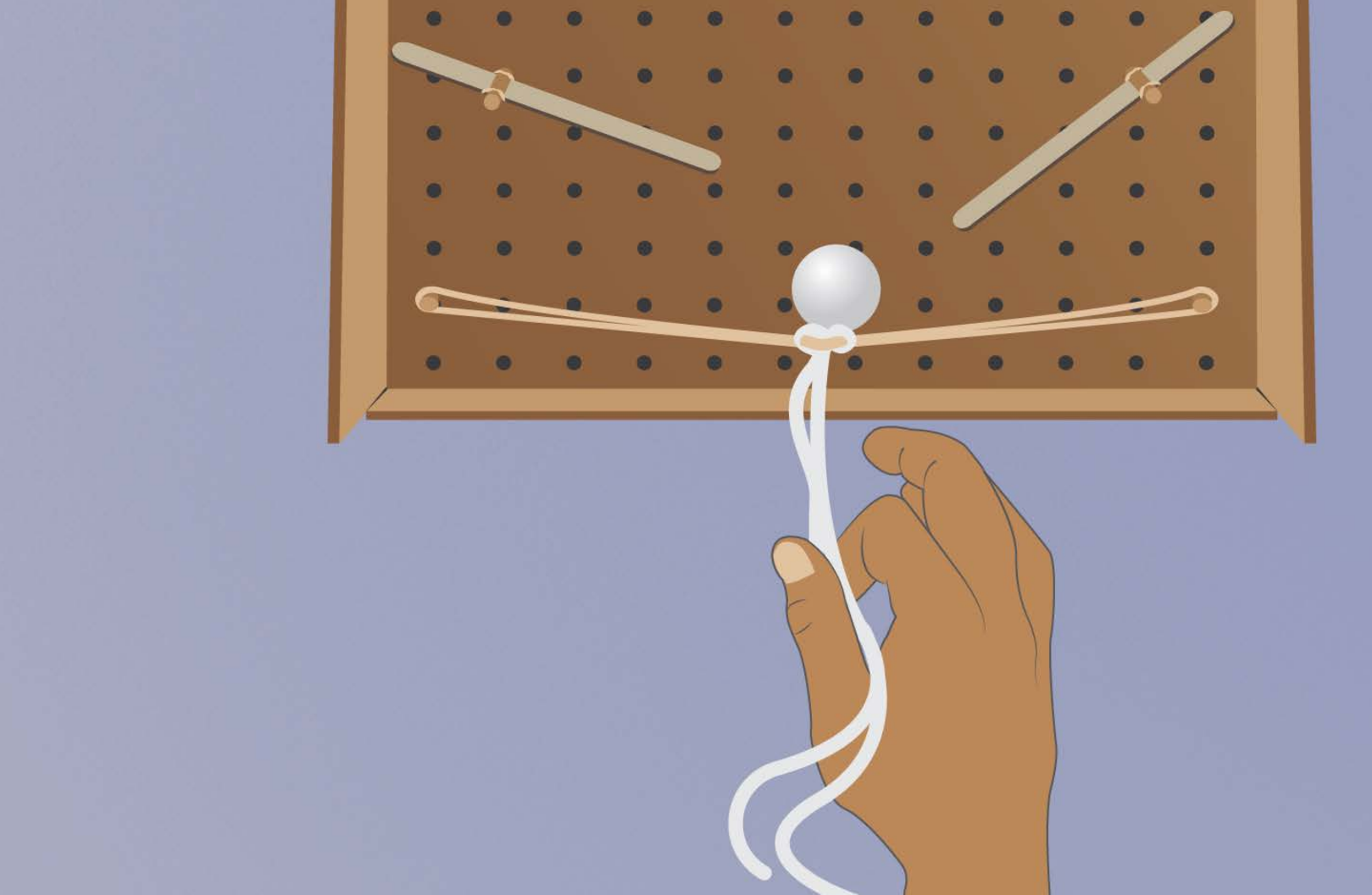
Unit storyline

Students take on the role of scientist in order to figure out why there are no longer any monarch caterpillars living in an area that was converted from a field to a community garden. Students investigate how plants and animals get what they need to live and grow, and then make a new plan for the community garden that will provide for the needs of monarch caterpillars as well as produce vegetables for humans.

Featured activity: Observing Radish Roots (Lesson 2.6)

In Chapter 2 of *Needs of Plants and Animals*, students investigate what it means for a plant to grow, whether or not all plants need water to grow, and how plants get the water they need to grow. Students plant radish seeds in soil, providing water to half of the plants while the other half receive no water. Students observe the radish plants over time and figure out that only the plants that receive water are growing. The plant observations also provide students with evidence that the plants that are growing get the water they need with their roots from the soil.





KINDERGARTEN

Pushes and Pulls

Unit storyline

Students take on the role of pinball engineer as they investigate the effects of pushes and pulls on the motion of an object. They make and test their own models of a pinball machine, and use what they learn to contribute to the design of a class pinball machine. Throughout the unit, students learn about the design cycle and how engineers continually test their designs to improve their solutions.

Featured activity:

Showcasing the Box Models (Lesson 5.3)

In Lesson 5.2 of *Pushes and Pulls*, students synthesize what they have figured out about force and motion to create a culminating design for their pinball machine models. Students incorporate a launcher, flippers, and bumpers into their model to help their pinball reach a target. Students then test their models to observe whether or not their solutions work as expected, and then make any additional modifications as necessary.





KINDERGARTEN

Sunlight and Weather

Unit storyline

The students at Carver and Woodland Elementary schools are not comfortable outside during their recess times. The Carver students are too cold in the morning and the Woodland students are too hot in the afternoon. In their roles as weather scientists, students help explain the difference in playground temperatures. They gather data from models of the sun and Earth's surface to figure out how sunlight causes changes in the temperature of different surfaces. At the end of the unit, students apply what they have learned and use models to solve a new problem about why Woodland's playground sometimes floods.



Featured activity:

Investigating with the Flooding Model (Lesson 5.2)

In Lesson 5.2 of *Sunlight and Weather*, students are introduced to four flooding models, each of which tests whether a particular difference between the playgrounds causes flooding — gravel or solid playground surface, dark or pale playground surface, trash cans with covers or no covers, and fountain or no fountain. Students analyze how the models are like and unlike the playgrounds and make predictions about what they will observe when they test them. They drip water on their models to simulate rain and observe and record the resulting water levels in the models. This activity allows students to use models to gather data to help determine whether any of the differences between the playgrounds are responsible for Woodland's playground flooding while Carver's does not.



GRADE 1

Animal and Plant Defenses

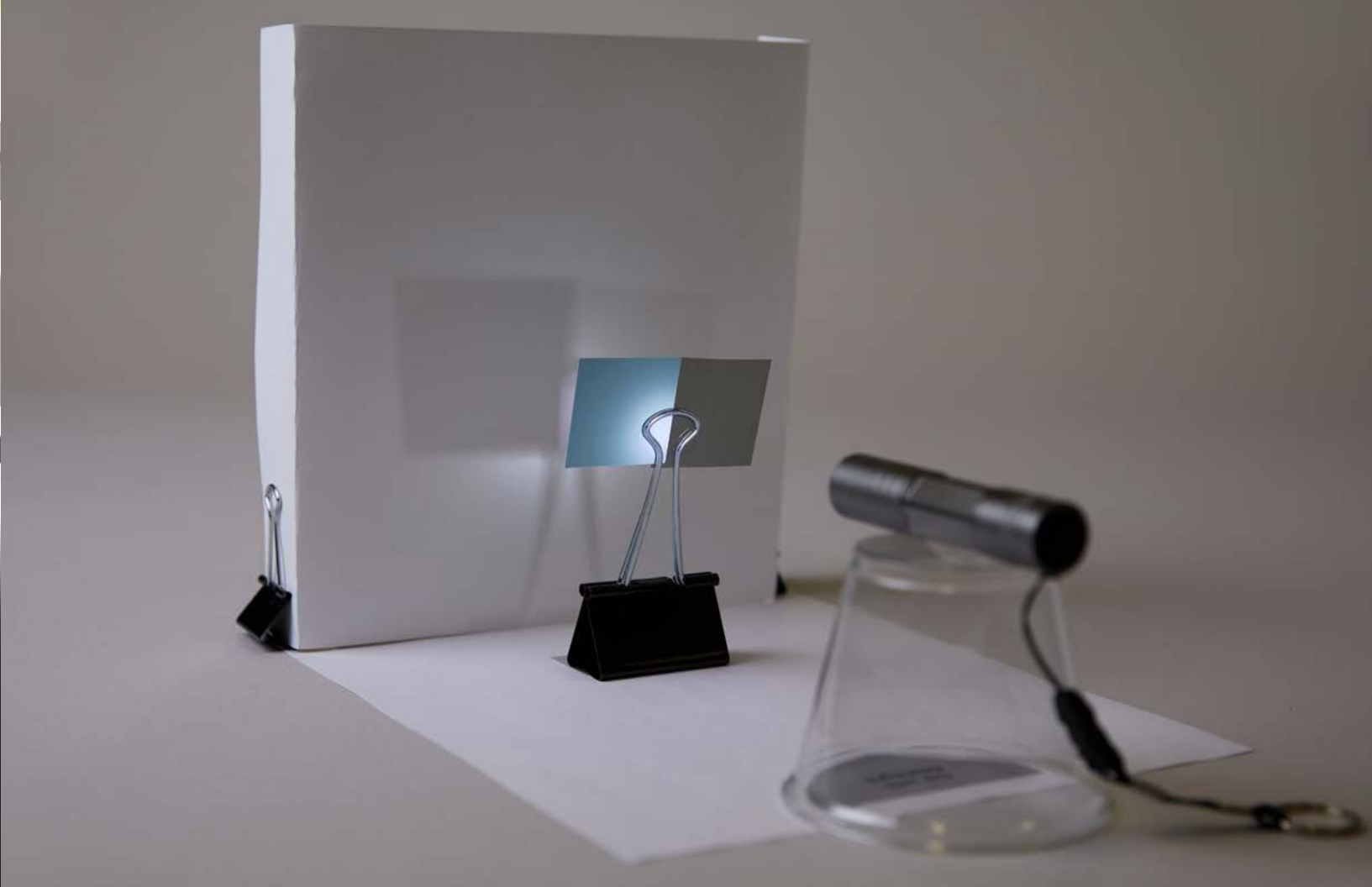
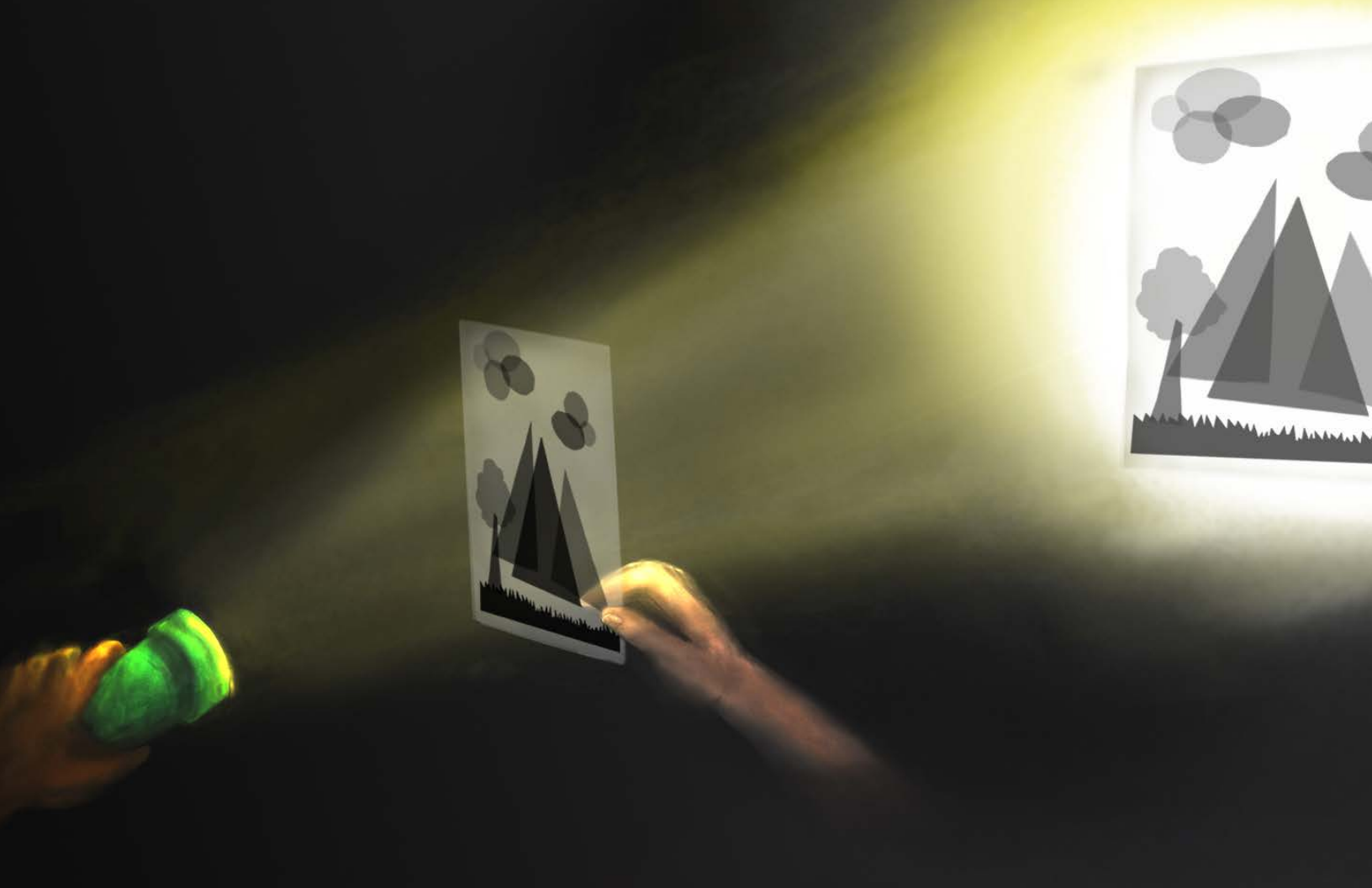
Unit storyline

In their roles as marine scientists, students apply their understanding of how animal and plant defense structures work as they explain to aquarium visitors how a sea turtle and other sea animals at an aquarium could defend themselves from predators once they are released back into the ocean.

Featured activity: Introducing Modeling (Lesson 2.3)

In Chapter 2 of *Animal and Plant Defenses*, students create a series of models to explain animal and plant defense structures. Students use a ball of clay, a comb, and a variety of materials to create models of different defense structures, including shells and armor, spikes and spines, and camouflage. After creating each model, students test their designs to ensure that the structures function as animal and plant defense structures would when encountering a predator.





GRADE 1

Light and Sound

Unit storyline

Students take on the dual roles of light engineers and sound engineers for a puppet-show company as they investigate cause-and-effect relationships and learn about the nature of light and sound. They apply what they learn to designing shadow scenery and sound effects for a puppet show.

Featured activity:

Investigating Materials That Do Not Block (Lesson 3.1)

By Lesson 3.1 of *Light and Sound*, students have figured out that not all materials block light to create a dark area on a surface. Partners use their Investigation Kits to test non-blocking materials (clear plastic, tinted plastic, and wax paper) in comparison to cardboard, a known blocking material. Students use their observations of these materials comparisons to discuss what may cause variation in the brightness of the areas created on a surface.





GRADE 1

Spinning Earth

Unit storyline

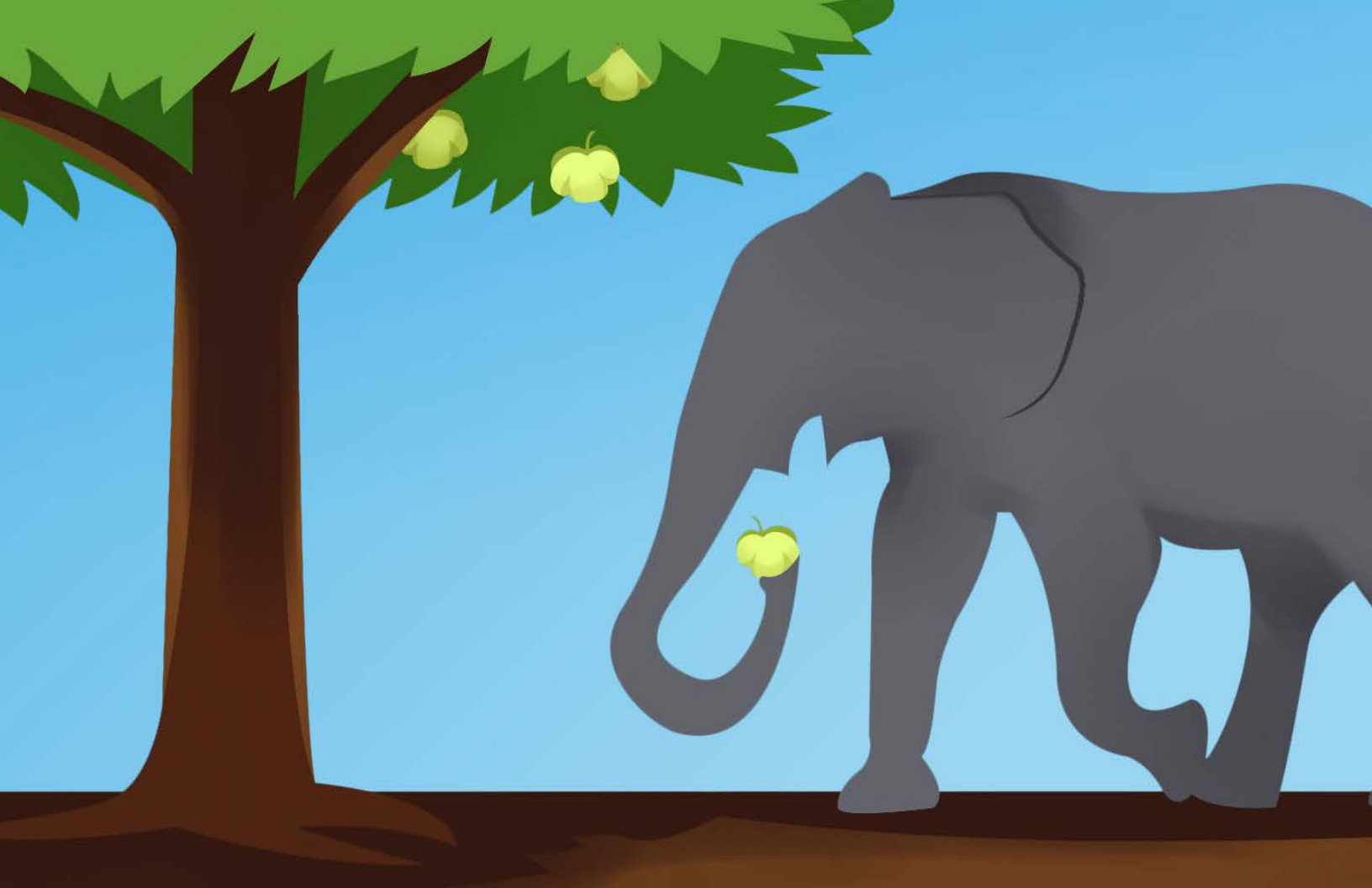
As sky scientists, students explain why Sai, a boy who lives in a place near them, sees different things in the sky than his grandma who lives in a faraway place. Students record, organize, and analyze observations of the sun and other sky objects as they look for patterns and make sense of the cycle of daytime and nighttime.

Featured activity:

Daytime and Nighttime in Places on Earth (Lesson 2.2)

In Lesson 2.2 of *Spinning Earth*, students revisit globes they labeled with daytime and nighttime stickers based on webcam observations. Students discover a pattern — the places that were experiencing daytime during the webcam observations are located around the same part of Earth, and the places that were experiencing nighttime during the webcam observations are located around a different part of Earth. Partners work together to position their globes relative to the sun to show where Earth was facing when they made their webcam observations. Students use their new understanding to make and check predictions about whether it is daytime or nighttime at other locations on the globe.





GRADE 2

Plant and Animal Relationships

Unit storyline

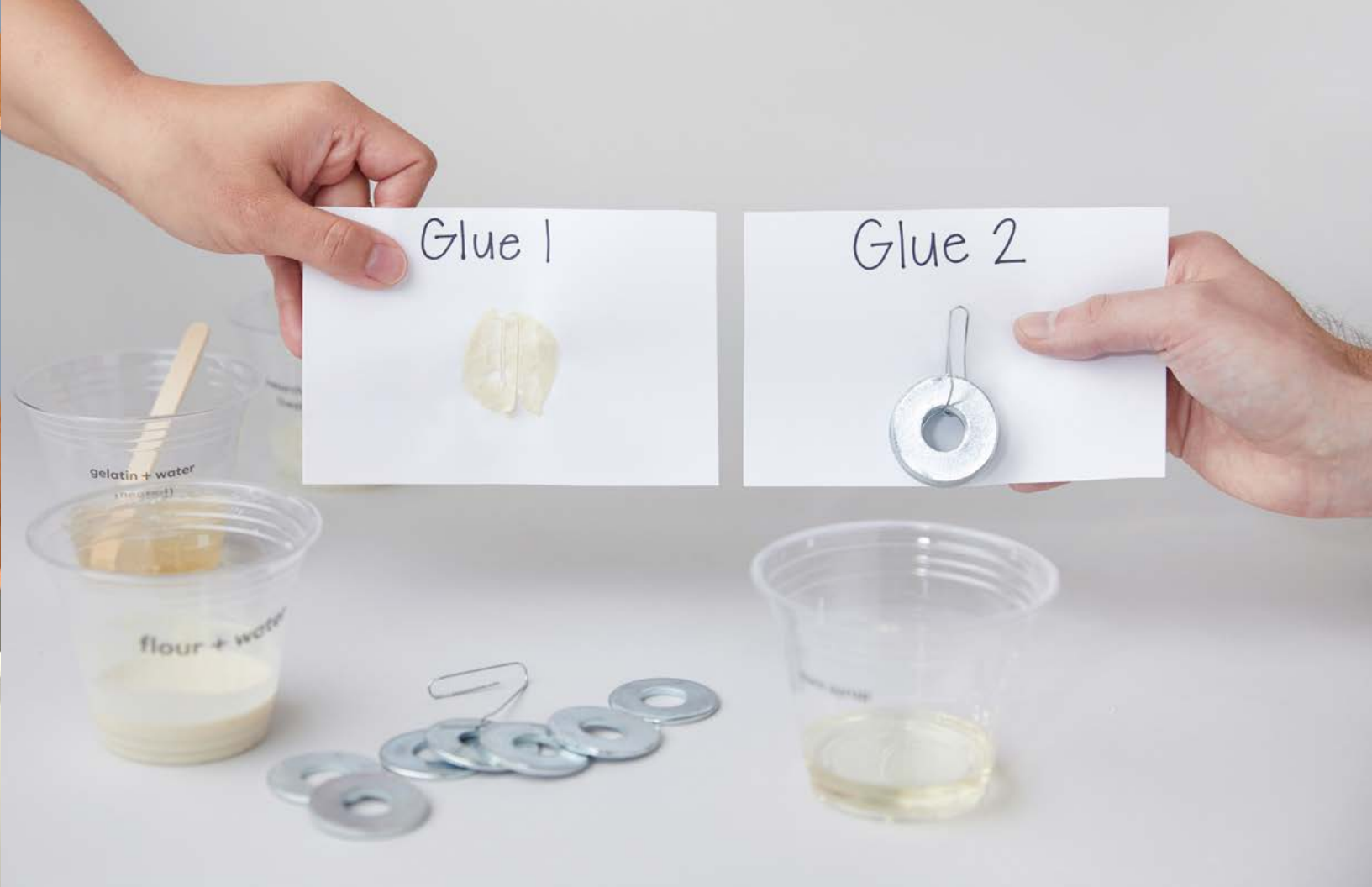
In their roles as plant scientists, students figure out why there are no new chalta trees growing in the Bengal Tiger Reserve, which is part of a broadleaf forest. Students investigate what the chalta tree needs to survive, and then collect and analyze quantitative and qualitative data to solve the mystery of the chalta trees.

Featured activity:

Propeller and Fluffy Seed Investigations (Lesson 4.2)

In Lesson 4.3 of *Plant and Animal Relationships*, students use models of seeds with and without propellers, and of seeds with and without fluffy parts, to investigate how seeds that are not used by animals for food are dispersed in their habitat. Students record and compare data collected in two investigations to learn that both propellers and fluffy parts help seeds get dispersed by wind to new places away from the plant that made the seeds.





GRADE 2

Properties of Materials

Unit storyline

As glue engineers, students are challenged to create a glue for use at their school that meets a set of design goals. Students present an evidence-based argument stating why their glue mixture would solve their school's need for a better glue. Throughout the unit, students conduct a series of tests to gather evidence about which ingredients can be used to make a glue that is sticky and strong.



Featured activity:

Making Our Second Glue and Setting Up Tests (Lesson 3.5)

In Lesson 3.5 of *Properties of Materials*, students apply the evidence that they have collected about the properties of glue ingredients to create a recipe for a glue that meets a series of design goals. Students use available ingredients to create their unique glue and then set up a fair test with partners that will allow them to compare the properties of their glues.



GRADE 2

Changing Landforms

Unit storyline

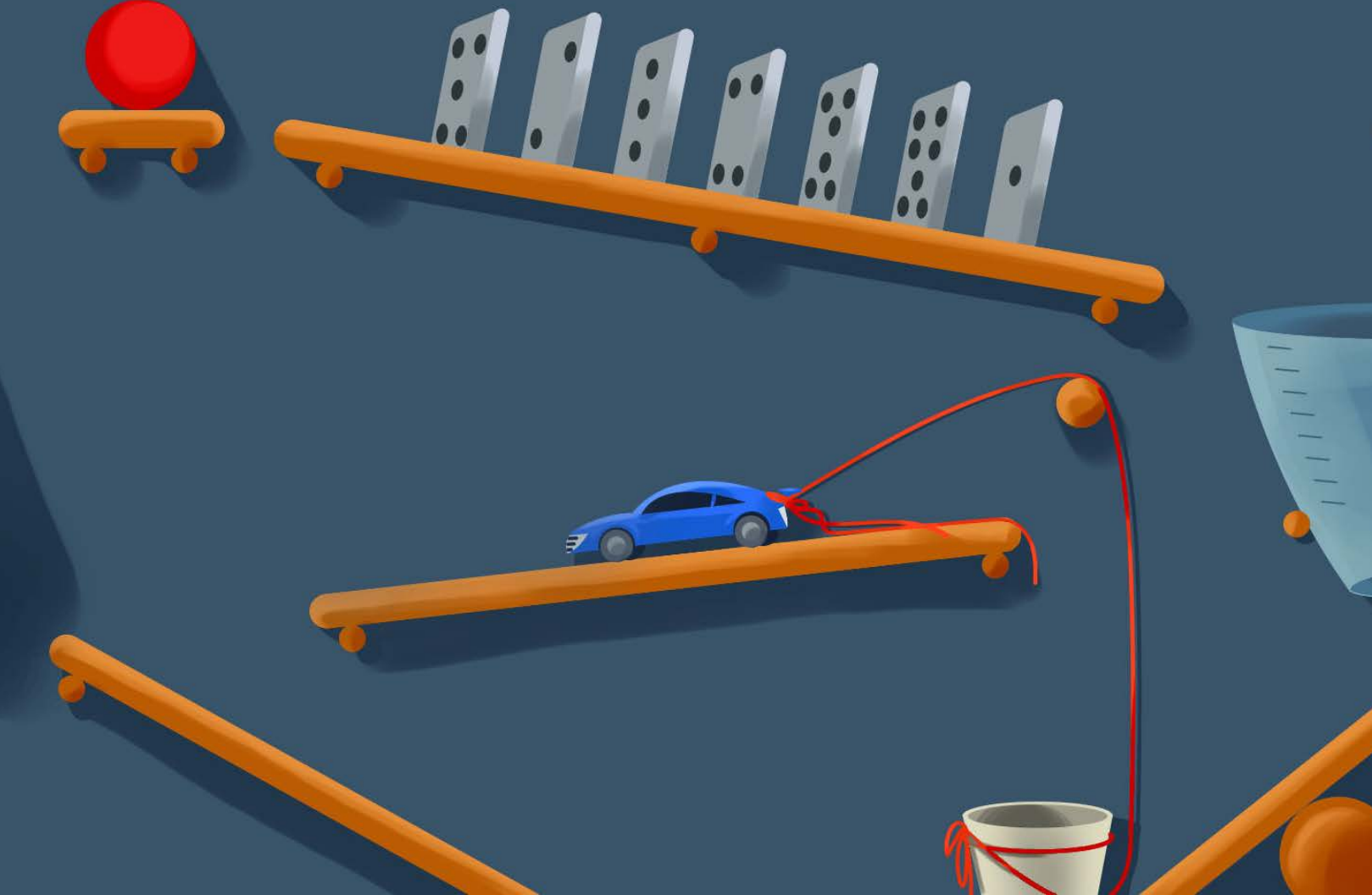
The director of the Oceanside Recreation Center got a scare when a nearby cliff collapsed, and he is worried that erosion on the recreation center's ocean cliff might have safety implications for the center's visitors. By taking on the roles of geologists investigating landforms and erosion, students are able to advise the director on the prudence of keeping the center open, even though its cliff is also changing.



Featured activity:

Investigating Fast Erosion with Chalk and Sand Models (Lesson 4.2)

In Lesson 4.2 of *Changing Landforms*, students use two models made of different materials to investigate how water can cause some landforms to erode quickly and others more slowly, observing what happens to chalk when it is sprayed with water and what happens to sand when it is sprayed with water.



GRADE 3

Balancing Forces

Unit storyline

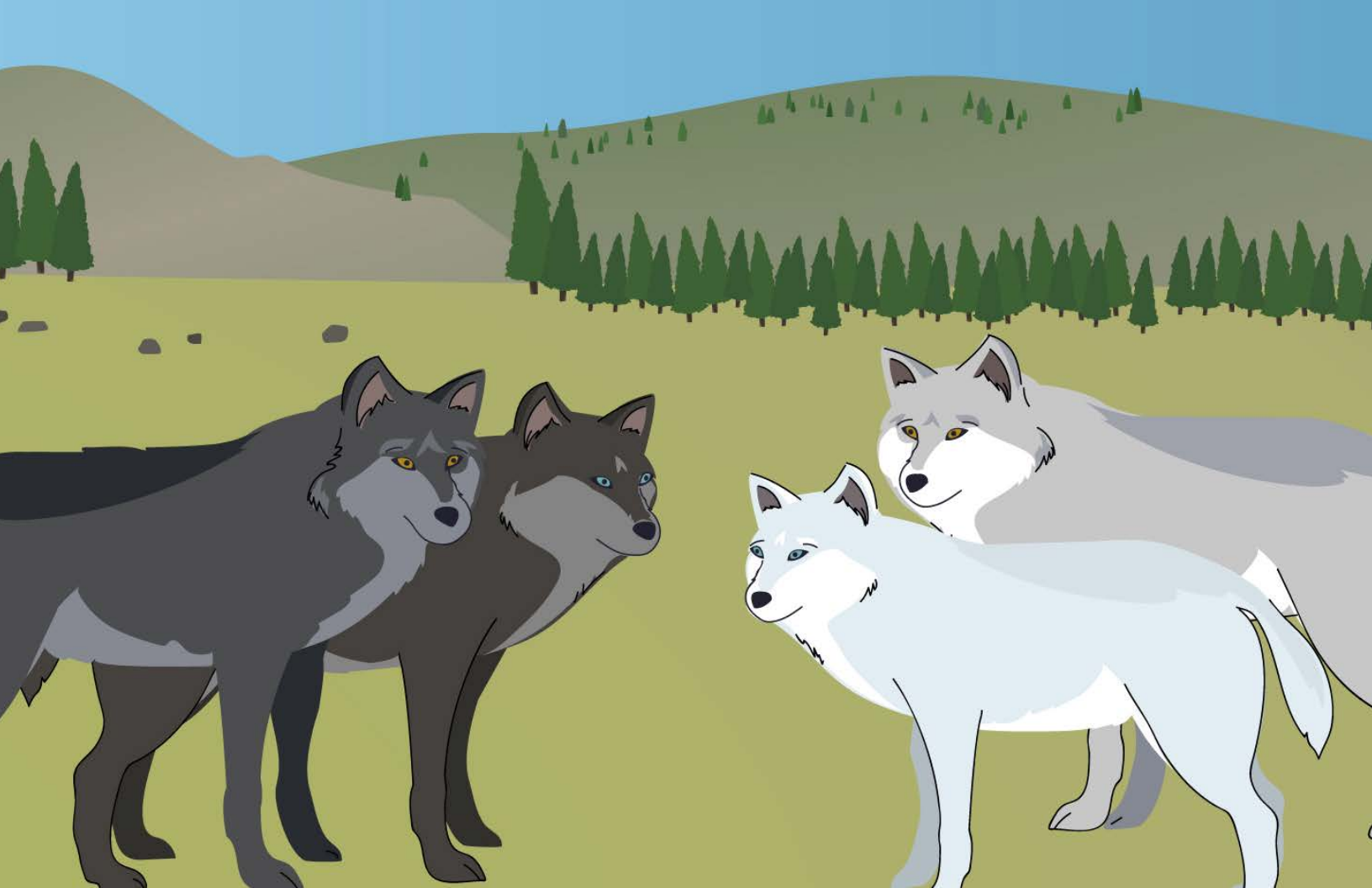
Students are challenged to figure out how a floating train works in order to explain it to the citizens of Faraday. People in Faraday are excited to hear that a new train service will be built for their city, but concerned when they hear that it will be a floating train. Students develop models of how the train rises, floats, and then falls back to the track, and then write an explanation of how the train works.

Featured activity:

Observing Forces in Chain Reactions (Lesson 3.3)

In Lesson 3.3 of *Balancing Forces*, students compare different types of forces by designing and then analyzing a chain reaction involving touching forces, magnetic force, and gravity. Students identify and record information about the forces involved.





GRADE 3

Inheritance and Traits

Unit storyline

Students play the roles of wildlife biologists working in Graystone National Park. They study two wolf packs and are challenged to figure out why Wolf 44, an adopted wolf, has certain traits. Students observe variation between and within different species, investigate inherited traits and those that result from the environment, and explain how Wolf 44 acquired certain traits.

Featured activity: Exploring Inheritance (Lesson 2.4)

In Lesson 2.4 of *Inheritance and Traits*, students investigate how traits are passed down from parents to offspring by building clay creature offspring. Students work in pairs to make clay creature offspring with specific traits based on instructions that were randomly inherited from two parent creatures. In the discussion following the activity, students compare creatures and observe that, although the offspring inherited instructions from the same parents, here is variation in traits among siblings.

Parent 1	Parent 2	Parent 1	Parent 2
&	&	&	&
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X	<	X	<
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GRADE 3

Environments and Survival

Unit storyline

In their roles as biomimicry engineers, students figure out how the traits of grove snails affect their survival in different environments. They apply that understanding as they explore other organisms, their traits, and the likelihood of survival in different environments. Students then design effective solutions to the problem of invasive plant removal using the structural traits of giraffes as inspiration.

Featured activity:

Making Test Versions of Robot Necks (Lessons 4.2–4.3)

In Lessons 4.2 and 4.3 of the *Environments and Survival* unit, students work on their design challenge of building a robot inspired by the necks and mouths of giraffes that will help get rid of invasive plants. The robot neck should help the robot reach plants at different heights, the neck should help them reach a lot of plants quickly, and the teeth should grab and break plants down into small pieces. First, they examine the materials available for making test versions of robot neck to make a plan for their designs. Then, they make their test versions and test them to see if they meet the design criteria.





GRADE 3

Weather and Climate

Unit storyline

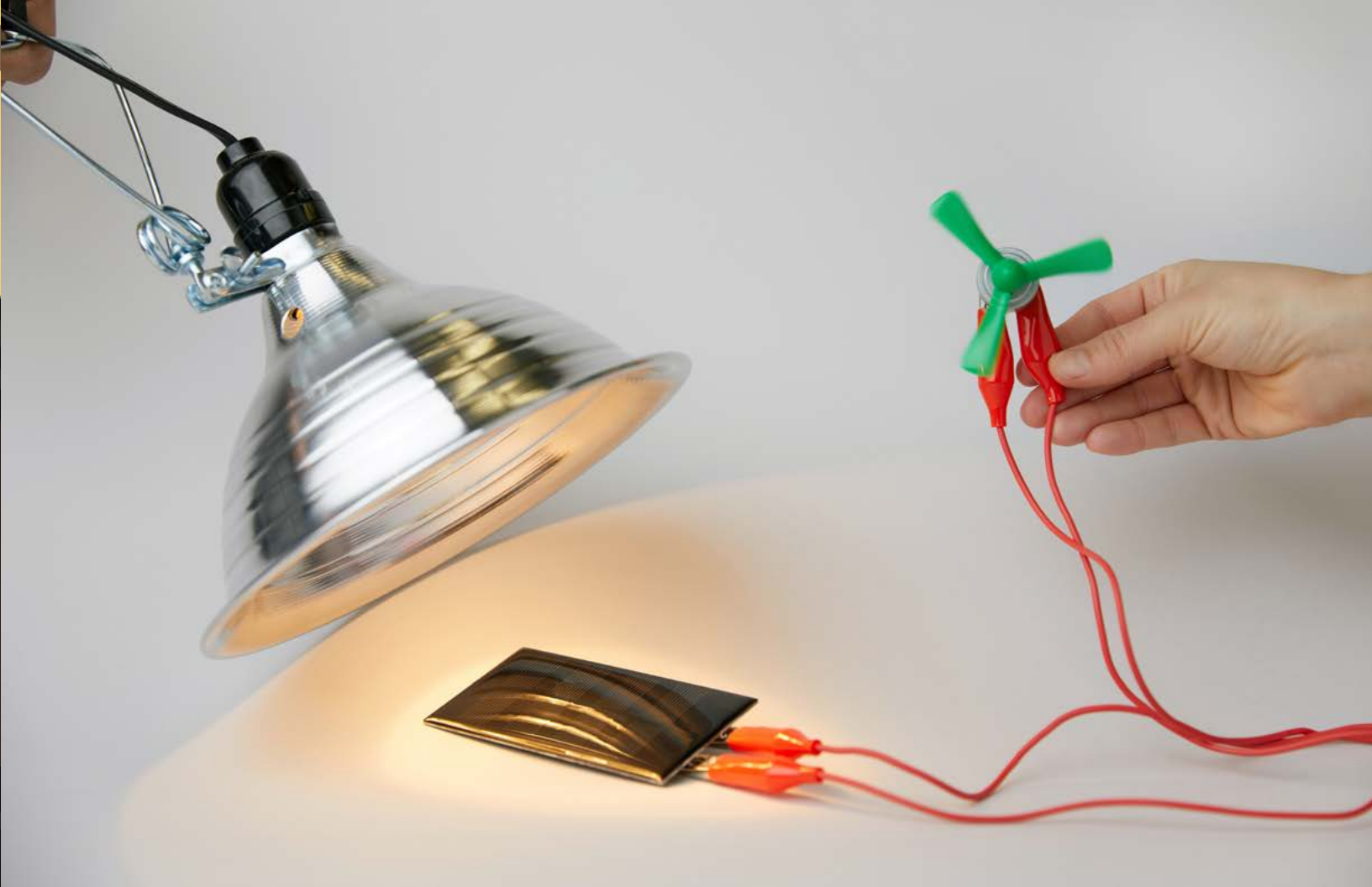
In their roles as meteorologists, students gather evidence and analyze weather patterns so they can advise the Wildlife Protection Organization on selecting one of three islands for an orangutan reserve, the one with hot and rainy weather that is most like the orangutans' natural habitat on Borneo and Sumatra. They then look for location-based patterns in weather as they figure out if it's possible to predict and/or design solutions that can prevent damage from hurricanes and other natural hazards.



Featured activity:

Building and Testing Hurricane-Proof Structures (Lesson 4.3)

In Lesson 4.3, students design and build structures that can withstand simulated hurricane winds and rain. Students use simple materials to build fortified structures that are meant to withstand a hurricane. After testing each pair's structure with blowing air and poured water, the class discusses what made some designs more effective than others.



GRADE 4

Energy Conversions

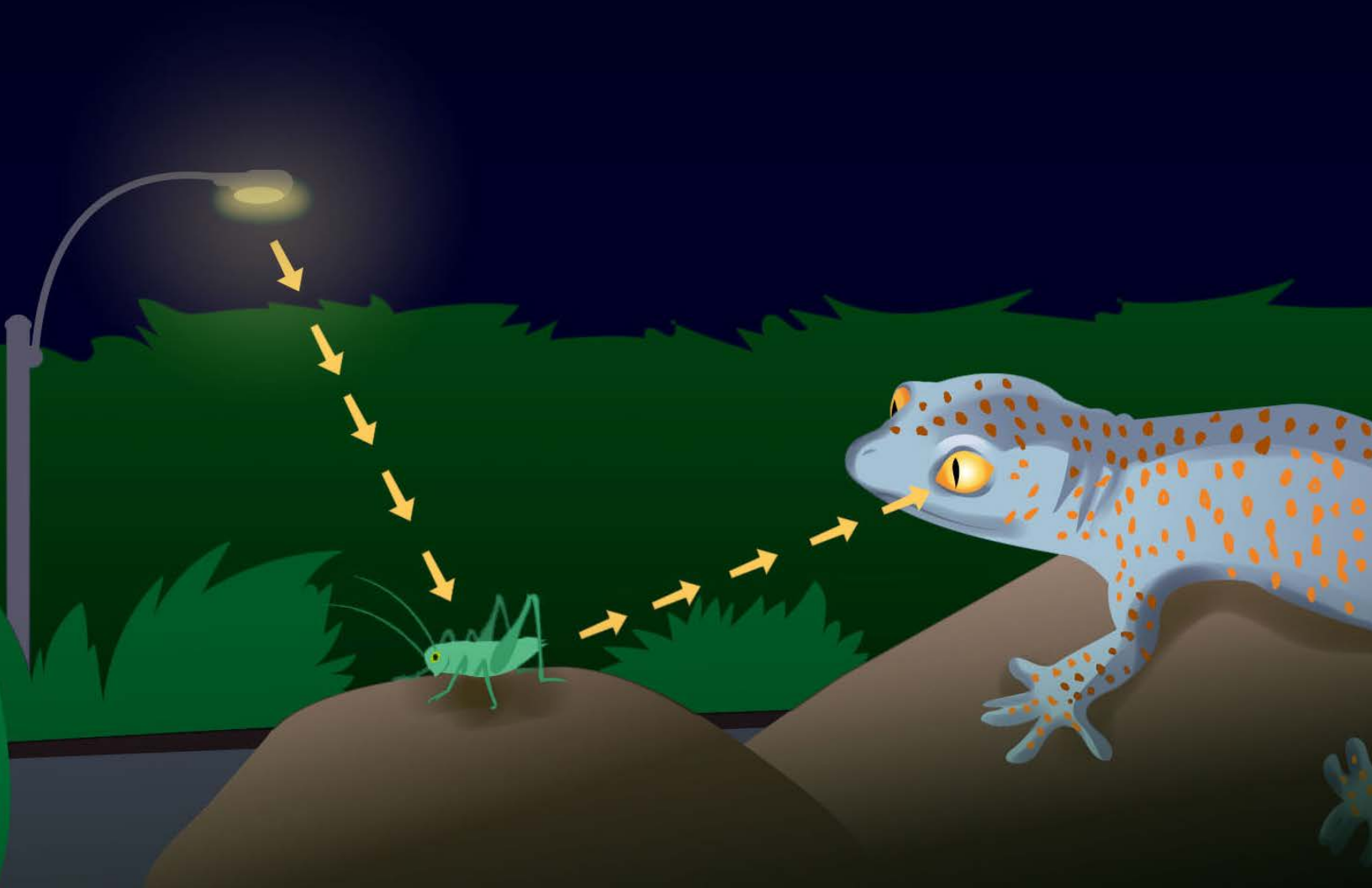
Unit storyline

Students take on the roles of systems engineers for Ergstown, a fictional town that experiences frequent blackouts, and explore the reasons why an electrical system can fail. Students apply what they learn to choosing new energy sources and energy converters for the town, and then they prepare arguments for why their design choices will make the town's electrical system more reliable.

Featured activity: Designing Wind Turbines (Lesson 3.4)

In Lesson 3.4 students are introduced to their first hands-on design challenge: to design and build a wind turbine. Students receive two proposed solutions to the blackout problem in Ergstown, both of which are intended to bring more energy to the electrical system: installing solar panels or installing wind turbines. In order to make an informed choice between the two proposed solutions, students are given a design challenge: to build a wind turbine that meets certain design criteria. Students then engage in the design cycle as they explore the available materials and plan, make, and test their wind turbine designs.





GRADE 4

Vision and Light

Unit storyline

Working as conservation biologists, students figure out why a population of Tokay geckos has decreased since the installation of new highway lights in the rainforest. Students use their understanding of vision, light, and information processing to figure out why an increase in light in the geckos' habitat is affecting the population. Then students turn their attention to humans by designing their own investigations in order to learn more about how our senses help us survive.



Featured activity:

Sense Investigation (Lessons 5.1–5.2)

In Lesson 5.1 of *Vision and Light*, students explore their own senses in order to understand how humans use their sensory structures to help gather information about their environment. Students use their sensory structures as they examine the provided materials. They then choose either hearing, touch, or smell to design an investigation about their structures and receptors that are involved in one sense. In the next lesson, they complete this investigation.



GRADE 4

Earth's Features

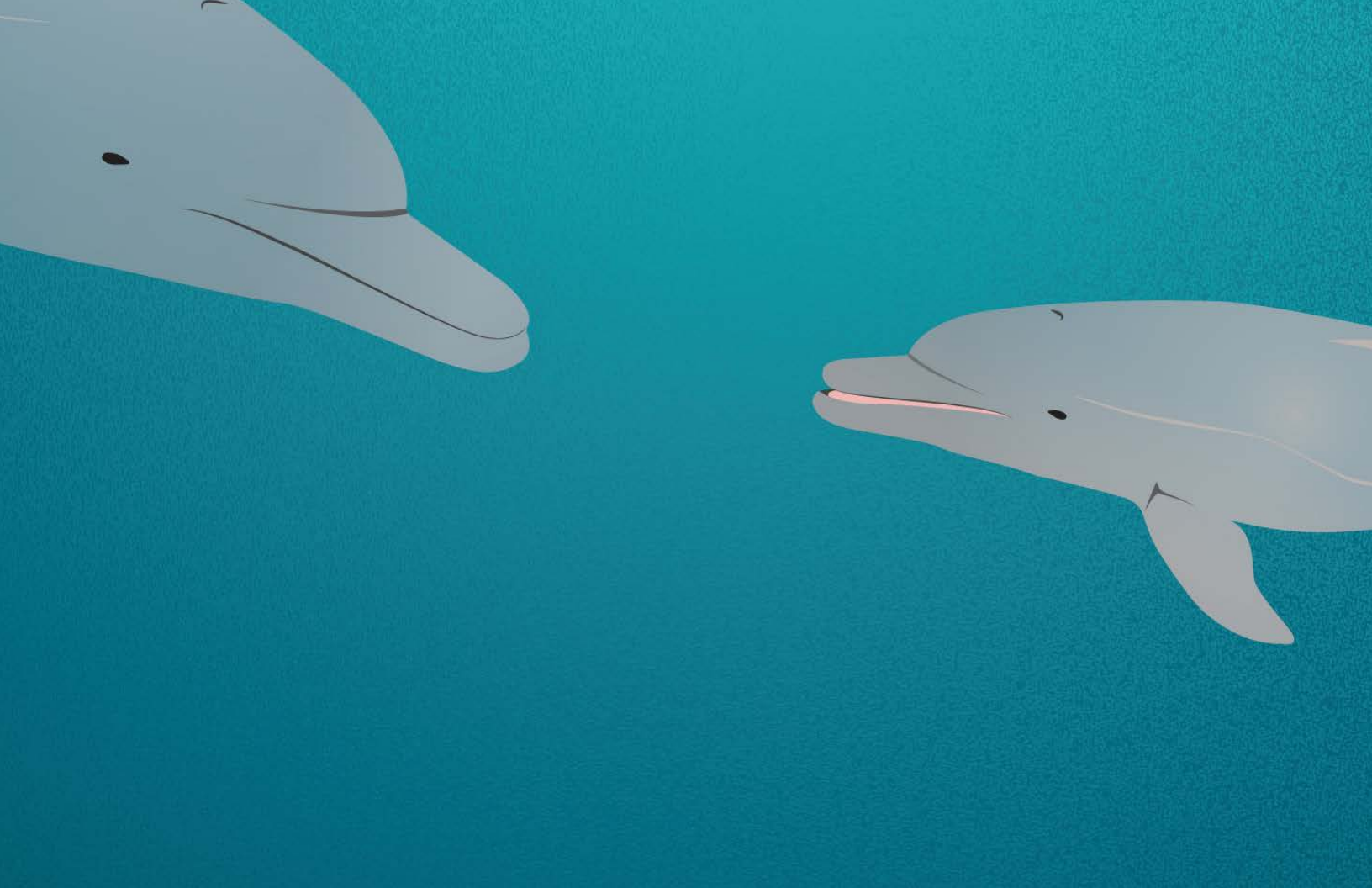
Unit storyline

Playing the role of geologist, students help the director of Desert Rocks National Park explain how and when a particular fossil formed and how it came to be in its current location. Students figure out what the environment of the park was like in the past and why it has so many visible rock layers.

Featured activity: Erosion Model (Lessons 4.3–4.4)

In Lesson 4.3 of *Earth's Features*, students use a stream table to investigate the question, “What affects the amount of rock that water can erode?” Students first narrow their focus to investigating one of the factors that affects erosion — the amount of time water flows over rock. Students determine how to use the Erosion Model to test how the amount of time a river flows affects erosion. The teacher prepares the model and students observe and record what happens.





GRADE 4

Waves, Energy, and Information

Unit storyline

Students take on the roles of marine scientists investigating how bottlenose dolphin mothers and their calves in the fictional Blue Bay National Park use patterns of sound to communicate across distances, which serves as the anchor phenomenon for this unit.



Featured activity: Designing Musical Instruments

Students design and make their own musical instruments, and then compose short songs with their instruments. They apply their understanding of the relationships between pitch and wavelength, and volume and amplitude, to draw waveforms of the sound waves produced when they play their songs.



GRADE 5

Patterns of Earth and Sky

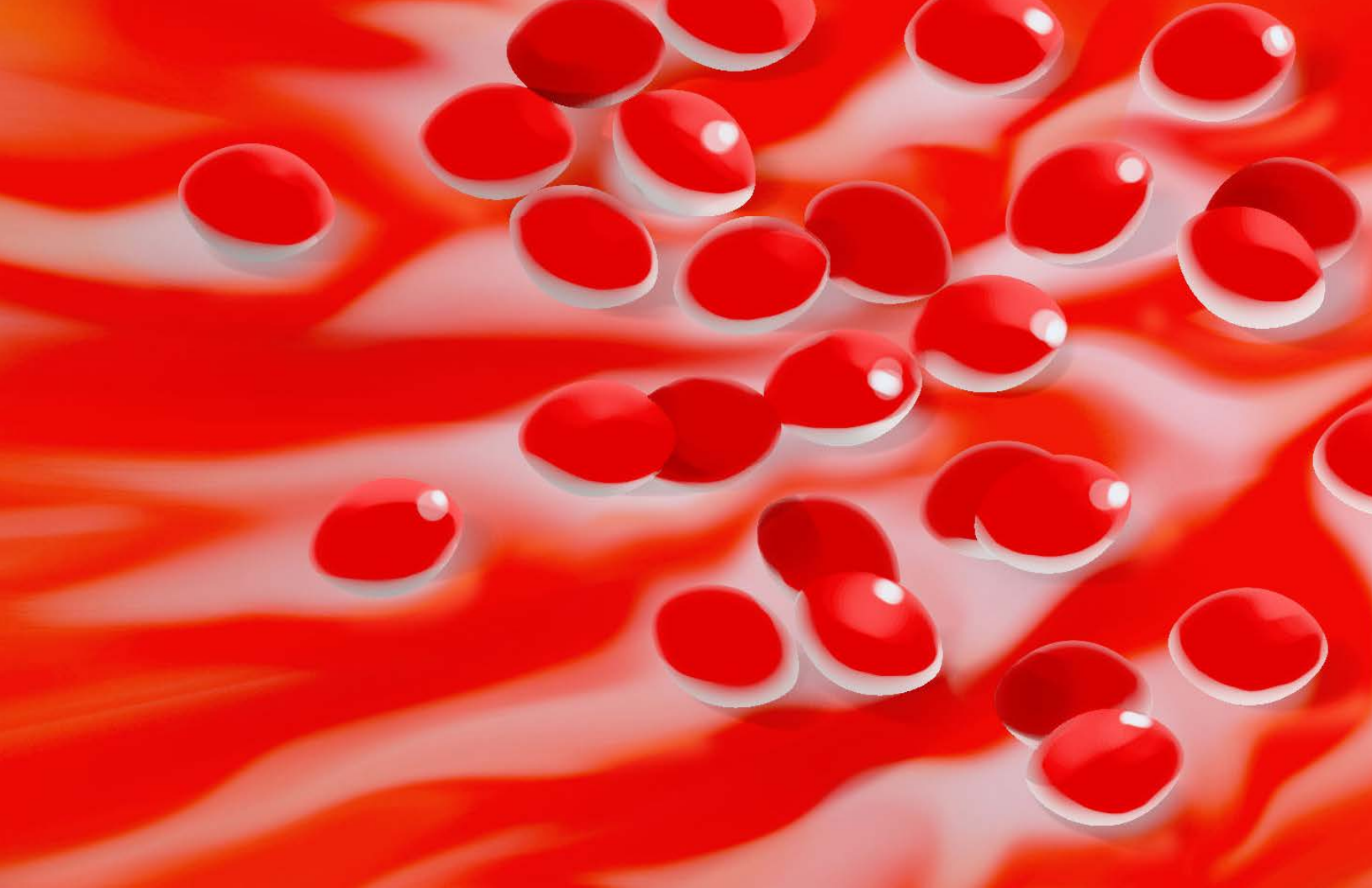
Unit storyline

Taking on the roles of astronomers, students help a team of archaeologists at the fictional Museum of Archaeology figure out what the missing piece of a recently discovered artifact might have depicted. As they learn about the sun and other stars and the movement of Earth, students can explain what is shown on the artifact and what might be on the missing piece.

Featured activity: Spinning Globes (Lesson 2.5)

In Lesson 2.5 of *Patterns of Earth and Sky*, students engage with a kinesthetic model to show their ideas about the directions up and down at various points on Earth as it spins. Groups of students use globes in a kinesthetic model that allows them to consider what people at various points on Earth see in the sky as up as the Earth spins.





GRADE 5

Modeling Matter

Unit storyline

In the roles of food scientists working for Good Food Production, Inc., students are introduced to the ideas that all matter is made of particles too small to see and that each different substance is made of particles (molecules) that are unique. Students are then challenged to solve two problems: One problem requires them to separate a mixture, and the other problem requires them to make unmixable substances mix. Students are challenged to use the particulate model of matter to explain their work to the president of the company. In so doing, students figure out that the properties of materials are related to the properties of the nanoparticles that make up those materials.

Featured activity:

Food Mixture Investigations (Lesson 1.2)

In Lesson 1.2 of *Modeling Matter*, students launch into the unit and their roles as food scientists working in the research lab at Good Food Production, Inc. Students learn that many foods are mixtures and practice their scientific-observation skills as they describe properties and perform simple tests on food mixtures. Student engage in scientific practices and consider ideas about mixtures at an observable scale that they can later apply to thinking about ideas in the nanoscale.





GRADE 5

The Earth System

Unit storyline

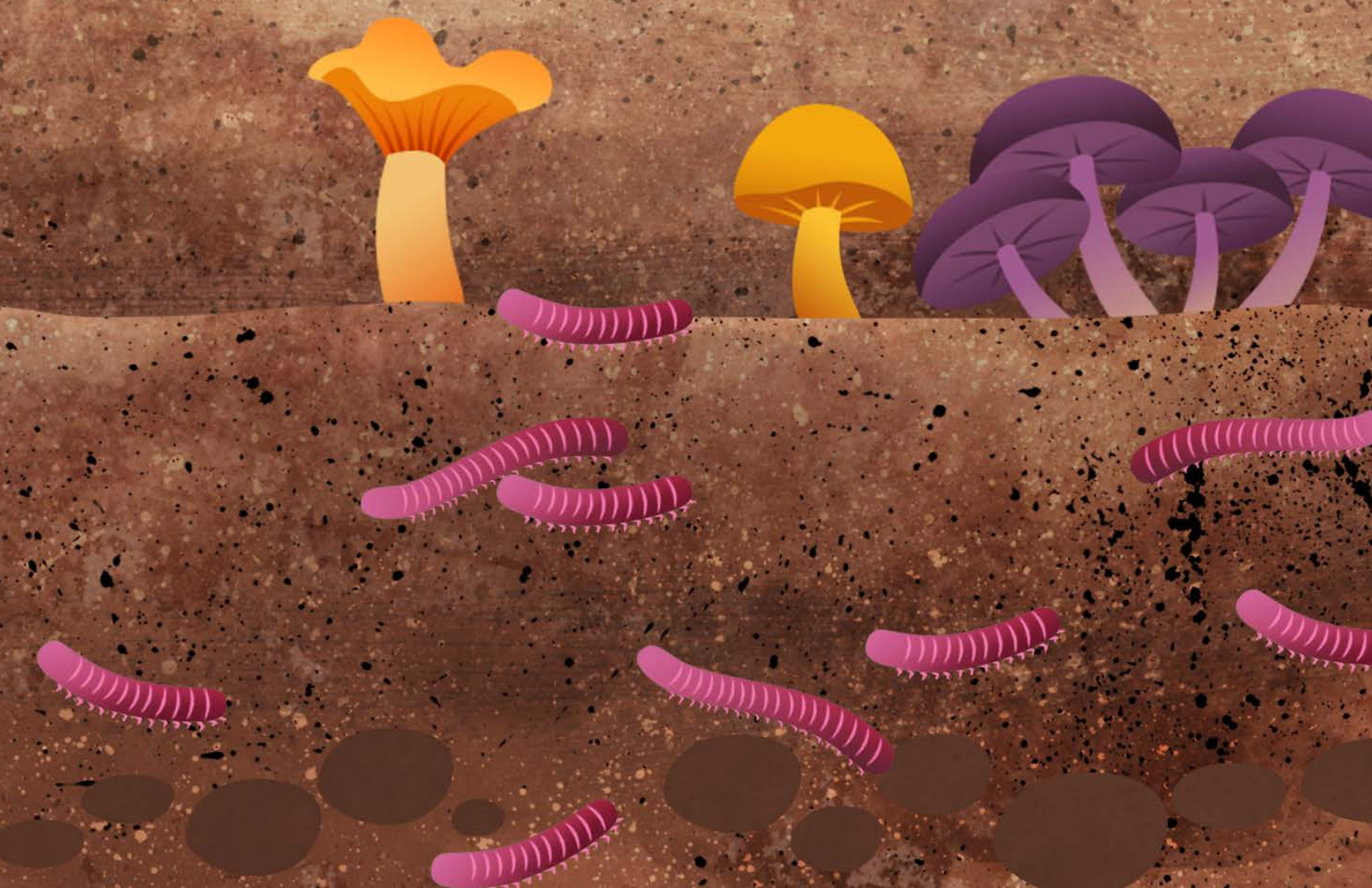
The cities of East Ferris and West Ferris are located on different sides of a mountain on the fictional Ferris Island. East Ferris is having a water shortage while West Ferris is not. As water resource engineers, students learn about the Earth system so they can help figure out what is causing the water shortage on one part of the island. They also design ways to alleviate the effects of water shortages, including freshwater collection systems and proposals for using chemical reactions to treat wastewater.

Featured activity:

Observing Substances and Mixing Substances (Lesson 5.1)

In Lesson 5.1 of *The Earth System*, students investigate how new substances form. Students observe a chemical reaction by mixing calcium chloride, baking soda, and phenol red solution. They discuss and record their observations of the substances before, during, and after the reaction.





FLEX

GRADE 5

Ecosystem Restoration

Unit storyline

Working as ecologists, students figure out why the organisms in a part of a Costa Rican rainforest ecosystem aren't growing and thriving. As they solve this problem, students learn more generally how organisms in an ecosystem get the matter and energy they need to survive. Along the way, students write a series of restoration plans that include arguments about why the rainforest ecosystem is not thriving and recommend actions to restore its health.

Featured activity: Terrarium Extensions (Flextension)

In this Flextension, students return to the terrariums they made earlier in the unit. Each group chooses what to add or change about their terrariums in order to make them healthier. Students may choose to add elements such as rocks, vegetables, or organisms or alter what is already in their terrariums. Groups implement these changes and then, over the course of several weeks, observe the effects of their changes.



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