GRADE 3

Science Curriculum

Oradell Public School District

Oradell, NJ

2023

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Oradell Public School District

Grade 3 Science Curriculum Committee Credits:

Oradell Public School District

Michael Hagopian
Denise Kuehner
Melissa Pizza
Danielle Westdyk
Adriana Velardi

Board Policy

This revision is aligned with the New Jersey Student Learning Standards for Science, the New Jersey Student Learning Standards for Computer Science and Design Thinking, the New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills, and includes connections to Social-Emotional Learning Competencies.

Affirmative Action

During the development of this course of study, particular attention was paid to the elimination or exclusion of any materials which might discriminate on the basis of race, color, national origin, ancestry, age, sex, affectional or sexual orientation, gender identity or expression, marital status, familial status, genetic information, mental or physical disabilities, or in educational opportunities. Every effort has been made to uphold both the letter and spirit of Affirmative Action mandates as applied to the content, the texts and the instruction inherent in this course.

Megan Bozios, Superintendent
Michelle Hawley, Principal
Amy Brancato, Director of Curriculum and Instruction

The Science curriculum was developed by the Oradell School District and aligned to the

New Jersey Student Learning Standards (NJSLS).

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Oradell Public School District

Suggested Pacing Guide for Science
Grade 3

Unit	Approximate Months	Unit	Skills
1	Sept-Nov	Life Science	Interdependent Relations in Ecosystems
2	Dec-Jan	Life Science	Inheritance and Variance in Traits Life Cycles and Traits
3	Feb-Mar	Earth and Space Science	Weather and Climate
4	Apr-June	Physical Science	Forces and Interactions
Appendix A			3-5 Engineering Design Standards

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Grade 3 Science Curriculum

Unit 1: Life Science: Interdependent Relationship in Ecosystems

Unit Overview

Excerpt from NJ model curriculum- Grade 3, Units 6 and 7, "What it looks like in the classroom"

Organisms and their habitats make up a system in which they are interdependent. Environmental factors affect the growth and survival of every type of organism, and organisms in turn affect the environment. The focus of this unit of study is identifying cause-and-effect relationships between the environment and organisms' ability to survive and reproduce.

In this unit, students first learn that all organisms have a variety of behaviors and traits that enable them to survive. One of these behaviors includes forming groups. Groups serve different functions and can vary dramatically in size. Animals may form groups to obtain food, to defend themselves, and/or to cope with changes in their environment. Students should have opportunities to conduct research on animals that form groups in order to understand how being part of a group is beneficial to survival and reproduction. Students might begin with studying animals that are indigenous to the local environment (e.g., squirrels, coyotes, deer, birds, or fish), and then investigate other animals of interest, such as (but not limited to) lions, sea turtles, or penguins. For each animal that is studied, students should identify the social structure of the group and how this structure supports individuals in their need to obtain food, defend themselves, and reproduce.

Topics to focus on might be the roles of males and females within a group as well as the interactions between parents and offspring. For example, within some groups of animals, the offspring leave the nest or pack early while others remain for longer periods of time. Those that stay within the group for longer periods of time may do so because of the benefits provided by the group structure. As students compare group structures of different animals and the functions that define each, they should also think about how the size of the group and the roles of individuals within the group affect the animals' overall ability to obtain food, defend themselves, and reproduce. Students will construct arguments with evidence, using cause-and-effect relationships to show why some animals form groups and how this is advantageous to survival and reproduction.

In this unit, students also learn that for any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. As students explore the components of a given environment, they learn that each environment has a particular climate as well as finite sources of water and space. Each environment will support organisms (both plants and animals) with structures and behaviors that are best suited to the climate and resources available. Students will need opportunities to investigate the organisms (plants and animals) that live in certain environments and determine what traits and behaviors allow these organisms to survive and reproduce in that environment. In addition, students should identify some examples of organisms that would survive less well, or not at all, in that environment, and give evidence to support their thinking. Students construct arguments with evidence, using cause-and-effect

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

relationships, to show how the needs and characteristics of the organisms are not well suited for the given environment.

In this unit, students will study fossils or organisms that lived long ago. Students will use that understanding to make a claim about the merit of a solution to a problem created by some environmental change. (Assessment is limited to one change.) Additionally, they will learn that solutions are limited by available resources (constraints), and that the success of a solution is determined by considering the desired features of a solution (criteria). This process is outlined in greater detail in the previous section.

Students gather evidence from fossils to learn about the types of organisms that lived long ago and the nature of their environments. As they learn about organisms from long ago, they come to understand that when the environment changes, some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die.

To begin the progression of learning in this unit, students need multiple opportunities to study fossils. If actual fossils are not available, pictures and diagrams found in books and other media sources can be used. Students should observe fossils of a variety of organisms, both plant and animal, and they should observe diagrams of fossils within layers of rock. As students examine each fossil, they should be asked to identify whether the organism lived on land or in water and to give evidence to support their thinking. As students examine diagrams of fossils in layers of rock, they should be asked to identify the type of environment that existed when the layers of rock were formed. Students should consider the types of organisms that are fossilized in the rock layers in order to provide evidence to support their thinking.

If the type of environment in which the fossil was found is different from the type of environment that might have existed when the organism lived (e.g., marine fossils found on dry land, or tropical plant fossils found in Arctic areas), this would provide the opportunity to ask students to think about the types of changes that might have occurred in the environment and what effects these changes might have had on the organisms that lived in the environment as it changed over time. As students observe and analyze fossils, they learn that fossils provide evidence about the types of organisms that lived long ago and the nature of their environments. They also learn that some kinds of plants and animals that once lived on Earth are no longer found anywhere, and that this could be a result of changes that occurred in the environment.

During this unit, students also learn that populations of organisms live in a variety of habitats, and change in those habitats affects the organisms living there. When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms will survive and reproduce, some will move to new locations, others will move into the transformed environment, and others will die.

Students will need the opportunity to engage in a portion of the engineering design process in order to investigate the merit of solutions to problems caused when the environment changes.

This process should include the following steps:

- Students brainstorm a list of environmental changes that might affect the organisms that live in the environment. This could include changes in
    - Land characteristics,
    - Water distribution,
    - Temperature,
    - Food,
    - Other organisms.
- As a class or in small groups, students define a problem that occurs when the environment changes. For example, if the distribution of water changes, the available water may no longer support the types of organisms that are found in the environment.
- As a class, determine criteria that can be used to weigh a possible solution's viability. For example, the response (solution) to the problem should not result in the extinction of a species.
- Small groups conduct research, using books and other reliable media sources, to determine possible solutions/ways in which organisms can solve the problem. For example, if the available water supply is no longer adequate for the organisms in the environment, there are a number of ways in which organisms respond (i.e., solve the problem); these include:
    - Plants do not grow as large as before (shorter plant, smaller or fewer leaves);
    - Fewer seeds germinate, thereby resulting in a smaller population;
    - Herd animals may move to another environment where the water supply is adequate;
    - Populations of some species may decrease, either through lower rate of reproduction or death;
    - Some populations completely die out; or
    - Other organisms (plants and animals) that require less water to survive may move into the environment.
- Students make claims about the merit of each of the various responses (solutions) by organisms based on how well the responses meet criteria; students use research data as evidence to support their thinking.

At every stage, communicating with peers is an important part of the design process. Students should identify cause-and-effect relationships throughout the process and use these relationships to explain the changes that might occur in the environment and in the populations of organisms that live there.

Big Idea/Common Thread:

- Environmental changes cause some organisms to survive and reproduce, some to move to new locations, and some to die.

Enduring Understanding:

- Particular organisms can only survive in particular environments.

- When the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die.
- Populations of organisms live in a variety of habitats. Change in those habitats affects the organisms living there.
- Being part of a group helps animals obtain food, defend themselves, and cope with changes.
- Some living organisms resemble organisms that once lived on Earth. Fossils provide evidence about the types of organisms and environments that existed long ago.

Essential Questions:

- What happens to an organism (plants and animals) when its environment changes?
- What types of interdependent relationships exist in ecosystems?

Assessments

Possible Ongoing Formative Assessments
• Teacher Observation • Student Participation • Wrap It Up! Questions • Teacher Observation • Class Discussions/Partner Talk • Science Notebook activities • Performance Expectation Activities: *Investigate; Think Like a Scientist; Think Like an Engineer* • Teacher Rubrics for Performance Expectations Activities
Summative Assessments
• Life Science Unit Assessment (Interdependent Relationships in Ecosystems)
Alternative Assessments
• Modified Assessments

Standards (NJSLS) Addressed in this Unit

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)

LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents. (3-LS3-1)
- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3- LS3-2)

LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1)
- The environment also affects the traits that an organism develops. (3-LS3-2)

LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Crosscutting Concepts

Cause and Effect
- Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1),(3-LS4-3)

Scale, Proportion, and Quantity
- Observable phenomena exist from very short to very long time periods. (3-LS4-1)

Systems and System Models
- A system can be described in terms of its components and their interactions. (3-LS4-4)

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.
- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1)

Engaging in Argument from Evidence
Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed worlds.
- Construct an argument with evidence, data, and/or a model. (3-LS2-1)
- Construct an argument with evidence. (3-LS4-3)
- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-LS4-4)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology
- Knowledge of relevant scientific concepts and research findings is important in engineering. (3-LS4-3)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems
- Science assumes consistent patterns in natural systems. (3-LS4-1)

Science is a Human Endeavor

- Most scientists and engineers work in teams. (3-LS4-3)

Computer Science and Design Thinking

- **8.1.5.DA.1:** Collect, organize, and display data in order to highlight relationships or support a claim.
- **8.1.5.DA.3:** Organize and present collected data visually to communicate insights gained from different views of the data.

Career Readiness, Life Literacies, and Key Skills

CAREER AWARENESS, EXPLORATION, PREPARATION, AND TRAINING
9.2.5.CAP.4 - Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

LIFE LITERACY AND KEY SKILLS
9.4.5.CI.1 - Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).
9.4.5.CI.2 - Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).
9.4.5.CI.3 - Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
9.4.5.CI.4 - Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).
9.4.5.CT.1 - Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).
9.4.5.CT.2 - Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem (e.g., 2.1.5.CHSS.1, 4-ESS3-1).
9.4.5.CT.4 - Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).
9.4.5.DC.8 - Propose ways local and global communities can engage digitally to participate in and promote climate action (e.g., 6.3.5.GeoHE.1).

PRACTICES

CLKSP1 - Act as a responsible and contributing community member and employee.
CLKSP4 - Demonstrate creativity and innovation.
CLKSP5 Utilize critical thinking to make sense of problems and persevere in solving them.

Interdisciplinary Connections:

English Language Arts

Reading Standards - Informational Text
● RI.3.1 - Ask and answer questions, and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
● 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.
● RI.3.7 - Use information gained from text features (e.g., illustrations, maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

Writing
● W.3.1 - Write opinion pieces on topics or texts, supporting a point of view with reasons.
● W.3.2 - Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
● W.3.9 - Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Speaking and Listening
● 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.

Mathematics

Mathematical Practices
● MP.2 - Reason abstractly and quantitatively.
● MP.4 - Model with mathematics.
● MP.5 - Use appropriate tools strategically.

Measurement & Data
● 3.MD.B.3 - Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.

● 3.MD.B.4 - Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

Social-Emotional Competencies

- **Self-Awareness**: ability to recognize one's emotions and know one's strengths and limitations
    - Connections:
        - Regular check-ins to share feelings (Oral, Thumbs Up, Thumbs Down, Emojis, etc.)
        - Reflecting on one's learning (Oral, Thumbs Up, Thumbs Down, Pictures, etc.)
        - Provide cool down spot in classroom

- **Self-Management**: ability to regulate and control one's emotions and behaviors, particularly in stressful situations
    - Connections:
        - Playing soft nature sounds - breathing, stretching
        - Draw a nature picture (i.e. animals in different habitats)

- **Social Awareness**: ability to take the perspective of others, demonstrate empathy, acknowledge and appreciate similarities and differences, and understand how one's actions influence and are influenced by others
    - Connections:
        - Animal charades games (One partner acts out animals and the other guesses what the animal is)
        - Providing positive comments on other students' STEAM activities

- **Relationship Skills**: refers to one's ability to demonstrate prosocial skills and behaviors in order to develop meaningful relationships and resolve interpersonal conflicts
    - Connections:
        - Class discussions
        - Incentives for individual students and small groups

- **Responsible Decision-Making**: refers to the ability to use multiple pieces of information to make ethical and responsible decisions

- Connections:
  - Class rules and routines
  - Class discussions
  - Following directions

UNIT OBJECTIVES

Students will be able to …

- **Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. (3-LS4-4)**
  [Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.]
  [Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.]

Disciplinary Ideas

- 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.
- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

Science and Engineering Practices

- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Crosscutting Concepts

- A system can be described in terms of its components and their interactions.

3-LS4-4

Concepts	Students Can...
• Populations live in a variety of habitats, and change in those habitats affects the organisms living there. • When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce,	• Explain that populations live in a variety of habitats, and change in those habitats affects the organisms living there. • Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may

others move to new locations, others move into the transformed environment, and some die. ● An ecosystem can be described as the living and nonliving things in a certain area and the ways they interact.	change. Examples of environmental changes could include changes in: ○ Land characteristics ○ Water distribution ○ Temperature ○ Food ○ Other organisms ● Describe an ecosystem as the living and nonliving things in a certain area and the ways they interact.

Students will be able to …

- **Construct an argument that some animals form groups that help members survive. (3-LS2-1**)

Disciplinary Core Ideas
- 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.

Science and Engineering Practices
- Construct an argument with evidence, data, and/or a model.

Crosscutting Concepts
- Routinely identify cause and effect relationships and use to explain change.

3-LS2-1

Concepts	Students Can...
● 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. ● Organisms and their habitat make up a system in which the parts depend on each other.	● Explain that being part of a group can help animals obtain food, defend themselves, and cope with changes. ● Explain the functions of various groups of organisms? ● Construct an argument with evidence that being part of a group can help animals obtain food, defend themselves, and cope with changes. ● Explain how organisms depend on each other and their habitat.

Students will be able to …

- Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. (3-LS4-1)
  [Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.]
  [Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.]

  Disciplinary Core Ideas
  - 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.

  Science and Engineering Practices
  - Analyze and interpret data to make sense of phenomena using logical reasoning.

  Crosscutting Concepts
  - Observable phenomena exist from very short to very long time periods.

3-LS4-1

Concepts	Students Can...
• 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. • Organisms and their environments can be observed over very short to very long periods of time.	• Explain that some kinds of plants and animals that once lived on Earth are no longer found anywhere. • Explain how fossils provide evidence about the types of organisms that lived long ago, and also about the nature of their environments. • Analyze and interpret data from fossils (e.g., type, size, distributions of fossil organisms) to provide evidence of the organisms and the environments in which they lived long ago. Examples of fossils and environments could include ○ Marine fossils found on dry land ○ Tropical plant fossils found in Arctic

	areas ○ Fossils of extinct organisms ● Observe organisms and their environments over very short to very long periods of time.

Students will be able to …

- Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. (3-LS4-3)

  [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]

  Disciplinary Ideas
  - For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

  Science and Engineering Practices
  - Construct an argument with evidence.

  Crosscutting Concepts
  - Cause and effect relationships are routinely identified and used to explain change.

3-LS4-3

Concepts	Students Can...
● For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. ● Cause-and-effect relationships are routinely identified and used to explain change.	● Explain for any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. ● Construct an argument with evidence that in a particular habitat, some organisms survive well, some survive less well, and some cannot survive at all. Evidence may include: ○ Needs of organisms ○ Characteristics of organisms ○ Habitats of organisms ● Identify cause-and-effect relationships between organisms and their

	environment.

SUGGESTED ACTIVITIES

*Please preview any videos as non-related ads may appear

- What's Inside The Termite Nest? | Diorama | PBS Digital Studios https://www.youtube.com/watch?v=lH4RbMbU74E

- Experiment with Ecosystems https://concord.org/stem-resources/experiment-ecosystems

https://pbskids.org/plumlanding/games/ecosystem/jungle_jeopardy.html

- Hands-on Activity: Biodomes Engineering Design Project https://www.teachengineering.org/activities/view/cub_bio_lesson02_activity1

- Bottle Biology Terrarium https://bottlebiology.org/
  https://team-cartwright.com/soda-bottle-terrarium/
- Weaving the Web http://forces.si.edu/main/pdf/2-5-WeavingTheWeb.pdf

- Mass Environmental Change: In this lesson, students explore what happens to organisms when they cannot meet their needs due to changes in the environment. They categorize scenario cards representing different changes to an environment, then discuss them in a whole group. Using what they have learned, they write about how changes to the environment can affect organisms. The resource link takes you to a full unit titled Effects of Changes in an Environment on the Survival of Organisms, of which Mass Environmental Change is a lesson.

- Musk Ox Save Calf from Wolves Video In this short video, Arctic wolves attack a musk ox calf on Canada's Ellesmere Island, but the herd rushes to its defense by forming a defensive circle around the calves.
- https://www.youtube.com/watch?v=o5I_3i6tIhI- video

- Insects That Work Together This nonfiction book summarizes how some insects work together to increase their chances of survival. Details are provided on four types of insects: honeybees, hive wasps (hornets, yellowjackets, and paper wasps), termites, and ants. A short section on insect migration and building a hive model are also included.

- Battle at Kruger: Water Buffalo Save Calf from Lions Video This short video captures student imagination and elicits ideas about how groups of organisms work together for survival. The video contains real footage of a pack of lions. This short video captures student imagination and elicits ideas about how groups of organisms work together for survival. The video contains real footage of a pack of lions attack on a water buffalo calf.

The footage filmed by amateur tourists features a surprising plot twist (featuring a crocodile), and exciting finale with the water buffalo herd rescues the calf and chases off the lions.

- A Walk in the Desert (Biomes of North America) This nonfiction text describes the climate, soil, plants and animals of the North American deserts. It provides detailed information on how plants and animals adapt and survive there.

- A Walk in the Deciduous Forest (Biomes of North America) This nonfiction text describes the climate, soil, plants and animals of the North American deciduous forests. It provides detailed information on how plants and animals adapt and survive there.

- A Walk in the Rain Forest (Biomes of North America) This nonfiction text describes the climate, soil, plants and animals of the North American rain forests. It provides detailed information on how plants and animals adapt and survive there.

- A Walk in the Prairie (Biomes of North America) This nonfiction text describes the climate, soil, plants and animals of the North American prairies. It provides detailed information on how plants and animals adapt

Unit Specific Vocabulary
ecosystems: all of the living things in a given area, interacting with each other, and also with their environments **fossil:** a preserved trace of an organism that lived long ago **habitat**: the place where a plant or animal lives and gets everything it needs to survive **hibernate:** while an animal hibernates in winter, its body does not use much energy **migrate:** to move to a different place to meet basic needs **pack:** a group of closely related animals that live and hunt together **predator:** an animal that hunts other animals for food **prey:** an animal that is hunted for food by other animals **swarm:** a large group of insects moving together from one place to another

Instructional Materials and Learning Activities
Core Instructional Materials: ● *National Geographic* Exploring Science ● *National Geographic* My NG connect Exploring Science Digital Resources

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

- *National Geographic* Exploring Science through Literacy Teacher's Guide
- *Hand2Mind* Exploring Science Hands on Kit
- Science Tech Book

Digital Resources:

- Access the Next Generation Science Standards by Topic - The NGSS Standards
- Classroom Resources - NGSS Hub - lesson ideas
- Next Generation Science Standards - lesson ideas
- www.njctl.org - a complete science curriculum to download for free

Supplemental Materials:

- Science Tech Book

Level Reader	Below-Level	On-Level	Above-Level
Tropical Rain Forest Adventure	620L	720L	810L

Suggested Modifications

These strategies can be adapted to scaffold for students needing more support or extending the learning for higher level students. Differentiation is accomplished through content, process, product, and learning environment.

NGSS Appendix D - "All Standards, All Students": Making the Next Generation Science Standards Accessible to All Students

Special Education Students

- *Have students make a chart that shows how the pond is a good habitat for marsh plants, turtles, dragonflies, and sunfish. If needed, help students conduct simple research on these organisms.*
- *Have students circle the predators in each of the following pairs of animals: cheetah/gazelle, mouse/snake, crow/worm, catfish/humans, coyote/house cat.*
- *In the ELABORATE section, Research Mammoths, have students print a world map and color and label it to show where mammoths lived. Have them write a title and three facts about mammoths on the page. (Exploring Science pg. 69)*
- Preview vocabulary
- Use of picture dictionaries and visual aids
- Use of word banks
- Color coding important vocabulary

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

- Directions given in smaller chunks
- Leveled texts (L-P)
- Online RazKids leveled texts (dictation features)
- Peer models
- Use of FM system to improve attention and support auditory informations
- Extended time for assignments
- Prompting
- Preferential seating
- Check for understanding
- Behavior chart to increase work completion
- Modified assessments: Chunked, use of word banks, fewer answer choices, highlighted materials emphasizing concepts.

Students at Risk

- *Have students make a chart that shows how the pond is a good habitat for marsh plants, turtles, dragonflies, and sunfish. If needed, help students conduct simple research on these organisms.*
- *Have students circle the predators in each of the following pairs of animals: cheetah/gazelle, mouse/snake, crow/worm, catfish/humans, coyote/house cat.*
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks
- Guide students to use text features to make sense of content knowledge
- Color coding important vocabulary
- Directions given in smaller chunks
- Use of FM system to improve attention and support auditory information
- Sensory breaks with timers
- Graphic organizers and outlines provided
- Study guides provided
- Small group instruction

Multilingual Learners

- *Explain the difference between effect and affect. Have students find an example of each word in a sentence online.*
- *Have students fill in the blank with either affect or effect: One (effect) of forest fires is the ground becomes black and bare. Fires also (affect) the plant and animal life. Ask students to explain their choices.*
- *Encourage students to write four sentences about forest fires, two using affect and two using effect.*
- *Support students in making a chart that shows how the pond is a good habitat for marsh plants, turtles, dragonflies, and sunfish. If needed, help students conduct simple research on these organisms.*
- *Have students choose tired or tiring to fill in the blanks. The people felt (tired) after planting trees. Planting trees is (tiring).*

- *Have students answer questions in complete sentences, using the words tired and tiring as adjectives. Ask: How did the people feel after planting trees? (The people felt tired after planting trees.) Ask: How would you describe planting trees? (Planting trees is tiring.)*
- *Have students write sentences using the following words: tired/tiring, confused/confusing, and excited/exciting. If needed, help them with sentence starters such as: The people felt . . ., Planting trees is . . ., The deer looked . . .,The forest path was . . ., My friends were . . ., The Earth Day celebration was . . .*
- *Provide sentence frames, such as: Siberia is (colder) than Africa. Siberia is the (coldest) place I have been. The beach is (more beautiful) than the mountains. The beach is the (most beautiful) place I have been. Give students a word back with the answers.*
- *Help students use each of these in an original sentence: colder, coldest, more beautiful, and most beautiful.*
- *Give students the same sentence frames as above, but provide only the words cold and beautiful and have students fill in the correct form of the word.*
- Pre-teaching of vocabulary by ESL teacher
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks
- Color coding important vocabulary
- Directions given in smaller chunks
- English language supports for parents of non English speaking students, (Teacher created dictionary with Force and Motion terms, pictures, and labels in English and student's first language)
- Visual clues (pictures)
- Repeated directions
- Check for understanding
- Ask pointed questions
- Peer models
- Students may employ the use of Google Translator on laptops and ipads
- Fewer answer choices on assessments

Gifted and Talented

- *Have students use the Internet or library resources to do research about how beaver dams can contribute to flooding. Have them draw a flowchart that begins with a beaver dam and ends with the potential effects of increased flooding.*
- *Have students circle the predators in each of the pairs above. Then, have them do research to find predators for the animals they circled and prey of the animals that they did not circle. Have them create new pairs with the information they find. If any animals don't have predators (humans), have them write the animal's name alone with a box around it.*
- *In the ELABORATE section, Research Mammoths, have students research and compare the Columbian Mammoth and the Woolly Mammoth. Have students write three facts about each type of mammoth and color a world map to show where each lived.*
- Advanced STEAM activities
- Create your own brochure of a topic related to Life Science concepts learned in the unit

- Higher order thinking and questioning about information related to Life Science concepts

Students with 504 Plans

- *Have students circle predators in animal pairs*
- Provide sentence frames and sentence stems to help students explain their understanding of ecosystems
- *Have students make a chart that shows how the pond is a good habitat for marsh plants, turtles, dragonflies, and sunfish. If needed, help students conduct simple research on these organisms.*
- *Have students circle the predators in each of the following pairs of animals: cheetah/gazelle, mouse/snake, crow/worm, catfish/humans, coyote/house cat.*
- *In the ELABORATE section, Research Mammoths, have students print a world map and color and label it to show where mammoths lived. Have them write a title and three facts about mammoths on the page.*
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks
- Color coding important vocabulary
- Directions given in smaller chunks
- Extended time for assignments
- Prompting
- Reassurance and time to formulate ideas
- Preferential seating
- Repeated directions
- Check for understanding
- Ask pointed questions
- Instructional Aides in classroom settings
- Frequent breaks during lesson
- Behavior chart to increase focus and work completion
- Use of FM system to improve attention and support auditory information
- Sensory breaks with timers
- Modified assessments: Chunked, use of word banks, fewer answer choices, highlighted materials emphasizing concepts.

Grade 3 Science Curriculum

Unit 2: Life Science: Inheritance and Variance in Traits: Life Cycles and Traits

Unit Overview

Excerpt from NJ model curriculum, Grade 3, Units 4 & 5, "What it looks like in the classroom"

Scientists sort and classify organisms based on similarities and differences in characteristics or traits. Students can easily observe external traits of animals such as body coverings; type, shape, and number of external features; and type, shape, and color of eyes. Similarly, they can observe external traits of plants such as the type of root system or the shape, color, and average size of leaves. The characteristics that organisms inherit influence how they look and how they function within their environment. As students observe parents and their offspring, they will notice that parents and offspring share many traits. As they observe a larger number of organisms from the same group, they will notice similarities and differences in the traits of individuals within a group. Students can observe similarities and differences in the traits of organisms and use these observations as evidence to support the idea that offspring inherit traits from parents, but these traits do vary within a group of similar organisms.

Sometimes, variations among organisms within a group are due to the fact that individuals inherit traits from different parents. However, traits can also be influenced by an individual's interaction with the environment. For example, all lions have the necessary inherited traits that allow them to hunt, such as sharp claws, sharp teeth, muscular body type, and speed. However, being a successful hunter also depends on the interaction that individual lions have with their parents and their environment. A lion cub raised in captivity without parents will have the same type of claws, teeth, and muscular body as all other lions, but it may never have the opportunity to learn to use its traits to hunt. Additionally, the environment can affect an organism's physical development. For example, any plant that lacks sufficient nutrients or water will not thrive and grow as it should. It will most likely be smaller in size, have fewer leaves, and may even look sickly. Likewise, too much food and lack of exercise can result in an overweight dog.
To investigate how the environment influences traits, students can plant the same type of seedling in different locations, which will provide variations of light, water, or soil. Data can be collected about rates of growth, height, and heartiness of the plant. The information gathered can be analyzed to provide evidence as to how the environment influenced the traits of the plant. As students read about, observe, and discuss these ideas, they learn that even though every organism inherits particular traits from its parents, the environment can have a marked effect on those traits and the development of others.

In third grade, students learn that the changes an organism goes through during its life form an observable pattern. Although different types of organisms have unique and diverse life cycles, they follow a pattern of birth, growth, reproduction, and death. While observing and studying life cycles, students should look closely for patterns of change and use these observed patterns to make predictions. They should also sort and classify a variety of organisms using the similarities and differences they observe. For example,

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

flowering plants begin as seeds. With the right conditions, the seeds germinate and grow, from small seedlings to adult plants. Adult plants then produce flowers that, once pollinated, will produce seeds from which the next generation will grow.

Animals, likewise, go through observable patterns of change, which allow students to sort and classify them based on the stages of their life cycles. Some animals, for example, undergo complete metamorphosis; others go through incomplete metamorphosis; while others do not undergo metamorphosis at all. Some animals begin their life cycles with a live birth, while others hatch from eggs. Students should develop models to describe the unique and diverse life cycles of organisms. They can draw diagrams, build physical models, or create presentations to show the patterns of change that make up the life cycles of given organisms. As students become familiar with the stages in the life cycles of different types of plant and animals, they will come to understand that reproduction is essential to the continued existence of every kind of organism.

Students learned that organisms have traits that are inherited from their parents. This process occurs during reproduction. While observing and identifying traits of a specific species or type of organism, students also learned that there are differences in characteristics within the same species. In this unit, students learn that these differences in characteristics among individuals of the same species sometimes provide advantages in survival, finding mates, and reproducing. For example, when comparing plants from the same species, those with larger or more abundant thorns may be less likely to be eaten by a predator. Likewise, animals with better camouflage coloration may be more likely to survive and therefore more likely to leave offspring. As students read about, observe, and discuss variations in organisms' characteristics, they should identify cause-and-effect relationships that help explain why any variation might give an advantage in surviving or reproducing to some members of a species over others.

Big Idea/Common Thread:

- There are similarities and differences of organisms' life cycles. Organisms have different inherited traits, and the environment can also affect the traits that an organism develops. Variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

Enduring Understanding:

- Reproduction is essential to every kind of organism. Organisms have unique and diverse life cycles.
- 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.

Essential Questions:

- How are life cycles unique?

- How do inherited traits of organisms help them survive?
- What environmental factors might influence the traits of a specific organism?

Assessments

Possible Ongoing Formative Assessments
• Teacher Observation • Student Participation • Wrap It Up! Questions • Teacher Observation • Class Discussions/Partner Talk • Science Notebook activities • Performance Expectation Activities: *Investigate; Think Like a Scientist; Think Like an Engineer* • Teacher Rubrics for Performance Expectations Activities
Summative Assessments
• Life Science Unit Assessment (Inheritance and Variance in Traits: Life Cycles and Traits)
Alternative Assessments
• Modified Life Science Unit Assessment (Less answer choices, highlighted vocabulary, etc.)

Standards (NJSLS) Addressed in this Unit

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)

LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents. (3-LS3-1)
- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3- LS3-2)

LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1)
- The environment also affects the traits that an organism develops. (3-LS3-2)

LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Crosscutting Concepts

Patterns

- Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)
- Patterns of change can be used to make predictions. (3-LS1-1)

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2), (3-LS4-2)

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop models to describe phenomena. (3-LS1-1)

Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2)
- Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns. (3-LS1-1)

Computer Science and Design Thinking

- **8.1.5.AP.6:** Develop programs using an iterative process, implement the program design, and test the program to ensure it works as intended.
- **8.1.5.DA.3:** Organize and present collected data visually to communicate insights gained from different views of the data.

Career Readiness, Life Literacies, and Key Skills

CAREER AWARENESS, EXPLORATION, PREPARATION, AND TRAINING

9.2.5.CAP.4 - Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

LIFE LITERACY AND KEY SKILLS

9.4.5.CI.1 - Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).

9.4.5.CI.2 - Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).

9.4.5.CI.3 - Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).

9.4.5.CI.4 - Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).

9.4.5.CT.1 - Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).

9.4.5.CT.2 - Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem (e.g., 2.1.5.CHSS.1, 4-ESS3-1).

9.4.5.CT.4 - Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).

9.4.5.DC.8 - Propose ways local and global communities can engage digitally to participate in and promote climate action (e.g., 6.3.5.GeoHE.1).

PRACTICES

CLKSP1 - Act as a responsible and contributing community member and employee.

CLKSP4 - Demonstrate creativity and innovation.

CLKSP5 Utilize critical thinking to make sense of problems and persevere in solving them.

Interdisciplinary Connections:

English Language Arts

Reading - Informational Text

● RI.3.1 - Ask and answer questions,and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
● 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.
● RI.3.7 - Use information gained from text features (e.g., illustrations, maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

Writing

● W.3.2 - Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
● W.3.7 - Conduct short research projects that build knowledge about a topic.
● 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.

Speaking and Listening

● SL.3.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
● SL.3.2 - Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
● SL.3.3 - Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
● 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.
● SL.3.6 - Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Mathematics

Mathematical Practices

● MP.2 - Reason abstractly and quantitatively
● MP.4 - Model with mathematics.

Measurement & Data

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

● 3.MD.B.3 - Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.
● 3.MD.B.4 - Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

Social-Emotional Competencies

- **Self-Awareness**: ability to recognize one’s emotions and know one’s strengths and limitations
    - Connections:
        - Regular check-ins to share feelings (Oral, Thumbs Up, Thumbs Down, Emojis, etc.)
        - Reflecting on one’s learning (Oral, Thumbs Up, Thumbs Down, Pictures, etc.)
        - Provide cool down spot in classroom

- **Self-Management**: ability to regulate and control one’s emotions and behaviors, particularly in stressful situations
    - Connections:
        - Playing soft nature sounds - breathing, stretching
        - Draw a nature picture (i.e. animals in different habitats)

- **Social Awareness**: ability to take the perspective of others, demonstrate empathy, acknowledge and appreciate similarities and differences, and understand how one’s actions influence and are influenced by others
    - Connections:
        - Animal charades games (One partner acts out animals and the other guesses what the animal is)
        - Providing positive comments on other students’ STEAM activities

- **Relationship Skills**: refers to one’s ability to demonstrate prosocial skills and behaviors in order to develop meaningful relationships and resolve interpersonal conflicts
    - Connections:
        - Class discussions
        - Incentives for individual students and small groups

- **<u>Responsible Decision-Making</u>**: refers to the ability to use multiple pieces of information to make ethical and responsible decisions
    - Connections:
        - Class rules and routines
        - Class discussions
        - Following directions

UNIT OBJECTIVES

Students will be able to …

- Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. (3-LS1-1)

  [Clarification Statement: Changes organisms go through during their life form a pattern.]
  [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]

  Disciplinary Core Ideas
    - Understand that reproduction is essential to the continued existence of every kind of organism.
    - Understand that plants and animals have unique and diverse life cycles.

  Science and Engineering Practices
    - Develop models to describe scientific concepts.

  Crosscutting Concepts
    - Use patterns of change to make predictions.

3-LS1-1

Concepts	Students Can...
• Reproduction is essential to the continued existence of every kind of organism. • Plants and animals have unique and diverse life cycles. • Science findings are based on recognizing similarities and/or	• Understand that reproduction is essential to the continued existence of organisms. • Develop models (visual representations) to describe diverse life cycles with common elements of birth, growth, reproduction, and death.

differences in patterns. ● Patterns of change can be used to make predictions.	● Make predictions using patterns of change.

Students will be able to …

- Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. (3-LS3-1)

  [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.]
  [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]

  Disciplinary Core Ideas
  - Understand that many characteristics of organisms are inherited from their parents.
  - Understand that different organisms vary in how they look and function because they have different inherited information

  Science and Engineering Practices
  - Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1)

  Crosscutting Concepts
  - Use similarities and differences in pattern to sort and classify natural phenomena. (3-LS3-1)

3-LS3-1

Concepts	Students Can...
● Many characteristics of organisms are inherited from their parents. ● Organisms vary in how they look and function because they have different inherited information. ● Similarities and differences in patterns can be used to sort and classify inherited traits.	● Recognize the match of an offspring with its parent, based on inherent traits. ● Develop a representation of an organism, based on inherited traits, with possible variations. ● Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. ● Sort traits of organisms using similarities

	and differences.

Students will be able to …

- Use evidence to support the explanation that traits can be influenced by the environment. (3-LS3-2)

  [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

Disciplinary Core Ideas
- Understand that characteristics other than ones inherited from parents result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.
- The environment also affects the traits that an organism develops.

Science and Engineering Practices
- Use evidence (e.g., observations, patterns) to support an explanation.

Crosscutting Concepts
- Routinely identify cause and effect relationships and use them to explain change.

3-LS3-2

Concepts	Students Can...
• Characteristics, which can range from diet to learning, result from individuals' interaction with the environment. • Many characteristics involve both inheritance and environment. • Organisms and their habitat make up a system in which the parts depend on each other. • Cause-and-effect relationships are routinely identified and used to explain physical changes of an organism due to environmental factors.	• Describe how an organism's characteristics may change due to its habitat • Use evidence to support the explanation that traits can be influenced by the environment. • Understand that cause-and-effect relationships can be used to explain physical changes of an organism due to environmental factors.

Students will be able to …

- Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)

  [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

  Disciplinary Core Ideas
  - Understand that sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

  Science and Engineering Practices
  - Use evidence (e.g., observations, patterns) to construct an explanation.

  Crosscutting Concepts
  - Cause and effect relationships are routinely identified and used to explain change.

3-LS4-2

Concepts	Students Can...
• Differences in characteristics between individuals of the same species may provide advantages in surviving, finding mates, and reproducing. • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. • Cause and effect relationships are routinely identified and used to explain change in traits to survive in a given environment	• Recognize characteristics which provide advantages in survival and reproduction. • Use evidence to construct an explanation for how the variations in characteristics among the same species may provide advantages in surviving, finding mates, and reproducing. • Understand that a change in traits may help an organism survive in a given environment Examples may include: ○ Animals that have better camouflage coloration than other animals may be more likely to survive) ○ Plants that have larger thorns than other plants may be less likely to be eaten by predators.

SUGGESTED ACTIVITIES

- **https://www.generationgenius.com/videolessons/variation-of-traits-video-for-kids/**
- **Variation of Traits - Generation Genius - Virtual Lab - Investigates how different environments influence plant traits**

- **Let's Hear it for Labybugs** http://www.oradellschool.org/osnj/_zumu_user_doc_cache/Lets_Hear_it_for_Ladybugs.pdf - This article describes a ladybug life cycle unit that incorporates language arts and science concepts. Students build on their prior knowledge of butterflies as they explore the metamorphosis of ladybugs. To create their final project, clay life cycle models, students synthesize what they learned from live observation and nonfiction texts.

- **"Rice is Life"** activity from *Picture-Perfect Science Lessons* by Karen Ansberry and Emily Morgan. Students explore the importance of rice as a food source, the differences among types of rice, the life cycle of rice, and rice production methods. Students also explore controls, variables, and experimental design by investigating how rice grows and by designing their own plant growth experiments.

- **Animal Detectives** An interdisciplinary unit featuring a wolf webcam has students investigate the world of animals. - This is an interdisciplinary, 5E unit that begins with students becoming animal detectives to explore the school habitat, moves on to students watching wolf families on a webcam, and ends with students forming groups to become "Animal Detectives."

- **Mystery Plant-** Adaptation simulation Mystery Plant Adaptation | STEM Resource Finder - Students perform a simulated investigation that models how thriving species are of an organism are adapted to their environments and that variation in a species can help the species adapt to changes in that environment.

- **Does it Have a Life Cycle?** Does It Have a Life Cycle? - This formative assessment probe asks students to identify organisms that have a life cycle from a list of plants and animals.

Unit Specific Vocabulary
acquired trait: a trait an organism gains from the environment **adaptation:** a behavior or body part that helps an organism survive and reproduce in its environment **behavior:** an action that an organism does **ecosystems:** all of the living things in a given area, interacting with each other, and also

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

with their environments
environment: all the living and nonliving things that surround an organism
habitat: the home of an animal or a plant
inherited trait: a trait that is passed down from organism to organism
interdependent: people, animals, plants, or things that depend on each other
life cycle: the series of changes in the life of an organism
mate: a member of a pair of organisms
reproduce: to make more of the same kind of organism
species: a group of living things of the same kind
trait: a personal characteristic
variations: a difference between cells, individual organisms, or groups of organisms of any species caused either by genetic differences or by the effect of environmental factors

Instructional Materials and Learning Activities

Core Instructional Materials:

- *National Geographic Exploring Science 3*
- *National Geographic My NG connect Exploring Science 3 Digital Resources*
- *National Geographic Exploring Science through Literacy and leveled readers*
- *Hand2Mind Exploring Science Hands on Kit*

Digital Resources:

- Access the Next Generation Science Standards by Topic - The NGSS standards
- Classroom Resources - NGSS Hub - lesson ideas
- Next Generation Science Standards - lesson ideas
- https://njctl.org/courses/science/3rd-grade-science/ - lessons, activities, and labs
- https://www.generationgenius.com/

Supplemental Materials:

- Science Tech Book

Leveled Readers:

Level Reader	Below-Level	On-Level	Above-Level
Tricks, Traps, and Tools	550L	680L	810L

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Suggested Modifications

These strategies can be adapted to scaffold for students needing more support or extending the learning for higher level students. Differentiation is accomplished through content, process, product, and learning environment.

NGSS Appendix D - "All Standards, All Students": Making the Next Generation Science Standards Accessible to All Students

Special Education Students
● Write the following parts of the plant life cycle on separate index cards; seed, seedling, young plant, adult plant. Shuffle the cards and help students shuffle the cards and help students place them in order to make a complete life cycle. ● Write words and phrases on the board that describe either the tadpole or adult stage of the frog, such as: legs, no legs, tail, no tail, gills, lives in water, and lives on land. Have students match these words and phrases to either the tadpole or adult frog. ● Have students make a set of 15 study cards with traits on the front and either “acquired” or “inherited” on the back. Have pairs of students work together to quiz each other using the study cards. ● Preview vocabulary ● Use of picture dictionaries and visual aids ● Use of word banks ● Color coding important vocabulary ● Directions given in smaller chunks ● Leveled texts (L-P) ● Online RazKids leveled texts (dictation features) ● Multisensory instruction ● Peer models ● Use of FM system to improve attention and support auditory informations ● Extended time for assignments ● Prompting ● Preferential seating ● Check for understanding ● Behavior chart to increase work completion ● Modified assessments: Chunked, use of word banks, fewer answer choices, highlighted materials emphasizing concepts.
Students at Risk
● *Write words and phrases on the board that describe either the tadpole or adult stage of the frog, such as: legs, no legs, tail, no tail, gills, lives in water, and lives on land. Have students match these words and phrases to either the tadpole or adult frog.*

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

- *Have students make a set of 15 study cards with traits on the front and either "acquired" or "inherited" on the back. Have pairs of students work together to quiz each other using the study cards.*
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks
- Guide students to use text features to make sense of content knowledge
- Color coding important vocabulary
- Directions given in smaller chunks
- Use of FM system to improve attention and support auditory information
- Sensory breaks with timers
- Graphic organizers and outlines provided
- Study guides provided
- Small group instruction

Multilingual Learners

- *Have students circle the prefix and then match the word with its meaning:*
  reusable
  not happy
  unhappy
  nonstop
  able to be used again
  without stopping
- *Have students match the above words and meanings, and then write definitions for the prefixes re–, un–, and non–.*
- *Have students write definitions of the words reusable, unhappy, and nonstop. Then, have them write definitions for the prefixes re–, un–, and non–. Lastly, have them combine the prefixes with the stems –sense, –fair, and –appear to create three new words. (nonsense, unfair, and reappear)*
- *Provide sentence frames, such as: (Variation) is important for a species' survival. Please (vary) your response. The (varied) color of the birds was interesting. Intermediate Have students complete the above sentence frames, and then identify each word as a noun, verb, or adjective.*
- *Have students identify the following terms as noun, verb, or adjective, and then use each one in an original sentence: variation, vary, and varied.*
- *Provide students with the definition of the prefixes bio– (connected with life or living things) and geo– (connected with Earth). Have students add endings onto the words:*
  Biology the study of living things
  Biologist someone who studies living things
  Geology the study of Earth
  Geologist someone who studies Earth
- Pre-teaching of vocabulary by ESL teacher
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks

- Color coding important vocabulary
- Directions given in smaller chunks
- English language supports for parents of non English speaking students, (Teacher created dictionary with Force and Motion terms, pictures, and labels in English and student's first language)
- Visual clues (pictures)
- Repeated directions
- Check for understanding
- Ask pointed questions
- Peer models
- Students may employ the use of Google Translator on laptops and ipads
- Fewer answer choices on assessments

Gifted and Talented

- *Have partners plan, write, and perform a short skit that shows the life cycle of a frog. One partner should be the narrator while the other acts out the changes in the frog's life cycle*
- *Have students make a list of five inherited traits and five acquired traits. Then have students circle the traits that could be considered both inherited and acquired. Have them explain the ones they circled to a partner.*
- Advanced STEAM activities
- Create your own brochure of a topic related to Life Science concepts learned in the unit
- Higher order thinking and questioning about information related to Life Science concepts

Students with 504 Plans

- Provide sentence frames and sentence stems to help students explain their understanding of life cycles and traits
- Write words and phrases on the board that describe either the tadpole or adult stage of the frog, such as: *legs, no legs, tail, no tail, gills, lives in water,* and *lives on land.* Have students match these words and phrases to either the tadpole or adult frog.
- Have students make a set of 15 study cards with traits on the front and either "acquired" or "inherited" on the back. Have pairs of students work together to quiz each other using the study cards.
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks
- Color coding important vocabulary
- Directions given in smaller chunks
- Extended time for assignments
- Prompting
- Reassurance and time to formulate ideas
- Preferential seating
- Repeated directions
- Check for understanding
- Ask pointed questions

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

- Instructional Aides in classroom settings
- Frequent breaks during lesson
- Behavior chart to increase focus and work completion
- Use of FM system to improve attention and support auditory information
- Sensory breaks with timers
- Modified assessments: Chunked, use of word banks, fewer answer choices, highlighted materials emphasizing concepts.

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Grade 3 Science Curriculum

Unit 3: Earth and Space Systems: Weather and Climate

Unit Overview

Excerpt from NJ Model Curriculum- Grade 3, Unit 1, "*What it Looks Like in the Classroom*"

In this unit of study, students organize and use data to describe typical weather conditions expected during a particular season. They notice patterns as they analyze and interpret weather data, and they use this data to determine cause-and-effect relationships. By applying their understanding of weather-related hazards, students make claims about the merit of a design solution that reduces the impacts of such hazards, using evidence to support their claims.

Initially, students learn that scientists record patterns of weather across different times and locations in order to make predictions about future weather conditions. To understand how scientists use weather data, students need time, tools, and resources (both print and digital) to collect weather data. They can use a variety of tools (e.g., thermometers, anemometers, rain gauges) to collect firsthand data and multiple resources (e.g., Weather Bug, NOAA) to gather weather data that has been collected over longer periods of time. Multiple units of measurement (e.g., m, cm, °C, km/hr) should be used when recording weather conditions such as temperature, types and amounts of precipitation, and wind direction and speed. To organize the data they collect, students create graphical displays (bar graphs and pictographs) and tables. Once a sufficient amount of data is collected, students need opportunities to analyze data, looking for patterns of change that can be used to make predictions about typical weather conditions for a particular region and time of year. As they collect and analyze data over time, students learn that certain types of weather tend to occur in a given area and that combinations of weather conditions lead to certain types of weather (e.g., it is always cloudy when it rains or snows, but not all types of clouds bring precipitation).

Weather is a combination of sunlight, wind, precipitation, and temperature in a particular region at a particular time. Climate describes the range of an area's typical weather conditions and the extent to which those conditions vary over the years. After learning to analyze and use data to make weather predictions, students use long-term patterns in weather to describe climates in a variety of regions around the world. To accomplish this, students use books and other reliable media to obtain information and weather data collected over a long period of time for a variety of regions. With guidance, students analyze the available data and information in order to describe the climate (e.g., average temperatures, average precipitation, average amount of sunlight) in each region.

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Science affects everyday life. Whenever people encounter problems, engineers use scientific knowledge to develop new technologies or improve existing ones to solve our day-to-day problems.

After studying weather and climate, students investigate how weather-related hazards can be reduced. Students learn that there are a variety of natural hazards that result from severe weather. Severe weather, such as high winds, flooding, severe thunderstorms, tornadoes, hurricanes, ice or snowstorms, dust storms, or drought, has the potential to disrupt normal day-to-day routines and cause damage or even loss of life. While humans cannot eliminate natural hazards, they can take steps to reduce their impact. Students can use trade books and media resources to research types of severe weather hazards and their effects on communities and find examples of how communities solve problems caused by severe weather. As a class, students determine the types of severe weather that are common to the local area and discuss the effects on the community. (Define the problem.) In pairs or small groups, students can research ways that the community reduces the effects of severe weather. (Determine ways in which the problem is solved.) Given criteria, groups can determine how well each solution reduces the effects of severe weather. Groups can also prepare a presentation that

- Describes the solution that the group thinks is best for reducing the effects of a given type of weather hazard,
- Lists evidence to support their thinking, and
- Lists at least one possible constraint, such as materials, time, or cost.

With the 2020 updates of the NJSLS for Science to include climate change, in addition to the previous excerpt from the NJ Model Curriculum, students will engage in conversations regarding the impact climate change has on our community and brainstorm ways to make a positive impact.

Big Idea/Common Thread:

- Patterns of typical weather conditions exist during a particular season. A solution can be designed that reduces the impacts of weather-related hazards.

Enduring Understanding:

- Climate describes patterns of typical weather conditions (temperature, precipitation, wind direction) over time.
- Historical weather patterns can be analyzed to understand the impact of weather-related hazards.

Essential Questions:

- What are typical weather patterns in different parts of the world, and during different times of the year?
- How can the impact of weather-related hazards be reduced?
- How does weather differ from climate?
- What are ways we can help make a positive impact on our environment?
- What can people do to reduce the impact of climate change?

Assessments

Possible Ongoing Formative Assessments
● Teacher Observation ● Student Participation ● Wrap It Up! Questions ● Teacher Observation ● Class Discussions/Partner Talk ● Science Notebook activities ● Performance Expectation Activities: *Investigate; Think Like a Scientist; Science Career* ● Teacher Rubrics for Performance Expectations Activities
Summative Assessments
● Earth & Space Science Unit Assessment
Alternative Assessments
● Modified Earth & Space Science Unit Assessment (Less answer choices, highlighted vocabulary, etc.)

Standards (NJSLS) Addressed in this Unit

Disciplinary Core Ideas
ESS2.D: Weather and Climate ● Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1) ● Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2) **ESS3.B: Natural Hazards** ● A variety of natural hazards result from natural processes. Humans cannot eliminate

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

natural hazards but can take steps to reduce their impacts. (3-ESS3-1) (Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.)

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions. (3-ESS2-1),(3-ESS2-2)

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1)

Science and Engineering Practices

Analyzing and Interpreting Data

- Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.
    - Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1)

Engaging in Argument from Evidence

- Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).
    - Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-ESS3-1)

Obtaining, Evaluating, and Communicating Information

- Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.
    - Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones). (3-ESS3-1)

Connections to Nature of Science

Science is a Human Endeavor
- Science affects everyday life. (3-ESS3-1)

Computer Science and Design Thinking

- **8.1.5.DA.1:** Collect, organize, and display data in order to highlight relationships or support a claim.
- **8.1.5.DA.3:** Organize and present collected data visually to communicate insights gained from different views of the data.

Career Readiness, Life Literacies, and Key Skills

PERSONAL FINANCIAL LITERACY
9.1.5.RMI.1: Identify risks that individuals and households face.
9.1.5.RMI.2: Justify reasons to have insurance.
9.1.5. EG.5: Identify sources of consumer protection and assistance.

CAREER AWARENESS, EXPLORATION, PREPARATION, AND TRAINING
9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
9.2.5.CAP.4 - Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
9.2.5.CAP.8: Identify risks that individuals and households face.
9.2.5.CAP.9: Justify reasons to have insurance.

LIFE LITERACY AND KEY SKILLS
9.4.5.CI.1 - Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).
9.4.5.CI.2 - Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).
9.4.5.CI.3 - Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
9.4.5.CI.4 - Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).
9.4.5.CT.1 - Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).

9.4.5.CT.2 - Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem (e.g., 2.1.5.CHSS.1, 4-ESS3-1).
9.4.5.CT.4 - Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).
9.4.5.DC.8 - Propose ways local and global communities can engage digitally to participate in and promote climate action (e.g., 6.3.5.GeoHE.1).

PRACTICES
CLKSP1 - Act as a responsible and contributing community member and employee.
CLKSP4 - Demonstrate creativity and innovation.
CLKSP5 Utilize critical thinking to make sense of problems and persevere in solving them.

Interdisciplinary Connections:

English Language Arts
Reading Standards - Informational Text
● RI.3.1 - Ask and answer questions, and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
● RI.3.9 - Compare and contrast and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) the most important points and key details presented in two texts on the same topic.

Writing
● W.3.1 - Write opinion pieces on topics or texts, supporting a point of view with reasons.
● W.3.7 - Conduct short research projects that build knowledge about a topic.
● W.3.9 - Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Speaking and Listening
● SL.3.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
● SL.3.3 - Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
● 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.
● SL3.6 - Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Mathematics
Mathematical Practices
- MP.2 - Reason abstractly and quantitatively.
- MP.4 - Model with mathematics.
- MP.5 - Use appropriate tools strategically.

Measurement and Data
- 3.MD.A.2 - Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.
- 3.MD.B.3 - Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs.

UNIT OBJECTIVES

Students will be able to …

- Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. (3-ESS2-1)
  [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.]
  [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.]

  Disciplinary Core Ideas
  - Understand that patterns of weather across different times and areas are recorded.
  - Recognize that predictions are made about what kind of weather might happen next.

  Science and Engineering Practices
  - Represent data in tables and graphs to reveal weather patterns.
  - Make a claim about a solution to a problem by citing evidence.

  Crosscutting Concepts
  - Understand that patterns of change can be used to make predictions.

3-ESS2-1

Concepts	Students Can...
• People record patterns of the weather across different times and areas so that	• Identify patterns of weather. • Represent data in tables and graphical

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

they can make predictions about what kind of weather might happen next. ● Patterns of change can be used to make predictions.	displays to describe typical weather conditions expected during a particular season. Examples of data could include: ● Average temperature ● Precipitation ● Wind direction ● Make predictions using patterns of change.

Students will be able to …

- Obtain and combine information to describe climates in different regions of the world (3-ESS2-2)

Disciplinary Core Ideas
- Recognize that climate describes a range of typical weather conditions and how they vary over years in a particular area.

Science and Engineering Practices
- Obtain and combine information from books and other reliable media to explain scientific concepts.

Crosscutting Concepts
- Understand that patterns of change can be used to make predictions.

3-ESS2-2

Concepts	Students Can...
● Climate describes a range of typical weather conditions and how they vary over years in a particular area. ● Patterns of change can be used to make predictions.	● Understand that climate describes a range of typical weather conditions. ● Obtain and combine information from books and other reliable media to explain climate in various regions of the world. ● Make predictions using patterns of change.

Students will be able to …

- Make a claim about the merit of a design solution that reduces the impacts of **climate change and/or**** a weather-related hazard. (3-ESS3-1)
  *[Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, etc.] **

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Disciplinary Core Ideas

- Recognize that a variety of natural hazards result from natural earth processes (e.g., flooding, fast wind, or lightning).
- Understand that humans cannot eliminate natural hazards but can take steps to reduce their impacts.

Science and Engineering Practices

- Make a claim about a solution to a problem by citing evidence.

Crosscutting Concepts

- Understand that cause and effect relationships explain change.

** Updated with 2020 NJSLS language

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

3-ESS3-1

Concepts	Students Can...
• Science affects everyday life. • People's needs and wants lead to improved technology. • A variety of natural hazards result from natural earth processes (e.g., flooding, fast wind, or lightning). • Humans can take steps to reduce impacts of natural hazards. • The success of a designed solution must consider the desired features (criteria). • Cause-and-effect relationships explain change.	• Make a claim about a solution to climate change by citing evidence. • Make a claim about a solution to a natural hazard by citing evidence. Examples of design solutions to weather related hazards could include: ○ Barriers to prevent flooding ○ Wind-resistant roofs • Understand that cause-and-effect relationships explain change.

SUGGESTED ACTIVITIES

- Make an anemometer http://www.weatherwizkids.com/experiments-anemometer.htm
- Record temperature and weather in a particular region for a period of time in a weather journal.
- Enter temperature into a Google Sheet and create a bar graph to observe patterns.
- Create a Google Slideshow of different natural hazards providing the definitions, regions, pictures, and facts.
    - Choose one hazard and develop an opinion piece on best solution to reduce the impact. (ex: create a barrier for a flash flood)
- Simulate a hurricane with cause & effect:
- https://scijinks.gov/hurricane-simulation/
- Students will listen to The Three Little Pigs and will discuss what the hazard was and why they think the brick house stayed together while the sticks and straw houses did not?

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

- Weather Science content for Kids and Teens: The National Weather Service has several education resources available at this website.

- NOAA Education Resources: The National Oceanic and Atmospheric Administration (NOAA) provides education resources at this website.
- Greenhouse Effect- video explaining the greenhouse effect
- Meet the Greenhouse Gases- get to know what is good and bad gasses by using these cards.
- Greenhouse Vase Activity- simple way to explain the greenhouse effect to children.
- Climate Change Challenge - In this lesson students will brainstorm to figure out ways they can make a difference. Thank you to Angela McDonough for sharing this activity with OPS teachers.
- The Lorax, by Dr Seuss, and related activities such as Join the Lorax and The Lorax's Earth Day

Unit Specific Vocabulary
air mass - a large body of air in the atmosphere of the same temperature and humidity **anemometer -** a tool that measure wind speed **atmosphere -** the blanket of air that surrounds Earth **barrier -** a structure or object that stops free movement **blizzard -** a long lasting snowstorm with a lot of falling or blowing snow **carbon dioxide-** a colorless, odorless, gas produced by burning carbon and organic compounds and by respiration **chlorofluorocarbons-** a group of chemicals which are made up of only chlorine, fluorine, carbon, and hydrogen. **climate -** an area's typical weather over a long period of time. **climate change -** a change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels. **data -** pieces of information about something, such as facts or measurements. **drought -** when not enough rain falls for a long period of time. **dust storm -** a storm that forms when strong winds pick up large amounts of dry soil. This forms big blowing clouds of dust. **evaporation -** when a liquid water changes to water vapor. **greenhouse gasses-** gasses in the Earth's atmosphere that trap heat

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

humidity - the amount of water vapor in the air.
hurricane - a large spinning storm with strong winds that forms over a tropical ocean.
meteorologist - a scientist who studies weather.
methane- a colorless, odorless flammable gas which is the main constituent of natural gas.
natural hazard - an extreme event that causes harm to humans, including avalanche, drought, earthquake, flooding, hurricane, tornado, tsunami, volcanic eruption, and wildfire.
nitrous oxide- a gas with the chemical formula N_2O. It is found naturally in the air. It is also made artificially, because it has many uses. It is a very strong greenhouse gas (almost 300 times more so than carbon dioxide). Because it is a greenhouse gas, people are trying to use it less.
ozone- a pale blue gas. It is a form of oxygen.
pattern - repeated design or recurring sequence
pollution- the presence in or introduction into the environment of a substance or thing that has harmful or poisonous effects
precipitation - water that falls to the grown in the form of rain, snow, or sleet
rain gage - a tool that measure rainfall
region - a large location on the surface of the earth
season - divisions of the year, defined by changes in weather and the position of Earth in its orbit around the Sun
temperature - how warm or cool something is
thermometer - a tool that measure temperature
thunderstorm - a strong storm that brings wind, rain, thunder, and lightning
tornado - a dangerous and powerful mass of spinning air
water vapor - water in the air that you cannot see
weather - what the atmosphere is like at a certain time and place
weather station - a set of equipment that measure temperature and other weather information.
wild fire - a large fire in a forest or grassland
wind direction - the direction the wind blows
wind vane - a tool that measure that direction wind comes from

Instructional Materials and Learning Activities

Core Instructional Materials:

- *National Geographic Exploring Science 3*
- *National Geographic My NG connect Exploring Science 3 Digital Resources*
- *National Geographic Exploring Science through Literacy and leveled readers*
- *Hand2Mind Exploring Science Hands on Kit*

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Digital Resources:

- Access the Next Generation Science Standards by Topic - The NGSS Standard
- Wind - Weather Wiz Kids
- Classroom Resources - NGSS Hub - lesson ideas
- Space Systems: Patterns and Cycles - lesson ideas
- Next Generation Science Standards - lesson ideas
- www.njctl.org - a complete science curriculum to download for free
- https://www.generationgenius.com/

Supplemental Materials:

- Science Tech Book
- STEAM INTEGRATION Unit 5 - Weatherproof the Roof - STEAM Integration Grades K-6 2022

Leveled Readers:

Level Reader	Below-Level	On-Level	Above-Level
Big Storm	580L	720L	810L
Mountain, Valleys, and Plains	640L	740L	840L

Suggested Modifications

These strategies can be adapted to scaffold for students needing more support or extending the learning for higher level students. Differentiation is accomplished through content, process, product, and learning environment.

NGSS Appendix D - "All Standards, All Students": Making the Next Generation Science Standards Accessible to All Students

Special Education Students
• Provide students with a word bank that includes the following terms and phrases: *clouds, humidity, precipitation, wind speed, temperature, lightning, fog, changes quickly,* and *repeats year after year.* Have students use the terms and phrases to complete a Venn diagram that differentiates between weather and climate. • Have students use sentence stems to write about lesson concepts. For example: *Hurricanes cause flooding because …. Levees reduce the impact of flooding by…. Dams reduce the impact of*

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

flooding by….

- Preview vocabulary
- Use of picture dictionaries and visual aids
- Use of word banks
- Color coding important vocabulary
- Directions given in smaller chunks
- Leveled texts (L-P)
- Online RazKids leveled texts (dictation features)
- Multisensory instruction
- Peer models
- Use of FM system to improve attention and support auditory informations
- Extended time for assignments
- Prompting
- Preferential seating
- Check for understanding
- Behavior chart to increase work completion
- Modified assessments: Chunked, use of word banks, fewer answer choices, highlighted materials emphasizing concepts.

Students at Risk

- Provide students with a word bank that includes the following terms and phrases: *clouds, humidity, precipitation, wind speed, temperature, lightning, fog, changes quickly,* and *repeats year after year.* Have students use the terms and phrases to complete a Venn diagram that differentiates between weather and climate.
- Have students use sentence stems to write about lesson concepts. For example: *Hurricanes cause flooding because …. Levees reduce the impact of flooding by…. Dams reduce the impact of flooding by….*
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks
- Color coding important vocabulary
- Directions given in smaller chunks
- Use of FM system to improve attention and support auditory information
- Sensory breaks with timers
- Graphic organizers and outlines provided
- Study guides provided
- Small group instruction
- Give directions in small, distinct steps

Multilingual Learners

- Provide students with sentence frames to help them describe weather. For example: *Weather is the state of the atmosphere at a certain (time) and (place). Scientists can measure (changes) in weather. Weather can change (quickly)*.Help students make a picture dictionary page that includes

a variety of weather terms. Have students add to the dictionary as they work through this section. Have students write new, single-sentence captions in their own words for each of the photos shown in this lesson
- Provide students with sentence frames to help students describe weather
- Use sentence frames to identify and compare tools for measuring weather.
- Pre-teaching of vocabulary by ESL teacher
- Cue student before asking question during class discussions
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks
- Color coding important vocabulary
- Directions given in smaller chunks
- English language supports for parents of non English speaking students, (Teacher created dictionary with weather terms and labels in English and student's first language)
- Visual clues (pictures)
- Repeated directions
- Check for understanding of material and comprehension of directions
- Ask pointed questions
- Peer models
- Students may employ the use of Google Translator on laptops and ipads
- Fewer answer choices on assessments

Gifted and Talented

- *Create your own brochure of a topic related to weather concepts learned in the unit*
- Higher order thinking and questioning about information within the text
- Have students write a radio weather report announcing a hurricane or tornado warning. The report should explain to listeners why the weather event is happening, how people can stay safe, and what to expect. Invite students to "broadcast" their reports by reading them aloud.

Students with 504 Plans

- Provide students with a word bank that includes the following terms and phrases: *clouds, humidity, precipitation, wind speed, temperature, lightning, fog, changes quickly,* and *repeats year after year.* Have students use the terms and phrases to complete a Venn diagram that differentiates between weather and climate.
- Have students use sentence stems to write about lesson concepts. For example: *Hurricanes cause flooding because …. Levees reduce the impact of flooding by…. Dams reduce the impact of flooding by….*
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks
- Color coding important vocabulary
- Directions given in smaller chunks
- Extended time for assignments

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

- Prompting
- Reassurance and time to formulate ideas
- Preferential seating
- Repeated directions
- Check for understanding
- Ask pointed questions
- Instructional Aides in classroom settings
- Frequent breaks during lesson
- Behavior chart to increase focus and work completion
- Use of FM system to improve attention and support auditory information
- Sensory breaks with timers
- Modified assessments: Chunked, use of word banks, fewer answer choices, highlighted materials emphasizing concepts.

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Grade 3 Science Curriculum

Unit 4: Physical Science: Forces and Interactions

Unit Overview

Excerpt from NJ model curriculum, Grade 3, Units 2 & 3, "What it looks like in the classroom"

In this unit of study, students look for cause-and-effect relationships as they investigate the effects of balanced and unbalanced forces on the motion of an object. They learn that objects in contact exert forces on each other, and these forces have both strength and direction. When forces are balanced, there is no change in the motion or the position of an object. In other words, an object at rest typically has multiple forces acting on it, but the forces balance out to equal a zero net force on the object. For example, if two children stand with their hands together and push against each other, the pushing force each exerts balances to a net zero effect if neither child moves. Pushing a box from both sides also demonstrates a balanced force if the forces do not produce any change in motion or position of the box.

When forces are unbalanced, however, there is a change in the motion and/or position of the object the forces are acting on. If the same two children from the example above were pushing against each other, and one child moves his/her hands, arms, or feet forward while the other child moves backward, this would demonstrate an unbalanced force. The first child is pushing with greater force than the second.

Through planning and conducting investigations, students will come to understand that forces that result in changes in an object's speed or direction of motion are unbalanced. Students can observe everyday examples on the playground, with seesaws and swings and by kicking and throwing soccer balls. As they conduct investigations and make observations, students should identify the cause-and-effect relationships at work and identify the objects that are exerting forces on one another. They should also use qualitative descriptions when identifying the relative strength (greater than, less than, equal) and direction of the forces, even if an object is at rest.

Investigating the effects of forces on objects will also give students opportunities to observe that patterns exist everywhere. Patterns are found in shapes, structures, natural environments, and recurring events. Scientists and engineers analyze patterns to make predictions, develop questions, and create solutions. As students have opportunities to observe forces interacting with objects, they will ask questions and analyze and interpret data in order to identify patterns of change in the motion of objects and to make predictions about an object's future motion. When students are on the playground, they can observe multiple patterns of change in the back-and-forth motion of a child swinging on a swing or in the up-and-down motion of a seesaw. In the classroom, students can observe a variety of objects, such as marbles rolling back and forth in bowls or tops spinning across the floor.

Throughout this unit, as students plan and carry out investigations, it is extremely important that they routinely identify cause-and-effect relationships and look for patterns of change as objects interact. As students interact with objects, such as when they push a door closed, bounce a ball, or roll a ball down a ramp, they may ask, "What caused the changes that I observed? How can I change the way in which the

object moved?" Students need to have many experiences in order to deepen their understanding of the cause-and-effect relationships between balanced and unbalanced forces on the motion of an object, and they should be guided to plan and conduct fair tests, testing only one variable at a time.

After investigating electrical and magnetic forces, students will engage in a portion of the engineering design process in order to define a simple design problem that can be solved by applying scientific ideas about magnets. This process should include the following steps:

- As a class, create a list of the properties of magnets. (See content descriptions above)
- Brainstorm a list of everyday objects that use magnets, and discuss the function of the magnet(s) in each object. For example, electric can openers have a strong magnet that attaches a can to the device as it cuts through (opens) the top of the can.
- In small groups or pairs, students discuss possible everyday problems that might be solved using magnets. For example, they could construct a latch to keep a door shut.
- As a class, determine possible criteria that might be used to determine how successful the devices might be, and discuss possible constraints (on materials, time, or cost) that might affect each group's design solution.
- Small groups or pairs should have the opportunity to create a presentation (poster, PowerPoint, drawings, or actual physical model, if time permits) to share both the design problem and solution with the class.

In this unit, students are not expected to build and test their design solutions or to optimize their designs; however, they can compare different proposals for solutions on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. The overall goal is for students to understand that engaging in engineering design will help them understand that scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process, and that as people's needs and wants change over time, so do their demands for new and improved technologies.
Engineering design is an important part of this unit of study. Students are expected to define a simple design problem that can be solved by applying scientific ideas and determine possible success criteria and constraints on time, materials, and cost. They should also compare different proposals for solutions based on how well the proposed solutions meet the criteria for success or how well each takes the constraints into account.

Big Idea/Common Thread:

- Balanced and unbalanced forces affect the motion of an object. Electric and magnetic forces affect the interactions between two objects not in contact with each other. Magnets can be used to solve simple design problems.

Enduring Understanding:

- The effect of unbalanced forces on an object results in a change of motion.
- Patterns of motion can be used to predict future motion.

- Some forces act through contact, and some forces act even when the objects are not in contact.

Essential Questions:

- How do equal and unequal forces on an object affect the object?
- How can magnets be used?

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Assessments

Possible Ongoing Formative Assessments
• Teacher Observation • Student Participation • Wrap It Up! Questions • Teacher Observation • Class Discussions/Partner Talk • Science Notebook activities • Performance Expectation Activities: *Investigate; Think Like a Scientist; Think Like an Engineer* • Teacher Rubrics for Performance Expectations Activities
Summative Assessments
• Physical Science Unit Assessment
Alternative Assessments
• Modified Physical Science Unit Assessment (Less answer choices, highlighted vocabulary, etc.)

Standards (NJSLS) Addressed in this Unit

Disciplinary Core Ideas

PS2.A: Forces and Motion

- 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.) (3-PS2-1)
- 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.) (3-PS2-2)

PS2.B: Types of Interactions

- Objects in contact exert forces on each other. (3-PS2-1)
- 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. (3-PS2-3),(3-PS2-4)

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions. (3-PS2-2)

Cause and Effect

- Cause and effect relationships are routinely identified. (3-PS2-1)
- Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3)
- Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-PS2-1)
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. (3-PS2-4)

Connections to Nature of Science

Science Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns. (3-PS2-2)

Scientific Investigations Use a Variety of Methods

- Science investigations use a variety of methods, tools, and techniques. (3-PS2-1)

Computer Science and Design Thinking

- **8.1.5.DA.1:** Collect, organize, and display data in order to highlight relationships or support a claim.
- **8.1.5.DA.3:** Organize and present collected data visually to communicate insights gained from different views of the data. .

Career Readiness, Life Literacies, and Key Skills

CAREER AWARENESS, EXPLORATION, PREPARATION, AND TRAINING

- 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
- 9.2.5.CAP.8: Identify risks that individuals and households face.
- 9.2.5.CAP.9: Justify reasons to have insurance.

Practices

- CLKSP1 Act as a responsible and contributing community member and employee.
- CLKSP4. - Demonstrate creativity and innovation.
- CLKSP5. - Utilize critical thinking to make sense of problems and persevere in solving them.

Interdisciplinary Connections:

English Language Arts

Reading Standards - Informational Text

● RI.3.1 - Ask and answer questions,and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
● 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) to support specific points the author makes in a text.

Writing

● W.3.7 - Conduct short research projects that build knowledge about a topic.
● 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.

Speaking and Listening
● SL.3.3 - Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

Mathematics
Mathematical Practices
● MP.2 - Reason abstractly and quantitatively.
● MP.5 - Use appropriate tools strategically.

Measurement and Data
● 3.MD.A.2 - Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

Social-Emotional Competencies

- **Self-Awareness**: ability to recognize one's emotions and know one's strengths and limitations
    - Connections:
        - Regular check-ins to share feelings (Oral, Thumbs Up, Thumbs Down, Emojis, etc.)
        - Reflecting on one's learning (Oral, Thumbs Up, Thumbs Down, Pictures, etc.)
        - Provide cool down spot in classroom

- **Self-Management**: ability to regulate and control one's emotions and behaviors, particularly in stressful situations
    - Connections:
        - Playing soft nature sounds - breathing, stretching
        - Draw a nature picture (i.e. animals in different habitats)

- **Social Awareness**: ability to take the perspective of others, demonstrate empathy, acknowledge and appreciate similarities and differences, and understand how one's actions influence and are influenced by others
    - Connections:

        - Animal charades games (One partner acts out animals and the other guesses what the animal is)
        - Providing positive comments on other students' STEAM activities

- **Relationship Skills**: refers to one's ability to demonstrate prosocial skills and behaviors in order to develop meaningful relationships and resolve interpersonal conflicts
    - Connections:
        - Class discussions
        - Incentives for individual students and small groups

- **Responsible Decision-Making**: refers to the ability to use multiple pieces of information to make ethical and responsible decisions
    - Connections:
        - Class rules and routines
        - Class discussions
        - Following directions

UNIT OBJECTIVES

Students will be able to …

- Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. (3-PS2-1)
  [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.]
  [Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.]

Disciplinary Ideas

- Understand that each force acts on one particular object and has both strength and a direction.
- Understand that 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.
- Understand that objects in contact exert forces on each other.

Science and Engineering Practices

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

Crosscutting Concepts

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

- Routinely identify cause and effect relationships and use them to explain change.

3-PS2-1

Concepts	Students Can...
• 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. • Objects in contact exert forces on each other.	• Identify cause-and-effect relationships. • Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. Examples could include: ○ An unbalanced force on one side of a ball can make it start moving. ○ Balanced forces pushing on a box from both sides • Use fair tests in which variables are controlled and the number of trials considered.

Students will be able to …

Students will be able to …

- Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. (3-PS2-2)
  [Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.]

  [Assessment Boundary: Assessment does not include technical terms such as period and frequency.]

  Disciplinary Core Ideas
  - Observe and measure the patterns of an object's motion in various situations; when that past motion exhibits a regular pattern, future motion can be predicted from it.

  Science and Engineering Practices
  - Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a scientific concept or test a design solution.

  Crosscutting Concepts
  - Recognize that patterns of change can be used to make predictions.

(3-PS2-2)

Concepts	Students Can...
• The patterns of an object's motion in	• Make predictions using patterns of

various situations can be observed and measured. ● When past motion exhibits a regular pattern, future motion can be predicted from it.	change ● Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. Examples of motion with a predictable pattern could include: ■ A child swinging in a swing. ■ A ball rolling back and forth in a bowl. ■ Two children on a seesaw

Students will be able to …

- Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. (3-PS2-3)

  [Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.]

  [Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.]

  Disciplinary Core Ideas
  - Understand that electric and magnetic forces between a pair of objects do not require that the objects be in contact.
  - Understand that 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.

  Science and Engineering Practices
  - Ask questions that can be investigated based on patterns such as cause and effect relationships.

  Crosscutting Concepts
  - Recognize that cause and effect relationships are routinely identified, tested, and used to explain change.

3-PS2-3

Concepts	Students Can...
● Electric and magnetic forces between	● Identify and test cause-and-effect

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. ● For forces between two magnets, the size of the force depends on their orientation relative to each other.	relationships in order to explain change. ● Ask questions to determine cause-and-effect relationships in electric or magnetic interactions between two objects not in contact with each other. Magnetic forces could include: ○ The force between two permanent magnets; ○ The force between an electromagnet and steel paperclips; ○ The force exerted by one magnet versus the force exerted by two magnets. Cause-and-effect relationships could include: ○ How the distance between objects affects the strength of the force ○ How the orientation of magnets affects the direction of the magnetic force.

Students will be able to …

Define a simple design problem that can be solved by applying scientific ideas about magnets.* (3-PS2-4)

* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea. See Appendix A, K-2 Engineering Design.

[Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.]

Disciplinary Core Ideas

- Understand that electric and magnetic forces between a pair of objects do not require that the objects be in contact.
- Understand that the sizes of the forces in each situation depend on the properties of the objects and their distances apart.
- For forces between two magnets, on their orientation relative to each other.

Science and Engineering Practices

- Define a simple problem that can be solved through the development of a new or improved object or tool.

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Crosscutting Concepts
- N/A

3-PS2-4

Concepts	Students Can...
• 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. • For forces between two magnets, the size of the force depends on their orientation relative to each other. • A situation that people want to change or create can be approached as a problem to be solved through engineering.	• Define a simple design problem that can be solved by applying scientific ideas about magnets Examples include: ▪ Constructing a latch to keep a door shut ▪ Creating a device to keep two moving objects from touching each other.

SUGGESTED ACTIVITIES

- Investigating The Magnetic Force Field: Calculating the magnetic pull of a magnet by varying distances. http://serc.carleton.edu/sp/mnstep/activities/26850.html

- Experimenting with Force and Motion Using Origami Frogs - Students measure the jumping abilities of origami frogs
  https://ngss.nsta.org/Resource.aspx?ResourceID=696

- Pendulums and Crooked Swings: students begin with a formative assessment probe that helps the teacher discover the students' prior knowledge of how pendulums work. Then the class reads a story from from *Yet More Everyday Science Mysteries* by Richard Konicek-Moran about an uneven swing, and do an investigation into what affects the number of swings a pendulum makes in a given time.
  http://www.oradellschool.org/osnj/_zumu_user_doc_cache/Pendulums_and_Crooked_Swings.pdf

- Replaced Robo Arm - students design and build a robotic arm.
  https://www.instructables.com/Robotic-Hand-Science-Project/

- New Jersey Center for Teaching and Learning: 3rd Grade Science Course
  https://njctl.org/courses/science/3rd-grade-science/
    - Motion and Stability Unit Labs:
        - Distance Time Speed Lab
        - Balanced and Unbalanced Forces Lab
        - Magnetic Interactions Lab
        - Predicting Motion Lab

Unit Specific Vocabulary
attract: objects that attract each other exert a pull without having to touch **balanced forces**: balanced forces cancel each other out and do not cause an object to move **force:** a push or a pull **magnet:** a material that is able to push or pull certain kinds of metal without contact **magnetic force:** the push or pull that magnets exert **net force:** all the forces acting upon an object add up to the net force **regular motion:** a motion that repeats in a pattern

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

pole: the places on a magnet where its pull or push is the strongest
repel: objects that repel each other exert a push without touching
static electricity: an electric charge that builds up in a material
unbalanced forces: unbalanced forces on an object cause the object to move

Instructional Materials and Learning Activities

Core Instructional Materials:

- *National Geographic Exploring Science 3*
- *National Geographic My NG connect Exploring Science 3 Digital Resources*
- *National Geographic Exploring Science through Literacy and leveled readers*
- *Hand2Mind Exploring Science Hands on Kit*

Digital Resources:

- Access the Next Generation Science Standards by Topic - The NGSS Standards
- https://phet.colorado.edu - online simulations
- STEM Resource Finder - online simulations (some require Java)
- Classroom Resources - NGSS Hub - lesson ideas
- Next Generation Science Standards - lesson ideas
- www.njctl.org - a complete science curriculum to download for free
- https://www.generationgenius.com/

Supplemental Materials:

- Science Tech Book *:*

Leveled Readers:

Level Reader	Below-Level	On-Level	Above-Level
Roller Coasters	570L	710L	860L
Hidden Discoveries	530L	650L	790L

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Suggested Modifications

These strategies can be adapted to scaffold for students needing more support or extending the learning for higher level students. Differentiation is accomplished through content, process, product, and learning environment.

NGSS Appendix D - "All Standards, All Students": Making the Next Generation Science Standards Accessible to All Students

Special Education Students
● Have pairs of students use the terms *force, motion, pull*, and *predict* to describe Cynthia Emerick's career and the science involved in it. ● Provide sentence frames and sentence stems to help students explain their understanding of forces and motion ● Preview vocabulary ● Use of picture dictionaries and visual aids ● Use of word banks ● Color coding important vocabulary ● Directions given in smaller chunks ● Leveled texts (L-P) ● Online RazKids leveled texts (dictation features) ● Multisensory instruction ● Peer models ● Use of FM system to improve attention and support auditory informations ● Extended time for assignments ● Prompting ● Preferential seating ● Check for understanding ● Behavior chart to increase work completion ● Modified assessments: Chunked, use of word banks, fewer answer choices, highlighted materials emphasizing concepts.
Students at Risk
● Have pairs of students use the terms *force, motion, pull*, and *predict* to describe Cynthia Emerick's career and the science involved in it. ● Provide sentence frames and sentence stems to help students explain their understanding of forces and motion ● Preview vocabulary ● Use of picture dictionaries ● Use of word banks ● Guide students to use text features to make sense of content knowledge ● Color coding important vocabulary ● Directions given in smaller chunks ● Use of FM system to improve attention and support auditory information

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

- Sensory breaks with timers
- Graphic organizers and outlines provided
- Study guides provided
- Small group instruction

Multilingual Learners

- Have pairs of students use the terms *force, motion, pull*, and *predict* to describe Cynthia Emerick's career and the science involved in it.
- Provide sentence frames and sentence stems to help students explain their understanding of forces and motion
- Pre-teaching of vocabulary by ESL teacher
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks
- Color coding important vocabulary
- Directions given in smaller chunks
- English language supports for parents of non English speaking students, (Teacher created dictionary with Force and Motion terms, pictures, and labels in English and student's first language)
- Visual clues (pictures)
- Repeated directions in small, distinct steps
- Check often for understanding and review
- Ask pointed questions in class discussion after cueing them beforehand Peer models
- Students may employ the use of Google Translator on laptops and ipads
- Fewer answer choices on assessments

Gifted and Talented

- Have partners prepare a mock interview with a roller coaster designer. Have one partner play the role of the reporter and the other partner play the designer. Have partners perform their interviews for the class.
- Advanced STEAM activities
- Create your own brochure of a topic related to forces and motion concepts learned in the unit
- Higher order thinking and questioning about information related to physical science concepts

Students with 504 Plans

- Have pairs of students use the terms *force, motion, pull*, and *predict* to describe Cynthia Emerick's career and the science involved in it.
- Provide sentence frames and sentence stems to help students explain their understanding of forces and motion
- Preview vocabulary
- Use of picture dictionaries
- Use of word banks
- Color coding important vocabulary

- Directions given in smaller chunks
- Extended time for assignments
- Prompting
- Reassurance and time to formulate ideas
- Preferential seating
- Repeated directions
- Check for understanding
- Ask pointed questions
- Frequent breaks during lesson
- Behavior chart to increase focus and work completion
- Use of FM system to improve attention and support auditory information
- Sensory breaks with timers
- Modified assessments: Chunked, use of word banks, fewer answer choices, highlighted materials emphasizing concepts.

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Appendix A
3-5 Engineering Design Standards

Students who demonstrate understanding can:
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

- 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. (3-5-ETS1-1)

ETS1.B: Developing Possible Solutions

- 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. (3-5-ETS1-2)
- At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)
- Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3)

ETS1.C: Optimizing the Design Solution

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

Science and Engineering Practices

Asking Questions and Defining Problems

OPS BOE Born on Date: July 2017
Revised on: July 2022
Annual Revision: OPS BOE September 2023

Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1) Planning and Carrying Out Investigations

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2)

Influence of Science, Engineering, and Technology on Society and the Natural World

People's needs and wants change over time, as do their demands for new and improved technologies. (3- 5-ETS1-1)

- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)