

**Bi-Borough Science Curriculum  
Grade Three**

**Developed 2017**

In Accordance with New Jersey Student Learning  
Standards for Science

**Oradell Public School District  
River Edge Public School District**

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## **BI-BOROUGH SCIENCE CURRICULUM - GRADE THREE**

### **UNIT ONE -**

#### **Earth and Space Systems- Weather and Climate**

*(Estimated months- September, October)*

### **INTRODUCTION OF UNIT:**

*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

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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.

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.

# **NEW JERSEY STUDENT LEARNING STANDARDS**

## **Science**

### **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 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.)

### **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)

## **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)

## **Connections to Nature of Science**

### **Science is a Human Endeavor**

- Science affects everyday life. (3-ESS3-1)

## **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)

## **NEW JERSEY STUDENT LEARNING STANDARDS**

### **Connections to:**

#### **Technology** <http://www.state.nj.us/education/cccs/2014/tech/>

- **8.1** Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge
- **8.2** Technology Education, Engineering, Design, and Computational Thinking

-  
Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

**ELA** <http://www.nj.gov/education/cccs/2016/ela/>

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.
- **SL.3.6** Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

**Mathematics** <http://www.nj.gov/education/aps/cccs/math/>

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.

## **21st Century Life and Careers**

<http://www.state.nj.us/education/cccs/2014/career/9.pdf>

- **9.2.4.A.3** Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes
- **9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
- **9.3.12.AC-DES.2** Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.
- **9.3.12.ED.1** Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

## **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 UNDERSTANDINGS**

- 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?

## **ASSESSMENT**

- Teacher-created formative assessments
  - Cumulative projects / Project-based assessment
  - Data collection (charts/graphs/tables)
  - Graphical Displays (pictographs, bar graphs)

- Teacher observations, conferences
- Hands-on lab experiences

## 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...
<ul style="list-style-type: none"> <li>• People record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.</li> <li>• Patterns of change can be used to make predictions.</li> </ul>	<ul style="list-style-type: none"> <li>• Identify patterns of weather.</li> <li>• Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. Examples of data could include:               <ul style="list-style-type: none"> <li>• Average temperature</li> <li>• Precipitation</li> <li>• Wind direction</li> </ul> </li> <li>• Make predictions using patterns of change.</li> </ul>

**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...
<ul style="list-style-type: none"><li>● Climate describes a range of typical weather conditions and how they vary over years in a particular area.</li><li>● Patterns of change can be used to make predictions.</li></ul>	<ul style="list-style-type: none"><li>● Understand that climate describes a range of typical weather conditions.</li><li>● Obtain and combine information from books and other reliable media to explain climate in various regions of the world.</li><li>● Make predictions using patterns of change.</li></ul>

**Students will be able to ...**

- Make a claim about the merit of a design solution that reduces the impacts of 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.]*

**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.

**3-ESS3-1**

Concepts	Students Can...
<ul style="list-style-type: none"> <li>● Science affects everyday life.</li> <li>● People’s needs and wants lead to improved technology.</li> <li>● A variety of natural hazards result from natural earth processes (e.g., flooding, fast wind, or lightning).</li> <li>● Humans can take steps to reduce impacts of natural hazards.</li> <li>● The success of a designed solution must consider the desired features (criteria).</li> <li>● Cause-and-effect relationships explain change.</li> </ul>	<ul style="list-style-type: none"> <li>● Make a claim about a solution to a problem by citing evidence.</li> </ul> <p>Examples of design solutions to weather related hazards could include:</p> <ul style="list-style-type: none"> <li>○ Barriers to prevent flooding</li> <li>○ Wind-resistant roofs</li> </ul> <ul style="list-style-type: none"> <li>● Understand that cause-and-effect relationships explain change.</li> </ul>

## 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://sites.google.com/site/bsscsciencetreasures/weather-1/lesson-plans/hurricanes-causes-and-effects--3rd-grade>
- 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?
- Lesson ideas  
<https://njctl.org/courses/science/3rd-grade-science/weather-climate/> -
- [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.

## UNIT 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

**climate** - an area's typical weather over a long period of time

**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

**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

**natural hazard** - an extreme event that causes harm to humans, including avalanche, drought, earthquake, flooding, hurricane, tornado, tsunami, volcanic eruption, and wildfire.

**pattern** - repeated design or recurring sequence

**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

## RESOURCES

### Supplies:

*Exploring Science*, National Geographic

### Trade books:

National Geographic: Everything Weather

The Cloud Book - Tomie dePaola

Flash, Crash, Rumble & Roll - Franklyn Branley

Oh Say Can You Say What's The Weather Today - Tish Rabe

Man Who Named the Clouds - Julie Hanna

Twister on Tuesday - Magic Tree House

Inside a Hurricane - Joanna Cole

Hurricanes - Gail Gibbons

Cloudy With a Chance of Meatballs - Judi Barrett

The Wind Blew - Pat Hutchins

### Websites:

<http://ngss.nsta.org/AccessStandardsByTopic.aspx> - The NGSS Standards

[www.discoveryeducation.com](http://www.discoveryeducation.com) - videos and lesson ideas

<http://www.weatherwizkids.com/weather-wind.htm>

<https://fromoniontopearl.files.wordpress.com/2015/02/world-climate-regions.jpg>- color coded map that breaks the world into 4 different regions

[www.opened.com](http://www.opened.com) - background information for teachers and lesson ideas

<http://learningcenter.nsta.org/> - background information for teachers and lesson ideas

<http://ngss.nsta.org/Classroom-Resources.aspx> - lesson ideas

<http://ngss.nsta.org/DisplayStandard.aspx?view=topic&id=6> - lesson ideas

<http://sciencespot.net/Pages/refdeskNextGen.html> - lesson ideas

<http://learning-in-action.williams.edu/opportunities/elementary-outreach/science-lessons/3rd-grade-weather-unit/> - lesson ideas

[www.njctl.org](http://www.njctl.org) - a complete science curriculum to download for free

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## MODIFICATIONS

- Structure lessons around questions that are authentic, related to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles  
[http://www.cast.org/our-work/about-udl.html#.VXmoXcfD\\_UA](http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)
- See NGSS Appendix D  
<http://www.nextgenscience.org/sites/ngss/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf>

## **BI-BOROUGH SCIENCE CURRICULUM - GRADE THREE**

### **UNIT TWO -**

#### **Physical Science-** Forces and Interactions

*(Estimated months- November, December, January)*

### **INTRODUCTION OF UNIT:**

*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.

## **NEW JERSEY STUDENT LEARNING STANDARDS**

### **Science**

#### **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)

## **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)

## **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)

## **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)

## **NEW JERSEY STUDENT LEARNING STANDARDS**

### **Connections to:**

#### **Technology** <http://www.state.nj.us/education/cccs/2014/tech/>

- **8.1** Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge
- **8.2** Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

#### **ELA** <http://www.nj.gov/education/cccs/2016/ela/>

##### Reading Standards for Science and Technical Subjects

- **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- Literacy in History/SS, Science and Technical Subjects

- **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** <http://www.nj.gov/education/aps/cccs/math/>

#### 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.

### **21st Century Life and Careers**

<http://www.state.nj.us/education/cccs/2014/career/9.pdf>

- **9.2.4.A.3** Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes
- **9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
- **9.3.12.AC-DES.2** Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.
- **9.3.12.ED.1** Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

## **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 UNDERSTANDINGS**

- 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?

## **ASSESSMENT**

- Teacher-created formative assessments, such as:
  - Cumulative projects / Project-based assessment
  - Data collection (charts/graphs/tables)
  - Graphical Displays (pictographs, bar graphs)
- Teacher observations, conferences
- Hands-on lab experiences

## 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

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

### 3-PS2-1

Concepts	Students Can...
<ul style="list-style-type: none"> <li>● Each force acts on one particular object and has both strength and a direction.</li> <li>● An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object.</li> <li>● Forces that do not sum to zero can cause changes in the object's speed or direction of motion.</li> </ul>	<ul style="list-style-type: none"> <li>● Identify cause-and-effect relationships.</li> <li>● 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:               <ul style="list-style-type: none"> <li>○ An unbalanced force on one side of a ball can make it start moving.</li> <li>○ Balanced forces pushing on a box from both sides</li> </ul> </li> <li>● Use fair tests in which variables are</li> </ul>

<ul style="list-style-type: none"> <li>• Objects in contact exert forces on each other.</li> </ul>	<p>controlled and the number of trials considered.</p>
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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...
<ul style="list-style-type: none"> <li>• The patterns of an object’s motion in various situations can be observed and measured.</li> <li>• When past motion exhibits a regular pattern, future motion can be predicted from it.</li> </ul>	<ul style="list-style-type: none"> <li>• Make predictions using patterns of change</li> <li>• 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: <ul style="list-style-type: none"> <li>■ A child swinging in a swing.</li> <li>■ A ball rolling back and forth in a bowl.</li> <li>■ Two children on a seesaw</li> </ul> </li> </ul>

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...
<ul style="list-style-type: none"><li>● Electric and magnetic forces between a pair of objects do not require that the objects be in contact.</li><li>● The sizes of the forces in each situation depend on the properties of the objects and their distances apart.</li><li>● For forces between two magnets, the size of the force depends on their orientation relative to each other.</li></ul>	<ul style="list-style-type: none"><li>● Identify and test cause-and-effect relationships in order to explain change.</li><li>● 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:<ul style="list-style-type: none"><li>○ The force between two permanent magnets;</li><li>○ The force between an electromagnet and steel paperclips;</li><li>○ The force exerted by one magnet versus the force exerted by two magnets.</li></ul>Cause-and-effect relationships could include:<ul style="list-style-type: none"><li>○ How the distance between objects affects the strength of the force</li><li>○ How the orientation of magnets affects the direction of the magnetic force.</li></ul></li></ul>

**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.

**Crosscutting Concepts**

- N/A

**3-PS2-4**

Concepts	Students Can...
<ul style="list-style-type: none"> <li>● Electric and magnetic forces between a pair of objects do not require that the objects be in contact</li> <li>● The sizes of the forces in each situation depend on the properties of the objects and their distances apart.</li> <li>● For forces between two magnets, the size of the force depends on</li> </ul>	<ul style="list-style-type: none"> <li>● Define a simple design problem that can be solved by applying scientific ideas about magnets Examples include:               <ul style="list-style-type: none"> <li>■ Constructing a latch to keep a door shut</li> <li>■ Creating a device to keep two moving objects from touching each other.</li> </ul> </li> </ul>

<p>their orientation relative to each other.</p> <ul style="list-style-type: none"> <li>● A situation that people want to change or create can be approached as a problem to be solved through engineering.</li> </ul>	
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## 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  
[http://stemsteamandfourseasonsforlearning.weebly.com/uploads/7/4/3/4/7434899/p67-78-activity\\_8.pdf](http://stemsteamandfourseasonsforlearning.weebly.com/uploads/7/4/3/4/7434899/p67-78-activity_8.pdf)
- 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](http://www.oradellschool.org/osnj/_zumu_user_doc_cache/Pendulums_and_Crooked_Swings.pdf)
- Robo Arm - students design and build a robotic arm out of cardboard  
[http://www-tc.pbskids.org/designsquad/pdf/parentseducators/DSN\\_NASA\\_MissionSolarSystem\\_RoboArm.pdf](http://www-tc.pbskids.org/designsquad/pdf/parentseducators/DSN_NASA_MissionSolarSystem_RoboArm.pdf)
- 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 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

**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

## RESOURCES

Supplies:

*Exploring Science*, National Geographic

Trade books:

Building Big, Written and illustrated by David Macaulay

Forces Make Things Move (Let's-Read-and-Find-Out Science 2) by Kimberly Brubaker Bradley

Roller Coaster by Marla Frazee

Give It a Push! Give It a Pull!: A Look at Forces by Jennifer Boothroyd

Magnets: Pulling Together, Pushing Apart by Natalie M. Rosinsky

What Makes a Magnet? (Let's-Read-and-Find-Out Science 2) by Franklyn M. Branley

Switch On, Switch Off (Let's-Read-and-Find-Out Science 2) by Melvin Berger

Websites:

<http://ngss.nsta.org/AccessStandardsByTopic.aspx> - The NGSS Standards

[www.discoveryeducation.com](http://www.discoveryeducation.com) - videos and lesson ideas

[www.opened.com](http://www.opened.com) - background information for teachers and lesson ideas

*Oradell and River Edge Public Schools*

*Bi-Borough Science Curriculum - Grade Three*

*OPS BOE Approved*

*RE BOE Approved (7/26/17)*

<https://phet.colorado.edu> - online simulations  
<https://concord.org/stem-resources> - online simulations (some require Java)  
<http://learningcenter.nsta.org/> - background information for teachers and lesson ideas  
<http://ngss.nsta.org/Classroom-Resources.aspx> - lesson ideas  
<http://sciencespot.net/Pages/refdeskNextGen.html> - lesson ideas  
[www.njctl.org](http://www.njctl.org) - a complete science curriculum to download for free

## MODIFICATIONS

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles  
[http://www.cast.org/our-work/about-udl.html#.VXmoXcfD\\_UA](http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)
- See NGSS Appendix D  
<http://www.nextgenscience.org/sites/ngss/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf>

## **BI-BOROUGH SCIENCE CURRICULUM - GRADE THREE**

### **UNIT THREE -**

*Life Science - Inheritance and Variance in Traits: Life Cycles and Traits  
(Estimated months- February, March)*

### **INTRODUCTION OF UNIT:**

*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 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, 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.

## **NEW JERSEY STUDENT LEARNING STANDARDS**

### **Science**

#### **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)

#### **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)

## **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)

## **Connections to Nature of Science**

### **Scientific Knowledge is Based on Empirical Evidence**

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

## **NEW JERSEY STUDENT LEARNING STANDARDS**

**Connections to:**

**Technology** <http://www.state.nj.us/education/cccs/2014/tech/>

- **8.1** Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge
- **8.2** Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

**ELA** <http://www.nj.gov/education/cccs/2016/ela/>

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

- **SL.3.3** aloud or information presented in diverse media and formats, including visually, quantitatively, and orally. 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**      <http://www.nj.gov/education/aps/cccs/math/>

Mathematical Practices

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

Number & Operations in Base Ten

- **3.NBT** Number and Operations in Base Ten

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.

**21st Century Life and Careers**

<http://www.state.nj.us/education/cccs/2014/career/9.pdf>

- **9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
- **9.3.12.AC-DES.2** Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.
- **9.3.12.AG-PL.2** Apply the principles of classification, plant anatomy and plant physiology to plant production and management.
- **9.3.12.ED.1** Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

## **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 UNDERSTANDINGS**

- 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?

## **ASSESSMENT**

- Teacher-created formative assessments, such as:
  - Cumulative projects
  - Data collection (charts/graphs/tables)
- Teacher observations, conferences
- Hands-on lab experiences

## 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...
<ul style="list-style-type: none"> <li>● Reproduction is essential to the continued existence of every kind of organism.</li> <li>● Plants and animals have unique and diverse life cycles.</li> <li>● Science findings are based on recognizing similarities and/or differences in patterns.</li> <li>● Patterns of change can be used to make predictions.</li> </ul>	<ul style="list-style-type: none"> <li>● Understand that reproduction is essential to the continued existence of organisms.</li> <li>● Develop models (visual representations) to describe diverse life cycles with common elements of birth, growth, reproduction, and death.</li> <li>● Make predictions using patterns of change.</li> </ul>

**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...
<ul style="list-style-type: none"> <li>● Many characteristics of organisms are inherited from their parents.</li> <li>● Organisms vary in how they look and function because they have different inherited information.</li> <li>● Similarities and differences in patterns can be used to sort and</li> </ul>	<ul style="list-style-type: none"> <li>● Recognize the match of an offspring with its parent, based on inherent traits.</li> <li>● Develop a representation of an organism, based on inherited traits, with possible variations.</li> <li>● Analyze and interpret data to</li> </ul>

<p>classify inherited traits.</p>	<p>provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.</p> <ul style="list-style-type: none"> <li>Sort traits of organisms using similarities and differences.</li> </ul>
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**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...
<ul style="list-style-type: none"> <li>Characteristics, which can range from diet to learning, result from individuals' interaction with the environment.</li> <li>Many characteristics involve both inheritance and environment.</li> <li>Organisms and their habitat make</li> </ul>	<ul style="list-style-type: none"> <li>Describe how an organism's characteristics may change due to its habitat</li> <li>Use evidence to support the explanation that traits can be influenced by the environment.</li> <li>Understand that cause-and-effect</li> </ul>

<p>up a system in which the parts depend on each other.</p> <ul style="list-style-type: none"> <li>● Cause-and-effect relationships are routinely identified and used to explain physical changes of an organism due to environmental factors.</li> </ul>	<p>relationships can be used to explain physical changes of an organism due to environmental factors.</p>
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**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...
<ul style="list-style-type: none"> <li>● Differences in characteristics between individuals of the same species may provide advantages in surviving, finding mates, and reproducing.</li> <li>● For any particular environment, some kinds of organisms survive well, some survive less well, and</li> </ul>	<ul style="list-style-type: none"> <li>● Recognize characteristics which provide advantages in survival and reproduction.</li> <li>● 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.</li> </ul>

<p>some cannot survive at all.</p> <ul style="list-style-type: none"> <li>● Cause and effect relationships are routinely identified and used to explain change in traits to survive in a given environment</li> </ul>	<ul style="list-style-type: none"> <li>● Understand that a change in traits may help an organism survive in a given environment</li> </ul> <p>Examples may include:</p> <ul style="list-style-type: none"> <li>○ Animals that have better camouflage coloration than other animals may be more likely to survive)</li> <li>○ Plants that have larger thorns than other plants may be less likely to be eaten by predators.</li> </ul>
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## SUGGESTED ACTIVITIES

- [NJ Center for Teaching and Learning](https://njctl.org/courses/science/3rd-grade-science/inheritance-of-traits/)  
<https://njctl.org/courses/science/3rd-grade-science/inheritance-of-traits/> -  
Lab activities: Pothos Plant Lab  
Bearded Worm fly Activity  
Virtual Field Lab
- **Let's Hear it for Labybugs**  
[http://www.oradellschool.org/osnj/\\_zumu\\_user\\_doc\\_cache/Lets\\_Hear\\_it\\_for\\_Ladybugs.pdf](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**  
[http://www.oradellschool.org/osnj/\\_zumu\\_user\\_doc\\_cache/Animal\\_Detectives.pdf](http://www.oradellschool.org/osnj/_zumu_user_doc_cache/Animal_Detectives.pdf) - 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  
<https://concord.org/stem-resources/mystery-plant-adaptation> - 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?**

[http://www.oradellschool.org/osnj/\\_zumu\\_user\\_doc\\_cache/Does\\_it\\_Have\\_a\\_Life\\_Cycle.pdf](http://www.oradellschool.org/osnj/_zumu_user_doc_cache/Does_it_Have_a_Life_Cycle.pdf) - This formative assessment probe asks students to identify organisms that have a life cycle from a list of plants and animals.

## UNIT 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

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

## RESOURCES

Supplies:

*Oradell and River Edge Public Schools*  
*Bi-Borough Science Curriculum - Grade Three*  
*OPS BOE Approved*  
*RE BOE Approved (7/26/17)*

*Exploring Science*, National Geographic  
*More Picture-Perfect Science Lessons* by Karen Ansberry and Emily Morgan

**Trade books:**

[Animal Adaptations for Survival](#) (Life Science Library) by Elizabeth Rose

[Animal Camouflage](#) (True Books: Amazing Animals) by Vicky Franchino

[The Tiny Seed](#) by Eric Carle

[Oh Say Can You Seed?](#) by Bonnie Worth

[The Life Cycle of a Butterfly](#) by Bobbie Kalman

**Websites:**

<http://ngss.nsta.org/AccessStandardsByTopic.aspx> - The NGSS standards

[www.discoveryeducation.com](http://www.discoveryeducation.com) - videos and lesson ideas

[www.opened.com](http://www.opened.com) - background information for teachers and lesson ideas

<http://learningcenter.nsta.org/> - background information for teachers and lesson ideas

<http://ngss.nsta.org/Classroom-Resources.aspx> - lesson ideas

<http://sciencespot.net/Pages/refdeskNextGen.html> - lesson ideas

<https://njctl.org/courses/science/3rd-grade-science/> - lessons, activities, and labs

## **MODIFICATIONS**

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.

*Oradell and River Edge Public Schools*  
*Bi-Borough Science Curriculum - Grade Three*  
*OPS BOE Approved*  
*RE BOE Approved (7/26/17)*

- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles

[http://www.cast.org/our-work/about-udl.html#.VXmoXcfD\\_UA](http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

- See NGSS Appendix D

<http://www.nextgenscience.org/sites/ngss/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf>

## **BI-BOROUGH SCIENCE CURRICULUM - GRADE THREE**

### **UNIT FOUR -**

**Life Science** - Interdependent Relationships in Ecosystems

*(Estimated months- April, May, June)*

### **INTRODUCTION OF UNIT:**

*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 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 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.

## **NEW JERSEY STUDENT LEARNING STANDARDS**

### **Science**

#### **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)

#### **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)

## **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)

## **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)

## **NEW JERSEY STUDENT LEARNING STANDARDS**

**Technology** <http://www.state.nj.us/education/cccs/2014/tech/>

- **8.1** Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge
- **8.2** Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

**ELA** <http://www.nj.gov/education/cccs/2016/ela/>

Reading

- **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**      <http://www.nj.gov/education/aps/cccs/math/>

Mathematical Practices

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

Number & Operations in Base Ten

- **3.NBT** Number and Operations in Base Ten

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.

**21st Century Life and Careers**

<http://www.state.nj.us/education/cccs/2014/career/9.pdf>

- **9.2.4.A.4** Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
- **9.3.12.AC-DES.2** Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.
- **9.3.12.ED.1** Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

**BIG IDEA/COMMON THREAD**

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

**ENDURING UNDERSTANDINGS**

- 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?

## **ASSESSMENT**

- Teacher-created formative assessments, such as:
  - Cumulative projects
  - Data collection (charts/graphs/tables)
- Teacher observations, conferences
- Hands-on lab experiences

## 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...
<ul style="list-style-type: none"> <li>● Populations live in a variety of habitats, and change in those habitats affects the organisms living there.</li> <li>● 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, others move into the transformed environment, and some die.</li> </ul>	<ul style="list-style-type: none"> <li>● Explain that populations live in a variety of habitats, and change in those habitats affects the organisms living there.</li> <li>● 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. Examples of environmental changes could include changes in:               <ul style="list-style-type: none"> <li>○ Land characteristics</li> </ul> </li> </ul>

<ul style="list-style-type: none"> <li>● An ecosystem can be described as the living and nonliving things in a certain area and the ways they interact.</li> </ul>	<ul style="list-style-type: none"> <li>○ Water distribution</li> <li>○ Temperature</li> <li>○ Food</li> <li>○ Other organisms</li> <li>● Describe an ecosystem as the living and nonliving things in a certain area and the ways they interact.</li> </ul>
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**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...
<ul style="list-style-type: none"> <li>● Being part of a group helps animals obtain food, defend themselves, and cope with changes.</li> <li>● Groups may serve different functions and vary dramatically in size.</li> <li>● Organisms and their habitat make up a system in which the parts depend on each other.</li> </ul>	<ul style="list-style-type: none"> <li>● Explain that being part of a group can help animals obtain food, defend themselves, and cope with changes.</li> <li>● Explain the functions of various groups of organisms?</li> <li>● Construct an argument with evidence that being part of a group can help animals obtain food, defend themselves, and cope with</li> </ul>

	<p>changes.</p> <ul style="list-style-type: none"> <li>● Explain how organisms depend on each other and their habitat.</li> </ul>
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**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...
<ul style="list-style-type: none"> <li>● Some kinds of plants and animals that once lived on Earth are no longer found anywhere.</li> <li>● Fossils provide evidence about the types of organisms that lived long ago, and also about the nature of their environments.</li> <li>● Organisms and their environments can be observed over very short to very long periods of time.</li> </ul>	<ul style="list-style-type: none"> <li>● Explain that some kinds of plants and animals that once lived on Earth are no longer found anywhere.</li> <li>● Explain how fossils provide evidence about the types of organisms that lived long ago, and also about the nature of their environments.</li> <li>● 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               <ul style="list-style-type: none"> <li>○ Marine fossils found on dry land</li> <li>○ Tropical plant fossils found in Arctic areas</li> <li>○ Fossils of extinct organisms</li> </ul> </li> <li>● Observe organisms and</li> </ul>

	their environments over very short to very long periods of time.
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**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...
<ul style="list-style-type: none"> <li>● For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.</li> <li>● Cause-and-effect relationships are</li> </ul>	<ul style="list-style-type: none"> <li>● Explain for any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.</li> </ul>

<p>routinely identified and used to explain change.</p>	<ul style="list-style-type: none"> <li>● 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: <ul style="list-style-type: none"> <li>○ Needs of organisms</li> <li>○ Characteristics of organisms</li> <li>○ Habitats of organisms</li> </ul> </li> <li>● Identify cause-and-effect relationships between organisms and their environment.</li> </ul>
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## 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=IH4RbMbU74E>
- Experiment with Ecosystems  
<https://concord.org/stem-resources/experiment-ecosystems>
- Hands-on Activity: Biodomes Engineering Design Project  
[https://www.teachengineering.org/activities/view/cub\\_bio\\_lesson02\\_activity1](https://www.teachengineering.org/activities/view/cub_bio_lesson02_activity1)
- Bottle Biology Terrarium  
[http://media.wfyi.org/IndianaExpeditions/IDEXSeason2\\_2009/IDEX201/IDEX201BottleBiologyTerrariumL.pdf](http://media.wfyi.org/IndianaExpeditions/IDEXSeason2_2009/IDEX201/IDEX201BottleBiologyTerrariumL.pdf)
- 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 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.
- [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 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

## RESOURCES

### Supplies:

*Exploring Science*, National Geographic

*More Picture-Perfect Science Lessons* by Karen Ansberry and Emily Morgan

### Trade books:

Insects That Work Together (The World of Insects) by Molly Aloian

A Walk in the Desert (Biomes of North America) by Rebecca L. Johnson

A Walk in the Desert (Biomes of North America) by Rebecca L. Johnson

A Walk in the Rain Forest (Biomes of North America) by Rebecca L. Johnson

A Walk in the Prairie (Biomes of North America) by Rebecca L. Johnson

A Walk in the Tundra (Biomes of North America) by Rebecca L. Johnson

A Walk in the Boreal (Biomes of North America) by Rebecca L. Johnson

A Journey into the Ocean (Biomes of North America) by Rebecca L. Johnson

Journey into an Estuary (Biomes of North America) by Rebecca L. Johnson

### Websites:

<http://ngss.nsta.org/AccessStandardsByTopic.aspx> - The NGSS Standards

[www.discoveryeducation.com](http://www.discoveryeducation.com) - videos and lesson ideas

[www.opened.com](http://www.opened.com) - background information for teachers and lesson ideas

*Oradell and River Edge Public Schools*

*Bi-Borough Science Curriculum - Grade Three*

*OPS BOE Approved*

*RE BOE Approved (7/26/17)*

<http://learningcenter.nsta.org/> - background information for teachers and lesson ideas  
<http://ngss.nsta.org/Classroom-Resources.aspx> - lesson ideas  
<http://sciencespot.net/Pages/refdeskNextGen.html> - lesson ideas  
[www.njctl.org](http://www.njctl.org) - a complete science curriculum to download for free

## **MODIFICATIONS**

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.

- Restructure lesson using UDL principles  
[http://www.cast.org/our-work/about-udl.html#.VXmoXcfD\\_UA](http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)
- See NGSS Appendix D  
<http://www.nextgenscience.org/sites/ngss/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf>

## 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**

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)