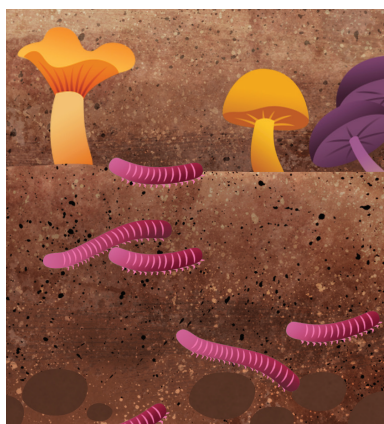
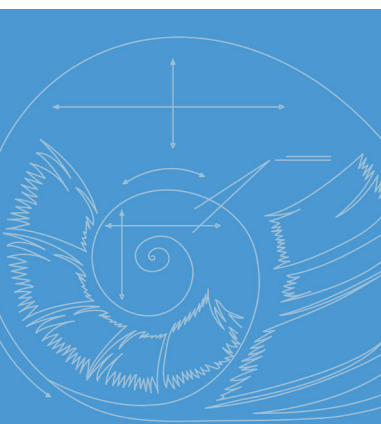
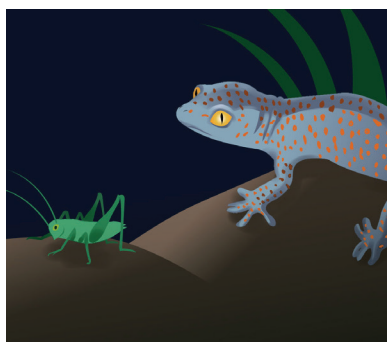
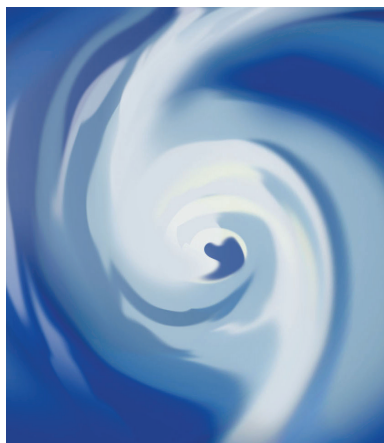
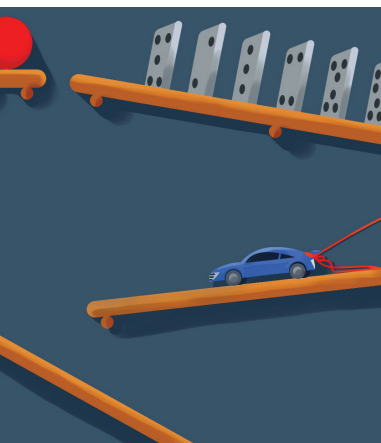
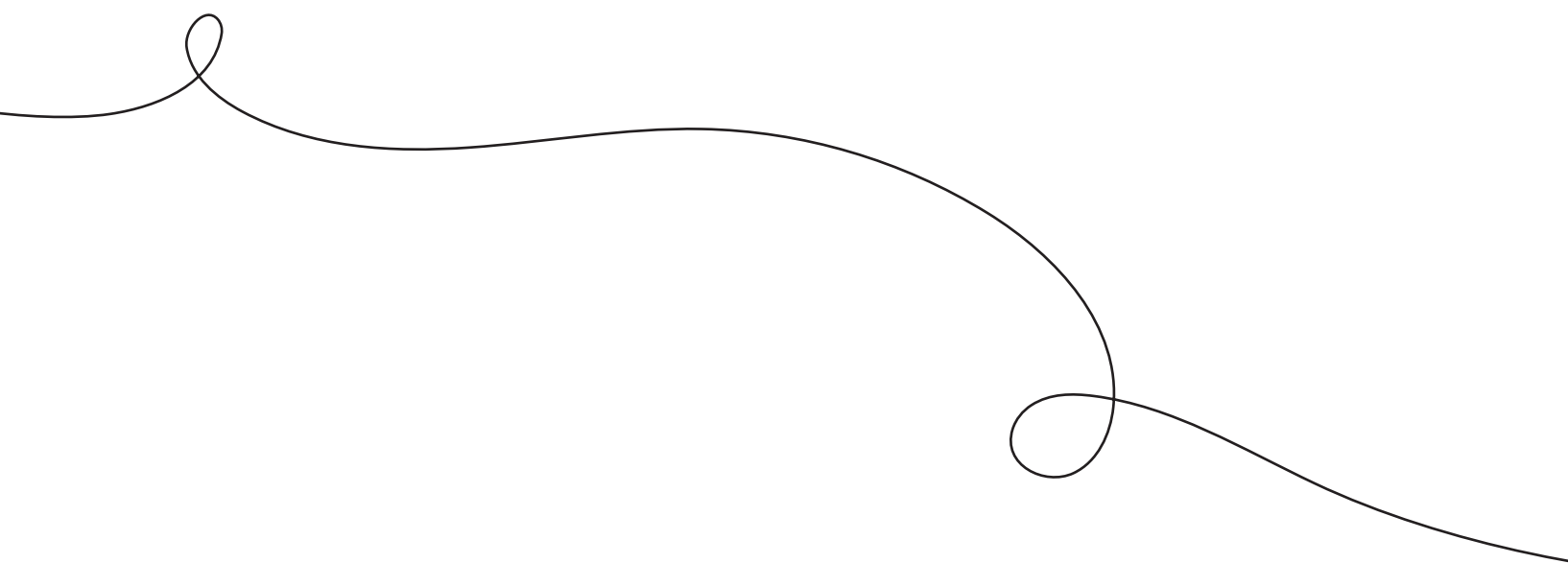


Phenomena in Grades K–5



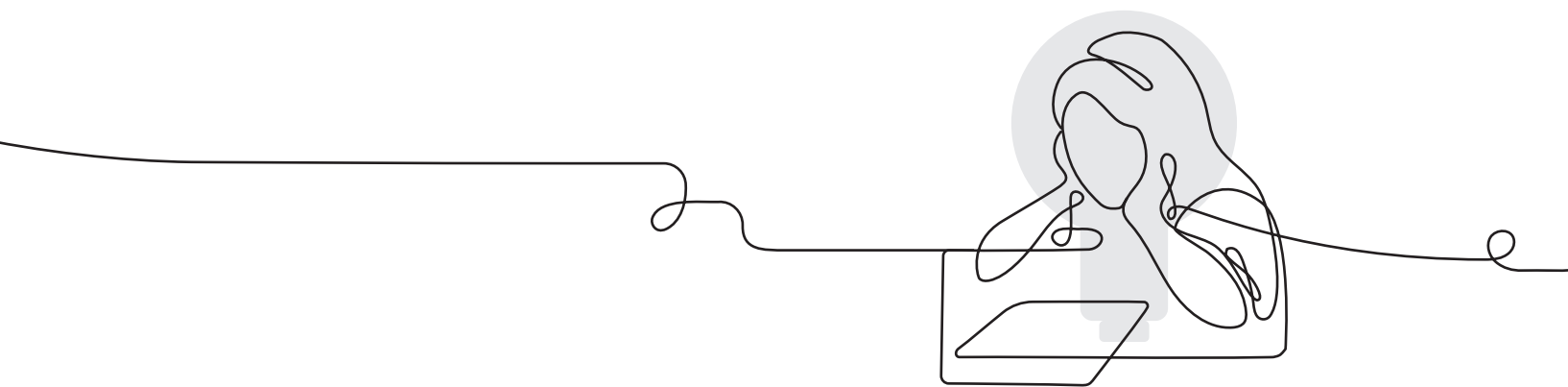


A unique, phenomena-based approach

In each Amplify Science unit, students are asked to inhabit the role of a scientist or engineer in order to investigate a real-world problem. These problems provide relevant, 21st-century contexts through which students investigate different scientific phenomena.

Once the problem context is clear, students collect evidence from multiple sources and through a variety of modalities. They move back and forth from first-hand investigation to second-hand analysis and synthesis, formulating an increasingly complex explanatory capacity for the problem at hand.

At the culmination of each unit, students have an opportunity to apply their newly acquired knowledge to a similar but different problem in novel and exciting circumstances. It is in this step that students demonstrate a deep understanding of the unit's key scientific phenomena.





THE LAWRENCE
HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

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Kindergarten

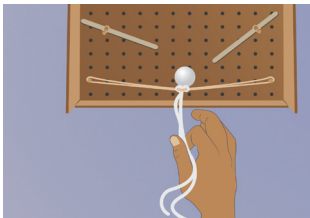


Needs of Plants and Animals (Life Science)

How can the kids in Mariposa Grove attract monarch caterpillars to their neighborhood?

Anchor phenomenon: When vegetables were planted in the Mariposa Grove community garden, the monarch caterpillars disappeared.

Students take on the role of scientists in order to figure out why there have been no monarch caterpillars in the community garden since vegetables were planted. They investigate how plants and animals get what they need to live and grow, and make a new plan for the community garden that provides for the needs of the monarch caterpillars in addition to producing vegetables for humans.



Pushes and Pulls (Physical Science)

How can we create a pinball machine for our class?

Anchor phenomenon: Pinball machines allow people to control the direction and strength of forces on a ball.

Students take on the role of pinball machine engineers as they investigate the effects of forces on the motion of an object. They conduct tests in their own prototypes (models) of a pinball machine and use what they learn to contribute to the design of a class pinball machine. Over the course of the unit, students construct a foundational understanding of why things move in different ways.



Sunlight and Weather (Earth Science)

Why is one school playground warmer than the other over the course of the day? And why does one playground flood?

Anchor phenomenon: Students at Carver Elementary School are too cold during morning recess, while students at Woodland Elementary School are too hot during afternoon recess.

The principals of Woodland Elementary and Carver Elementary need student weather scientists to help them explain why Woodland's playground is warmer than Carver's at recess. Students gather data from models of the sun and Earth's surface and observe their own playgrounds to figure out how sunlight causes changes in the temperatures of different surfaces. Students then use models to figure out why Woodland's playground sometimes floods.

Grade 1

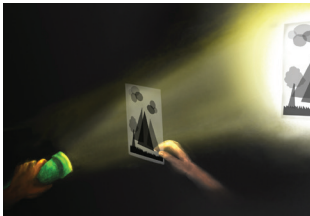


Animal and Plant Defenses (Life Science)

How can a sea turtle survive in the ocean after an aquarium releases it?

Anchor phenomenon: Spruce the Sea Turtle lives in an aquarium and will soon be released back into the ocean, where she will survive despite ocean predators.

Students play the role of marine scientists. In their role, students apply their understanding of plant and animal defense structures to explain to aquarium visitors how a sea turtle and her offspring can defend themselves from ocean predators when they are released into the wild.



Light and Sound (Physical Science)

How can we use light and sound to design shadow scenery and sound effects for a puppet theater?

Anchor phenomenon: A puppet show company uses light and sound to depict realistic scenes in puppet shows.

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



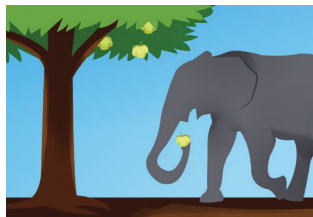
Spinning Earth (Earth Science)

Why doesn't the sky always look the same?

Anchor phenomenon: The sky looks different to Sai and his grandma when they talk on the phone.

As sky scientists, students explain why a boy living in a place near them sees different things in the sky than his grandma when he talks to her on the phone. 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.

Grade 2



Plant and Animal Relationships (Life Science)

What is happening to the chalta trees in the Bengal Tiger Reserve?

Anchor phenomenon: No new chalta trees are growing in the fictional Bengal Tiger Reserve in India.

In their role as plant scientists, students work to 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, then collect and analyze qualitative and quantitative data to solve the mystery.

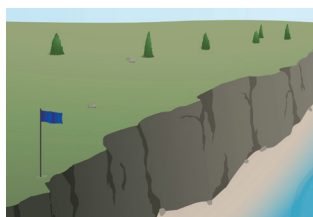


Properties of Materials (Physical Science)

How can we create glue for our school to use?

Anchor phenomenon: Different glue recipes result in glues that have different properties.

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 of why their glue mixture will be good for their school to use.



Changing Landforms (Earth Science)

Why is the edge of the ocean cliff closer to the flagpole than it used to be?

Anchor phenomenon: The cliff that Oceanside Recreation Center is situated on appears to be receding over time.

The director of the Oceanside Recreation Center gets a scare when a nearby cliff collapses overnight. Research reveals that the distance between the Recreation Center's flagpole and the edge of the cliff have changed over time. **Students play the role of geologists and work to figure out why the cliff has changed over time.** Based on what they learn about erosion, they advise on whether it is safe to keep the center open even though the cliff is changing.

Grade 3

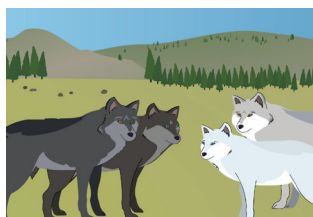


Balancing Forces (Physical Science)

How is it possible for a train to float?

Anchor phenomenon: The town of Faraday is getting a new train that floats above its tracks.

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 are challenged to figure out how a floating train works in order to explain it to the citizens of Faraday.** They 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.

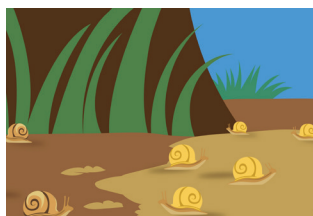


Inheritance and Traits (Life Science)

What is the origin of the traits of Wolf 44—a wolf that appears different from the rest of its pack?

Anchor phenomenon: An adopted wolf in Graystone National Park (“Wolf 44”) has some traits that appear similar to one wolf pack in the park and other traits that appear to be similar to a different wolf pack.

Students play the role of wildlife biologists working in Greystone National Park. They study two wolf packs and are challenged to figure out why an adopted wolf (“Wolf 44”) in one of the packs has certain traits. Students observe variation between and within different species, investigate inherited traits and those that result from the environment, and explain the origin of several of the adopted wolf’s traits.

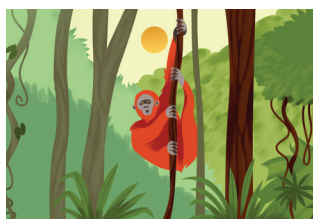


Environments and Survival (Life Science)

How can learning about how grove snails survive help engineers design effective solutions to problems?

Anchor phenomenon: Over the last 10 years, a population of grove snails has changed: The number of grove snails with yellow shells has decreased, while the number of snails with banded shells has increased.

In their role as biomimicry engineers, students work to figure out how the traits of grove snails affect their survival in different environments, then apply what they learn to designing solutions to problems. They explore how the traits of different organisms make them more likely or less likely to survive, collecting and interpreting data to understand how organisms’ traits affect their survival in different environments. Students then apply their understanding to a new challenge: Using the structural traits of giraffes as inspiration, they design effective solutions for the removal of invasive plants.



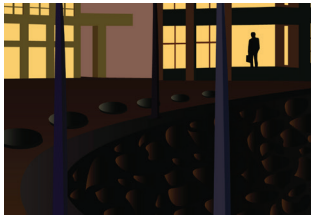
Weather and Climate (Earth Science)

Where should the Wildlife Protection Organization build an orangutan reserve? How can they prepare for natural hazards that may damage their office?

Anchor phenomenon: Three different islands, each a contender for becoming an orangutan reserve, experience different weather patterns.

In their role as meteorologists, students gather evidence to decide where to build an orangutan reserve by analyzing patterns in weather data to determine which of three fictional islands has weather most like that of orangutans’ existing habitats, Borneo and Sumatra. Students then determine what additional evidence they will need to make the strongest argument. After choosing the strongest evidence, students use data to make arguments about which island’s weather is most similar to orangutans’ hot, rainy habitats. They then discern patterns in the locations of natural hazards in order to figure out which ones the Wildlife Protection Organization must prepare for.

Grade 4

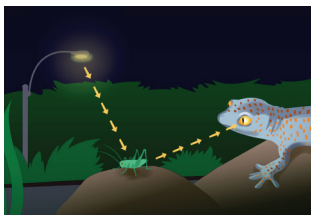


Energy Conversions (Physical Science)

Why does Ergstown keep having blackouts?

Anchor phenomenon: The fictional town of Ergstown experiences frequent blackouts.

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

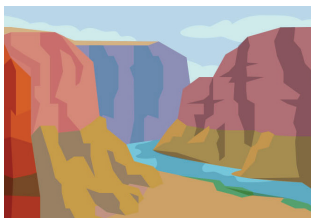


Vision and Light (Life Science)

Why is an increase in light affecting the health of Tokay geckos in a Philippine rainforest?

Anchor phenomenon: The population of Tokay geckos in a rain forest in the Philippines has decreased since the installation of new highway lights.

As conservation biologists, students work to 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.

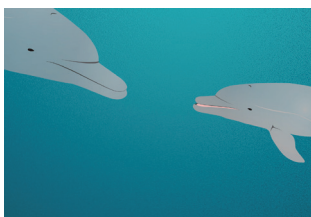


Earth's Features (Earth Science)

What was the environment of this place like in the past?

Anchor phenomenon: A mysterious fossil is discovered in a canyon within the fictional Desert Rocks National Park.

Playing the role of geologists, 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.



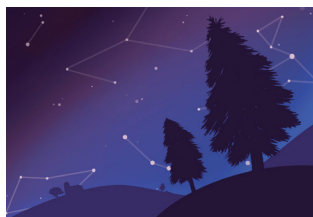
Waves, Energy, and Information (Physical Science)

How can a mother dolphin and her calf communicate underwater when they cannot see each other? How can humans use patterns to communicate?

Anchor phenomenon: Mother dolphins in the fictional Blue Bay National Park seem to be communicating with their calves when they are separated at a distance underwater.

In their role as marine scientists, students work to figure out how mother dolphins communicate with their calves. They write a series of scientific explanations with diagrams to demonstrate their growing understanding of how sound waves travel. Then they apply what they've learned about waves, energy, and patterns in communication to figure out how to create patterns that can communicate information over distances. As they solve these problems, students construct a foundational understanding of how waves transfer information from one place to another.

Grade 5

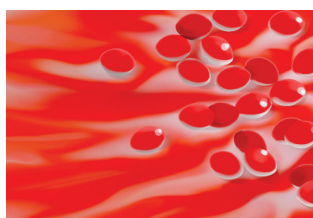


Patterns of Earth and Sky (Earth Science)

Archaeologists have found part of an ancient astronomical artifact depicting drawings of the sun and other stars. How can we figure out which stars were likely to be shown on the missing piece?

Anchor phenomenon: An ancient artifact depicts what we see in the sky at different times — the sun during the daytime and different stars during the nighttime — but it is missing a piece.

Playing the role of astronomers, students help a team of archaeologists 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.



Modeling Matter (Physical Science)

What happens when two substances are mixed together?

Anchor phenomenon: Chromatography is a process for separating mixtures. Some solids dissolve in a salad dressing while others do not. Oil and vinegar appear to separate when mixed in a salad dressing.

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



The Earth System (Earth Science)

Why is East Ferris experiencing a water shortage and what can the city do about it?

Anchor phenomenon: East Ferris, a city on one side of the fictional Ferris Island, is experiencing a water shortage, while West Ferris is not.

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 to help figure out what is causing the water shortage problem and design possible solutions, including freshwater collection systems and proposals for using chemical reactions to treat wastewater.**



Ecosystem Restoration (Life Science)

Why aren't the jaguars and sloths in a reforested part of the Costa Rican rainforest ecosystem growing and thriving?

Anchor phenomenon: The jaguars, sloths, and cecropia trees in a reforested section of a Costa Rican rain forest are not growing and thriving.

As ecologists, students work to 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, and then write a series of restoration plans that include arguments about why the rainforest ecosystem is not thriving and recommend actions to restore its health.

For more information on Amplify Science,
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