

Science- Grade 3

Unit 1

Title: Playground with Forces

Unit Overview

In this unit, students think about common forces that they experience. Students begin by considering mechanical forces and how balanced and unbalanced forces change the motion of objects. They then explore electrical charges and how like and unlike charges exert forces on each other. Finally, students focus on magnetic forces and magnetic fields. While considering electric and magnetic forces, students examine forces that do not require objects to be in contact and that vary in magnitude as a function of the distance between objects. To summarize their learning, students design a better swing set that takes advantage of the different forces that they have studied.

PA Academic Standards Science:

- 3.2.3.B1 Explain how movement can be described in many ways. Explore how energy can be found in moving objects
- 3.2.3.B4 Identify and classify objects and materials that are conductors or insulators of electricity. Identify and classify objects and materials as magnetic or non-magnetic.

NGSS Disciplinary Core Ideas:

- PS2.A.1 Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.)
- PS2.A.2 The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)
- PS2.B.1 Objects in contact exert forces on each other.
- PS2.B.2 Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

Core Standards Literacy

- RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.
- RI.3.8 Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).
- W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
- SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail

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Content:

- Forces and Motion
 - Forces are constantly in action
 - Forces can combine.
 - Movement can be predicted based on patterns.
 - Balanced & unbalanced forces..
- Static Forces
 - Positive and negative charges.
 - Changing charges.
 - Impact of objects with the same and opposite charges.
- Magnetic Forces
 - Magnetic fields.
 - Objects can apply forces without touching
 - The distance between a magnet and an object can affect the strength of the force.

Skills:

- Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
- Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
- Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
- Develop and describe a simple design problem that can be solved by applying scientific ideas about magnets.

Inquiry Questions: *(include factual, conceptual, debatable)*

- **Factual:**
How does a hanging object fall back by itself after it is pushed? Why does an object move when it is pushed or pulled? Why do objects have a charge? How is a positive charge on an object different from a negative charge? How is electricity used to power devices and appliances? Why does a compass point a certain way? Why does the magnetic field affect the compass?
- **Conceptual:**
What happens when several different forces push or pull an object at once? How can an object be pushed or pulled but not move? What do we need to know to predict the motion of objects? How can forces cause the movement to follow a 360 degree pattern? What kind of force causes the compass needle to move? How do forces affect the motion of objects? What kind of forces make objects move? What happens when several different forces push or pull an object at once?
- **Debatable:**
To what extent can objects push or pull each other without even touching?

Resources:

"Unit 1: Playground Forces." *Discovery Education Grade 3 Science Techbook*, Discovery Education, <https://app.discoveryeducation.com/learn/techbook/units/a51012af-6604-4b1f-bc2e-b18712acee28>.

"Invisible Forces." *Mystery Science*, Mystery.org, <https://mysteryscience.com/forces/>.

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Unit 2

Title: Life Cycles for Survival

Unit Overview

In this unit, students explore the many ways in which organisms grow and change throughout their life cycles and how organisms depend on each other for survival. Students begin by examining how plants and animals change and grow throughout their life cycle. Students observe patterns in the life cycles of different organisms, such as trees, lion cubs, and mayflies. Next, students look for patterns in how traits are passed on from parents to their offspring and consider how those traits help organisms survive. Students use observations and data to make predictions about parents and their offspring and construct arguments for why some traits are important for an organism's survival. Finally, students examine how organisms can cooperate and help each other survive. Students use evidence to construct an argument for why some animals, such as humpback whales, live together in groups. Students apply the core ideas of the unit by analyzing the life cycle of leafcutter ants and identifying the traits that help the ants work together to survive in the rainforest. By studying this unit, students will be able to use what they learned to show how animals have specific traits and adaptations that help them survive.

PA Academic Standards Science:

- 3.1.3.A1 Describe characteristics of living things that help to identify and classify them.
- 3.1.3.A2 Describe the basic needs of living things and their dependence on light, food, air, water, and shelter.
- 3.1.3.A3 Illustrate how plants and animals go through predictable life cycles that include birth, growth, development, reproduction, and death.
- 3.1.3.A5 Identify the structures in plants that are responsible for food production, support, water transport, reproduction, growth, and protection.

NGSS Disciplinary Core Ideas:

- LS1.B Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.
- LS3.A Many characteristics of organisms are inherited from their parents. Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.
- LS3.B Different organisms vary in how they look and function because they have different inherited information. The environment also affects the traits that an organism develops.
- LS4.B Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.
- LS2.D Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size

Core Standards Literacy

- RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
- W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

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Content:

- Life Cycles
 - Plants and animals have four stages of their life cycles.
 - The length of time for each stage is different for each organism.
- Inherited Traits
 - Offspring inherit traits from their parents.
 - Each offspring is unique but shares similar traits with its siblings.
 - Traits given to offspring can help them survive.
- Working in Groups:
 - Groups help animals survive.

Skills:

- Develop and describe models that compare patterns in birth, growth, reproduction, and death in the life cycles of various plants and animals.
- Analyze and interpret data to provide evidence that while plants inherit traits from their parents, they also differ from their parents, and variation in traits is present in a group of similar plants.
- Use logical reasoning and observed patterns to predict the traits offspring will inherit from their parents.
- Construct explanations based on evidence for how the variations in characteristics among individuals of the same species and between different species provide advantages in surviving, finding mates, and reproducing.
- Identify limitations of a model ecosystem and revise the model to describe the effects of changes in its living and nonliving components.
- Identify the reasons that animals form groups and construct explanations based on logical reasoning for why and how animals work together and what could happen if the group status changed.
- Identify examples of animals that form groups.
- Predict what could happen if the group status were to change.

Inquiry Questions: (include factual, conceptual, debatable)

- **Factual:**
What do living things need? How do living things change as they grow? How do inherited traits help offspring survive? How do plants and animals work together? Why do animals form groups?
- **Conceptual:**
How are the life cycles of plants and animals similar and different? How can life cycles be used to predict what will happen next? What do parents and their offspring have in common? How are life cycles of various organisms the same and different?
- **Debatable:**
Why is change necessary for the survival of a species?

Resources:

"Unit 2: Life Cycles for Survival." *Discovery Education Grade 3 Science Techbook*, Discovery Education, <https://app.discoveryeducation.com/learn/techbook/units/cb97dea3-4401-453f-a0da-98c4f30b5b97>.

"Power of Flowers." *Mystery Science*, Mystery.org, <https://mysteryscience.com/flowers/>.

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Unit Overview

In this unit, students examine how organisms are able to survive in changing environments. To begin the unit, students observe tracks created by a modern organism—a snake—and compare the tracks to those of a dinosaur. Students dive deeper into the unit topics by examining an image of a fossil fish and looking for evidence that can help explain what its environment was like long ago. Students are then introduced to a kangaroo rat and asked to identify the traits of the animal that help it survive in its habitat. They analyze data and investigate how organisms are adapted to particular habitats and make observations and predictions about how the traits of an animal help it to survive. Next, students examine the salt harvest mouse and use evidence to construct an argument for how environmental changes affect its ability to survive in a marshland habitat. Students summarize their learning for this unit by researching their local geological history and communicating evidence of the type of organisms that survived in the area during three different time periods

PA Academic Standards Science:

- 3.4.3.A1 Identify how the natural made world and the human made world are different.
- 3.4.3.A2 Identify that some systems are found in nature and some systems are made by humans.
- 3.4.3.A3 Identify how the study of technology uses many of the same ideas and skills as many other subjects.

NGSS Disciplinary Core Ideas:

- LS2.C When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.
- LS4.A Some kinds of plants and animals that once lived on Earth are no longer found anywhere. Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.
- LS4.C For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.
- LS4.D Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

Core Standards Literacy

- RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.
- RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.
- W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.
- W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
- SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace

Content:

- Fossils
 - Fossils provide clues about ancient environments.

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- Fossils can tell us what type of organism lived in a certain location.
- Interaction with environment
 - The environment where an organism lives can affect how the organism grows and survives.
- Environmental changes
 - Nature and humans can change an environment.
 - Living things can be affected positively or negatively when environments change.

Skills:

- Analyze and interpret data from fossils to describe the environments in which ancient organisms lived, how Earth's environments have changed over time and provide evidence based on patterns that explain how extinct organisms are related to current organisms.
- Argue from evidence about where a fossil would be found and how an organism's traits and behaviors can be influenced by the environment in which it lives.
- Decide the type of data that would be useful in constructing explanations of patterns in the distribution of organisms.
- Carry out an investigation in which an environment is modified to describe the effect on an organism that lives there.
- Analyze and interpret data using logical reasoning to construct an explanation of the relationship between learning and behavior and to describe patterns that predict how well different organisms can survive in particular habitats.
- Ask questions about how human activities affect the environment and construct explanations that account for the rates at which changes occur in environments due to natural and human-induced influences.
- Use logical reasoning to predict the effects of changes in environments on the organisms that live there.
- Develop a model that describes patterns in the interactions between the living and nonliving parts of an environment and predicts the effects of changes in one part on other parts.
- Argue from evidence that changes in land ecosystems affect water ecosystems on small and large scales.

Inquiry Questions: *(include factual, conceptual, debatable)*

- **Factual:**
How did the tracks of dinosaurs become fossilized? What can we tell about dinosaurs from their tracks? How does the environment affect living organisms? How do organisms' traits help them survive in different environments? What happens to organisms when the environment changes? How can fossils give us information about changing landscapes over time? Are environments today similar to or different from the environments when fossils were formed?
- **Conceptual:**
How can fossils help us understand ancient environments? How can we analyze a fossil to learn about the environment the animal lived in? How does the environment affect where plants and animals survive? What kinds of traits do other animals have that help them survive in their environment? How does the environment change over time?
- **Debatable:**
How might changes in the environment where an organism lives affect how the organism grows and survives?

Resources:

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"Unit 3: Surviving in Changing Environments." *Discovery Education Grade 3 Science Techbook*, Discovery Education,
<https://app.discoveryeducation.com/learn/techbook/units/4d65e0b9-6aa3-4937-9693-d146fda0891b>

"Animals Through Time." *Mystery Science*, Mystery.org, <https://mysteryscience.com/animals>.

Unit 4

Title: Weather Impacts

Unit Overview

In this unit, students work toward designing solutions to mitigate the damage caused by flooding and mudslides. Students are presented with an example of flooding and investigate by obtaining information to describe different regional climates around the world, such as drought across the United States. Students learn to use data in tables and graphical displays to describe and predict weather conditions, as in the example of an impending hurricane. Finally, students describe the problems that are caused by weather related hazards. Using the example of flooding and mudslides caused by rain, students generate and compare solutions to mitigate the damage caused by weather.

PA Academic Standards Science:

- 3.2.3.B2 Explore energy's ability to cause motion or create change. Explore how energy can be found in moving objects, light, sound, and heat.
- 3.2.3.B3 Explore temperature changes that result from the addition or removal of heat.
- 3.2.3.B6 Recognize that light from the sun is an important source of energy for living and nonliving systems and some source of energy is needed for all organisms to stay alive and grow.
- 3.3.3.A1 Explain and give examples of the ways in which soil is formed.
- 3.3.3.A2 Identify the physical properties of minerals and demonstrate how minerals can be tested for these different physical properties.
- 3.3.3.A4 Connect the various forms of precipitation to the weather in a particular place and time.
- 3.3.3.A5 Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time.
- 3.3.3.B1 Relate the rotation of the earth and day/night, to the apparent movement of the sun, moon, and stars across the sky. Describe the changes that occur in the observable shape of the moon over the course of a month.

NGSS Disciplinary Core Ideas:

- ESS1.C Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.
- ESS2.A Wind and water can change the shape of the land.
- ETS1.A Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account
- ETS1.B Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. At whatever stage, communicating with peers about proposed solutions is an important part of the design process,

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and shared ideas can lead to improved designs. Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.

ETS1.C Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

Core Standards Literacy

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

RI.5.1 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Content:

- Regional Climates
 - There are different climates around the world.
 - Climate patterns can be used to predict the weather.
- Weather
 - Weather data can be recorded to look for patterns and to make predictions about future weather conditions.
 - Severe weather events have different causes and outcomes.
 - Engineers design solutions to prevent hazards caused by severe weather.

Skills:

- Construct explanations of the patterns that exist among Earth's climates and of the predictable, yearly changes that occur in Earth's climates.
- Develop a model that describes the causes of Earth's climates and predicts how, over long periods of time, they cause Earth's climates to change.
- Argue from evidence that distance from a coast affects climate.
- Analyze large-scale climate patterns to predict smaller-scale weather conditions.
- Evaluate appropriate methods and tools for collecting data about the weather in an area.
- Obtain, summarize, and communicate information about how meteorologists use data collected from many sources to describe weather patterns that can be used to predict future weather.
- Represent weather data in tables and graphical displays to describe typical weather conditions expected during a particular season and reveal patterns and relationships.
- Analyze and interpret patterns in weather data to predict future weather conditions and describe climates in different regions of the world..
- Construct explanations of the causes of and patterns in common severe weather conditions.
- Evaluate appropriate safety measures to take during a severe weather event and design an effective safety plan for a severe weather event.

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- Combine written information with tables, diagrams, and charts to communicate design solutions that reduce the effect of severe weather.
- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

Inquiry Questions: (*include factual, conceptual, debatable*)

- **Factual:**

How do scientists use climate patterns to predict the risk of flooding? What measurements and data show how bad the flooding is compared to flooding in different times and places? How is the weather predicted? How does climate change around the world? What solutions exist for severe weather events? How do weather people predict weather? How could I learn about the climate of my area?

- **Conceptual:**

How do engineers design solutions to prevent flooding? How are certain areas on Earth more susceptible to weather events compared to other areas? How are climates of different regions determined? What causes some weather events to be more extreme than others?

- **Debatable:**

Does gathering weather data and predicting weather forecasts help develop safety actions protect people in different kinds of severe weather? How is weather data gathered and used to forecast the weather?

Resources:

“Unit 4: Weather Impacts.” *Discovery Education Grade 3 Science Techbook*, Discovery Education, <https://app.discoveryeducation.com/learn/techbook/units/3b6a03b9-47c2-46bb-8d78-1f5b01924664>.

“Stormy Skies” *Mystery Science*, Mystery.org, <https://mysteryscience.com/weather>.