Commercial Township School District

Content Area: Science

Grade: 3

Unit: 1 Weather and Climate

Instructional Days: 15

Unit Summary
What is the typical weather near our home? How can we protect people from weather-related hazards? In this unit of study, students organize and use data to describe typical weather conditions expected during a particular season. By applying their understanding of weather-related hazards, students are able to make a claim about the merit of a design solution that reduces the impacts of such hazards. The crosscutting concepts of patterns, cause and effect, and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in asking questions and defining problems, analyzing and interpreting data, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 3-ESS2-1, 3-ESS2-2, 3-ESS3-1, and 3-5-ETS1-1.
Student Learning Objectives
Develop a model using an analogy, to describe how weather and climate are related. (ESS2.D)
Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. [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.] (3-ESS2-1)
Obtain and combine information to describe climates in different regions of the world. (3-ESS2-2)
Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. [Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.] (3-ESS3-1)

Unit Sequence	
Part A: Can we predict the kind of weather that we will see in the spring, summer, autumn, or winter?	
Concepts	**Formative Assessment**
• Patterns of change can be used to make predictions. • 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.	*Students who understand the concepts are able to:* • Make predictions using patterns of change. • Represent data in tables, bar graphs, and pictographs to reveal patterns that indicate relationships. • Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. (Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.) Examples of data could include: Average temperature Precipitation Wind direction

Unit Resources	District/School Summative Assessments
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. 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 www.betterlesson.com	https://mysteryscience.com/print/preview/g/1K2qATfB_oJ158uK2WdT3KMkkes_UP1VvIX5qwLqQ4Ss/document

Unit Sequence	
Part B: How can climates in different regions of the world be described?	
Concepts	**Formative Assessment**
• Patterns of change can be used to make predictions. • Climate describes the range of an area's typical weather conditions and the extent to which those conditions vary over years.	*Students who understand the concepts are able to:* • Make predictions using patterns of change. • Obtain and combine information from books and other reliable media to explain phenomena.
Unit Resources	**District/School Summative Assessments**
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. 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 www.betterlesson.com	https://mysteryscience.com/print/preview/g/1K2qATfB_oJ158uK2WdT3KMkkes_UP1VvIX5qwLqQ4Ss/document

Unit Sequence

Part B: How can we protect people from natural hazards such as flooding, fast wind, or lightning?

Concepts	Formative Assessment
• Cause-and-effect relationships are routinely identified, tested, and used to explain change. • Science affects everyday life. • People's needs and wants change over time, as do their demands for new and improved technologies. • A variety of natural hazards result from natural processes (e.g., flooding, fast wind, or lightning). • Humans cannot eliminate natural hazards but can take steps to reduce their impacts. • Engineers improve 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). • 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 criteria for success or how well each takes the constraints into account.	*Students who understand the concepts are able to:* • Identify and test cause-and-effect relationships to explain change. • 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. • Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. Examples of design solutions to weather related hazards could include: Barriers to prevent flooding Wind-resistant roofs Lightning rods • Define a simple design problem that can be solved through the development of an object, tool, process, or system and include several criteria for success and constraints on materials, time, or cost. • Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
Unit Resources	**District/School Summative Assessments**
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. 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 www.betterlesson.com	https://mysteryscience.com/print/preview/g/1K2qATfB_oJ158uK2WdT3KMkkes_UP1VvIX5qwLqQ4Ss/document

Interdisciplinary Connections

English Language Arts/Literacy

As students engage in the science described in this unit of study, they use books and other reliable media resources to collect weather and climate information for a given region. They compare information found in two different texts and use information to answer questions about weather and climate. To integrate writing, students can take brief notes as they conduct research and sort evidence into provided categories. Opinion pieces and short research projects should be included to build knowledge about weather and climate.

Mathematics

Like literacy, mathematics is integrated in a variety of ways. Students use appropriate tools and units of measure when collecting and recording weather and climate data. They model with mathematics when organizing data into scaled bar graphs, pictographs, and tables. Throughout the unit, students reason abstractly and quantitatively as they analyze and compare weather data. They will use that information to answer questions and solve multistep problems.

Future Learning

Grade 4 Unit 1: Weathering and Erosion

• Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.

Grade 4 Unit 5: Transfer of Energy

• A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.

Grade 4 Unit 7: Using Engineering Design with Force and Motion Systems

• 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. (secondary)

Grade 5 Unit 5: Earth Systems

• Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.

Prior Learning

Kindergarten Unit 3: Weather

• Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time.

• Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events.

• Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary)

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.

21st Century Themes and Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy, Civic Literacy, Environmental Literacy, Health Literacy Creativity & Innovation, Communication & Collaboration, Media Literacy, Critical Thinking & Problem Solving, Information Literacy, Information, Communication, & Technology, Life & Career Skills

Commercial Township School District

Content Area: Science

Grade: 3

Unit: 2 Forces and Motion

Instructional Days: 20

Unit Summary
How do equal and unequal forces on an object affect the object? In this unit of study, students are able to determine the effects of balanced and unbalanced forces on the motion of an object. The crosscutting concepts of patterns and cause and effect are identified as organizing concepts for these disciplinary core ideas. In the third-grade performance expectations, students are expected to demonstrate grade-appropriate proficiency by planning and carrying out investigations. Students are expected to use these practices to demonstrate understanding of the core ideas.
Student Learning Objectives
Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. [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.] (3-PS2-1)
Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. [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.] (3-PS2-2)

Unit Sequence	
Part A: How do scientists play soccer?	
Concepts	**Formative Assessment**
• Science investigations use a variety of methods, tools, and techniques. • Cause-and-effect relationships are routinely identified. • Objects in contact exert forces on each other. • Each force that acts on a particular object has both strength and a direction. • An object at rest typically has multiple forces acting on it, but they add to 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. (Qualitative and conceptual, but not quantitative, addition of forces are used at this level.)	*Students who understand the concepts are able to:* • Identify cause-and-effect relationships. • Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence. • Use fair tests in which variables are controlled and the number of trials considered. • Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. (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 also limited to gravity being addressed as a force that pulls objects down.) Examples could include: An unbalanced force on one side of a ball can make it start moving. Balanced forces pushing on a box from both sides
Unit Resources	**District/School Summative Assessments**
Puffing Forces: Students will predict and observe what happens when a force is applied to an object, and compare the relative effects of a force of the same strength on objects of different weights by using a straw to gently puff air at a ping pong ball then a golf ball and measuring the distance the ball travels with a ruler. Students will repeat this procedure using a harder puff. This lesson was adapted from the Utah Education Network http://www.uen.org/Lessonplan/preview?LPid=14858 Robo Arm: This fun activity is one of five in a series of space based engineering challenges developed by NASA and Design Squad where students are engaged in implementing the Engineering Design process to build a robotic arm that can lift a cup off a table using cardboard strips, brass fasteners, paper clips, straw, string, tape and a cup. The activity includes an instructor's guide, questioning techniques, discussion questions,	Summative Assessment 1: Paper Airplane challenge

extension activity, a rubric, and 3 short video clips that enhance the purpose of the activity and its relevance to NASA. www.betterlesson.com	

Unit Sequence	
Part B: Can we use patterns that we observed to predict the future?	
Concepts	**Formative Assessment**
• Science findings are based on recognizing patterns. • Patterns of change can be used to make predictions. • The patterns of an object's motion in various situations can be observed and measured. • When past motion exhibits a regular pattern, future motion can be predicted from it. (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.)	*Students who understand the concepts are able to:* • Make predictions using patterns of change. • Make observations and/or measurements to produce data to serve as the basis of evidence for an explanation of a phenomenon. • Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. (Assessment does not include technical terms such as period and frequency.) Examples of motion with a predictable pattern could include: ● A child swinging in a swing. ● A ball rolling back and forth in a bowl. ● Two children on a seesaw.
Unit Resources	**District/School Summative Assessments**
Puffing Forces: Students will predict and observe what happens when a force is applied to an object, and compare the relative effects of a force of the same strength on objects of different weights by using a straw to gently puff air at a ping pong ball then a golf ball and measuring the distance the ball travels with a ruler. Students will repeat this procedure using a harder puff. This lesson was adapted from the Utah Education Network http://www.uen.org/Lessonplan/preview?LPid=14858 Robo Arm: This fun activity is one of five in a series of space based engineering challenges developed by NASA and Design Squad where students are engaged in implementing the Engineering Design process to build a robotic arm that can lift a cup off a table using cardboard strips, brass fasteners, paper clips, straw, string, tape and a cup. The activity includes an instructor's guide, questioning techniques, discussion questions, extension activity, a rubric, and 3 short video clips that enhance the purpose of the activity and its relevance to NASA.	Summative Assessment 1: Force and Motion Investigation

Interdisciplinary Connections
English Language Arts • In order to integrate the CCSS for ELA into this unit, students need opportunities to read content-specific texts to deepen their understanding of force and motion. As they read, teachers should pose questions such as, “What interactions can you identify between the objects in the text?” and “What patterns of motion are described in the text?” Students should be encouraged to answer questions and cite evidence from the text to support their thinking. • To further support the integration of the ELA standards, students can also conduct short research projects about simple force-and-motion systems and the interactions that occur among forces and objects within the systems. For example, students could be asked to conduct a short study by bouncing a ball 10 times and identifying the patterns they observe. Next students could predict, based on the patterns they saw, what would happen if they bounced the ball 10 more times. Students then could draw a model of the force and motion system, identifying the structures and forces that interact within the system. This would also give students the opportunity to develop note-taking skills and use multiple sources to collect information about force and motion. Mathematics • In order to integrate the Common Core State Standards for Mathematics, students can use measurement tools in a variety of ways to conduct investigations. Students could find the mass of an object in order to understand that the heavier something is, the greater the force needed to cause a change in its motion. Students could use rulers or tape measures to measure the distance an object moves. Student can then record and analyze their data to determine patterns of change and explain cause-and-effect relationships, while reasoning abstractly and quantitatively.

Future Learning
Grade 4 Unit 5: Energy Transfer • Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when water meets a beach. • Waves of the same type can differ in amplitude (height) and length (the spacing between wave peaks). Grade 5 Unit 6: Interactions Within the Earth, Sun and Moon System • The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center. Grade 6 Unit 4: Force and Motion • For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton’s third law). • The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, the object’s motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. • All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. • The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.

• This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short term but is tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.

• The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.

• Water continually cycles among land, ocean, and the atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.

• The complex patterns of the changes in the movement of water in the atmosphere are determined by winds, landforms, and ocean temperatures and currents; which are major determinants of local weather patterns.

• Global movements of water and its changes in form are propelled by sunlight and gravity.

• Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.

• Water's movements—both on land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.

Prior Learning

Kindergarten Unit 1: Pushes and Pulls
• Pushes and pulls can have different strengths and directions.
• Pushing or pulling on an object can change the speed or direction of the object's motion and can start or stop it.
• When objects touch or collide, they push on one another and can change motion.
• A bigger push or pull causes things speed up or slow down more quickly.

Grade 1 Unit 1: Patterns of Change in the Sky
• Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.

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.

21st Century Themes and Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy Environmental Literacy Health Literacy Creativity & Innovation Communication & Collaboration Media Literacy Critical Thinking & Problem Solving Information Literacy Information, Communication, & Technology Life & Career Skills

Commercial Township School District

Content Area: Science

Grade: 3

Unit: 3 Electrical and Magnetic Forces

Instructional Days: 15

Unit Summary
How can we use our understandings about magnets be used to solve problems? In this unit of study, students determine the effects of balanced and unbalanced forces on the motion of an object and the cause-and-effect relationships of electrical or magnetic interactions to define a simple design problem that can be solved with magnets. The crosscutting concept of cause and effect, and the interdependence of science, engineering, and technology, and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 3-PS2-3, 3-PS2-4, and 3-5-ETS1-1.
Student Learning Objectives
Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. [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.] (3-PS2-3)
Define a simple design problem that can be solved by applying scientific ideas about magnets.* [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.] (3-PS2-4)
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-ETS1-1)

Unit Sequence	
Part A: What are the relationships between electrical and magnetic forces?	
Concepts	**Formative Assessment**

• Cause-and-effect relationships are routinely identified, tested, and used to explain change. ntact. • 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	*Students who understand the concepts are able to:* • Identify and test cause-and-effect relationships in order to explain change. • Ask questions that can be investigated based on patterns such as cause-and effect relationships. • Ask questions to determine cause-and-effect relationships in electric or magnetic interactions between two objects not in contact with each other. (Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.) • Magnetic forces could include: ● The force between two permanent magnets; ● The force between an electromagnet and steel paper clips; ● The force exerted by one magnet versus the force exerted by two magnets. • Cause-and-effect relationships could include: ● How the distance between objects affects the strength of the force ● How the orientation of magnets affects the direction of the magnetic force.
Unit Resources	**District/School Summative Assessments**
Investigating the Magnetic Force Field: Calculating the Magnetic Pull of a Magnet by Varying Distances: Students will investigate the magnetic pull of a bar magnet at varying distances with the use of paper clips. Students will hypothesize, conduct the experiment, collect the data, and draw conclusions. As a class, students will then compare each team's data and their interpretation of the results. www.betterlesson.com	Summative Assessment 2: Magnet Engineering Design Challenge

Unit Sequence	
Part A: What are the relationships between electrical and magnetic forces?	
Concepts	**Formative Assessment**
• Cause-and-effect relationships are routinely identified, tested, and used to explain change. • 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	*Students who understand the concepts are able to:* • Identify and test cause-and-effect relationships in order to explain change. • Ask questions that can be investigated based on patterns such as cause-andeffect relationships. • Ask questions to determine cause-and-effect relationships in electric

	or magnetic interactions between two objects not in contact with each other. (Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.) • Magnetic forces could include: The force between two permanent magnets; The force between an electromagnet and steel paperclips; The force exerted by one magnet versus the force exerted by two magnets. • Cause-and-effect relationships could include: How the distance between objects affects the strength of the force How the orientation of magnets affects the direction of the magnetic force.
Unit Resources	**District/School Summative Assessments**
Investigating the Magnetic Force Field: Calculating the Magnetic Pull of a Magnet by Varying Distances: Students will investigate the magnetic pull of a bar magnet at varying distances with the use of paper clips. Students will hypothesize, conduct the experiment, collect the data, and draw conclusions. As a class, students will then compare each team's data and their interpretation of the results. www.betterlesson.com	Summative Assessment 2: Magnet Engineering Design Challenge

Unit Sequence	
Part B: How can we use our understandings about magnets be used to solve problems?	
Concepts	**Formative Assessment**
• Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. • People's needs and wants change over time, as do their demands for new and improved technologies. • Electric and magnetic forces between a pair of objects do not require that the objects be in contact. • The sizes of the forces in each situation depend on the properties of the objects and their distances apart. • For forces between two magnets, the size of the force depends on their orientation relative to each other. • 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).	*Students who understand the concepts are able to:* • Define a simple problem that can be solved through the development of a new or improved object or tool. • Define a simple design problem that can be solved by applying scientific ideas about magnets (e.g., constructing a latch to keep a door shut or creating a device to keep two moving objects from touching each other). • Define a simple design problem that can be solved through the development of an object, tool, process, or system, and include several criteria for success and constraints on material, time, or cost. • Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

• 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.	
Unit Resources	**District/School Summative Assessments**
Investigating the Magnetic Force Field: Calculating the Magnetic Pull of a Magnet by Varying Distances: Students will investigate the magnetic pull of a bar magnet at varying distances with the use of paper clips. Students will hypothesize, conduct the experiment, collect the data, and draw conclusions. As a class, students will then compare each team's data and their interpretation of the results. www.betterlesson.com	Summative Assessment 2: Magnet Engineering Design Challenge

Interdisciplinary Connections
English Language Arts Students should be given opportunities to conduct short research projects that build knowledge about electric and magnetic forces. They should be given multiple opportunities to recall and gather information from their investigations as well as from print and digital sources. Students should use that information to answer questions, describe cause-and-effect relationships, make comparisons, and explain interactions between objects when electrical or magnetic forces are involved. Teachers should provide a variety of texts for students to explore in order to develop students' note-taking skills. As students take notes, they should use graphic organizers, such as Venn diagrams and T-charts, to sort supporting evidence into provided categories. For example, as students read a variety of texts about forces, they can take notes and then sort the evidence they collect into categories, such as electrical and magnetic forces. Mathematics Students should use measurement tools in a variety of ways as they conduct investigations. They could find the mass of an object in order to understand that the more mass an object has, the greater the force needed to attract, repel, or move it. Students then reason mathematically as they analyze their data to determine patterns of change that can be used to support explanations of cause-and-effect relationships. Students might also use algebraic reasoning during investigations. For example, when measuring magnetic strength by increasing the number of magnets, students can use multiplication to make predictions about possible outcomes. So, if a paper clip moves toward a single magnet when it is 2 centimeters away, then students might predict that the paper clip will move toward a double magnet when it is 4 centimeters away. Or, if the paper clip moved towards a set of four magnets at a distance of 8 centimeters, then students might predict that the paper clip will move toward a single magnet when it is 2 centimeters away.

Future Learning
Grade 4 Unit 7: Using Engineering Design with Force and Motion Systems • 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. (secondary) Grade 6 Unit 5: Types of Interactions

• Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.

• Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.

• Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively).

Prior Learning

Kindergarten Unit 1: Pushes and Pulls
• Pushes and pulls can have different strengths and directions.
• Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.
• When objects touch or collide, they push on one another and can change motion.
• A bigger push or pull makes things speed up or slow down more quickly.
• A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (secondary)

Grade 1 Unit 1: Patterns of Change in the Sky
• Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.

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.

21st Century Themes and Skills

Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy Environmental Literacy Health Literacy

Creativity & Innovation Communication & Collaboration Media Literacy Critical Thinking & Problem Solving Information Literacy Information, Communication, & Technology Life & Career Skills

Commercial Township School District

Content Area: Science

Grade: 3

Unit: 4 Traits

Instructional Days: 15

Unit Summary
What kinds of traits are passed on from parent to offspring? What environmental factors might influence the traits of a specific organism? In this unit of study, students acquire an understanding that organisms have different inherited traits and that the environment can also affect the traits that an organism develops. The crosscutting concepts of patterns and cause and effect are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in analyzing and interpreting data, constructing explanations, and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 3-LS3-1 and 3-LS3-2.
Student Learning Objectives
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. [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.] (3-LS3-1)
Use evidence to support the explanation that traits can be influenced by the environment. [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.] (3-LS3-2)

Unit Sequence	
Part A: What kinds of traits are passed on from parent to offspring?	
Concepts	**Formative Assessment**
• Similarities and differences in patterns can be used to sort and classify natural phenomena (e.g., inherited traits that occur naturally). • Many characteristics of organisms are inherited from their parents. • Different organisms vary in how they look and function because they have different inherited information.	*Students who understand the concepts are able to:* • Sort and classify natural phenomena using similarities and differences. (Clarification: Patterns are the similarities and differences in traits shared between offspring and their parents or among siblings, with an emphasis on organisms other than humans). • Analyze and interpret data to make sense of phenomena using logical reasoning. • 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. (Assessment does not include genetic mechanisms of inheritance and prediction of traits, and is limited to nonhumans.)
Unit Resources	**District/School Summative Assessments**

Guppies Galore: Groups of students set up a small freshwater aquarium (made from gallon jars) that feature a male guppy, a female guppy, and a green plant. After the female guppy goes through her pregnancy and gives birth, the students will then observe, over time, the development of the fry into male and female guppies with characteristics similar to the parents www.betterlesson.com	Summative Assessment 1: Mystery Science End of Unit Assessment

Unit Sequence	
Part B: What environmental factors might influence the traits of a specific organism?	
Concepts	**Formative Assessment**
• Cause-and-effect relationships are routinely identified and used to explain change. • Other characteristics, which can range from diet to learning, result from individuals' interaction with the environment. • Many characteristics involve both inheritance and environment. • The environment also affects the traits that an organism develops	*Students who understand the concepts are able to:* • Identify cause-and-effect relationships in order to explain change. • Use evidence (e.g., observations, patterns) to support an explanation. • Use evidence to support the explanation that traits can be influenced by the environment. Examples of the environment's affect on traits could include: ● Normally tall plants that grow with insufficient water are stunted. ● A pet dog that is given too much food and little exercise may become overweight.
Unit Resources	**District/School Summative Assessments**
Guppies Galore: Groups of students set up a small freshwater aquarium (made from gallon jars) that feature a male guppy, a female guppy, and a green plant. After the female guppy goes through her pregnancy and gives birth, the students will then observe, over time, the development of the fry into male and female guppies with characteristics similar to the parents www.betterlesson.com	Summative Assessment 1: Mystery Science End of Unit Assessment

Interdisciplinary Connections
English Language Arts In order to integrate the CCSS for English language arts, students will need opportunities to read about inherited traits of animals and plants in a variety of texts and resources. During discussions, teachers might pose questions such as "What kinds of traits are passed on from parent to offspring?" or "What environmental factors might influence the traits of a specific organism?" Students should be able to refer specifically to the text when answering questions, articulate the main idea, and describe the key ideas using supporting details in their explanations. Additionally, they should describe the relationship between scientific ideas or concepts, using language that pertains to time, sequence, and cause and effect. During this unit, students also need opportunities to write informative/explanatory texts to convey

ideas and information gathered through investigations and from other resources. For example, after reading texts about a given organism, students should be expected to use key details and appropriate facts about that organism to compose an informative piece of writing. This piece should list some of the organism's traits that were passed on from its parents, describe how those traits enable the organism to interact in its environment to meet its needs, and describe any influence the environment has on the organism's traits. Students should also have the opportunity to report orally on a given topic related to traits and the way they are influenced by the environment. They should share relevant facts, details, and information while speaking clearly and at an understandable pace.

Mathematics

This unit also has connections to the CCSS for mathematics. Students can use rulers to measure the growth of organisms, then generate and plot the data they collected on line plots, making sure the horizontal scale is marked off in appropriate units (whole numbers, halves, or quarters). For example, students might chart out data in line plots to document the growth (over time) of each of a number of plants grown from a single parent. As students analyze their data, they will observe that the offspring are not the same exact height as each other or as the parent, but that the height of all plants is very similar when the plants are grown under the same conditions. Students might also make similar line plots to compare the same type of plants grown with varying amounts of water or sunlight, then compare these data to the growth data of the parent plant. Analyzing this data will help students understand that environmental factors influence/affect the traits of organisms. As students collect, organize, and analyze their data, they have opportunities to reason abstractly and model with mathematics.

Future Learning

By the end of middle school, students will understand that:

• Animals engage in characteristic behaviors that increase the odds of reproduction.

• Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.

• Genetic factors as well as local conditions affect the growth of the adult plant.

• Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.

• Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affect the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.

• Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.

• In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.

• In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others are harmful, and some are neutral to the organism.

Prior Learning

By the end of Grade 1, students understand that:
• Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents.
• Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

Modifications
Modifications for not only special education students but for English Language learners, students at risk for school failure and gifted students. • 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.

21st Century Themes and Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy Environmental Literacy Health Literacy Creativity & Innovation Communication & Collaboration Media Literacy Critical Thinking & Problem Solving Information Literacy Information, Communication, & Technology Life & Career Skills

Commercial Township School District

Content Area: Science

Grade: 3

Unit: 5 Continuing the Cycle

Instructional Days: 10

Unit Summary
Do all living things have the same life cycle? Are there advantages to being different? In this unit of study, students develop an understanding of the similarities and differences in organisms' life cycles. In addition, students 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. The crosscutting concepts of patterns and cause and effect are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade appropriate proficiency in developing and using models and constructing explanations and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 3-LS1-1 and 3-LS4-2.
Student Learning Objectives

Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. [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.] (3-LS1-1)
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. [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.] (3-LS4-2)

Unit Sequence	
Part A: Do all living things have the same life cycle?	
Concepts	**Formative Assessment**
• Science findings are based on recognizing patterns. • Similarities and differences in patterns can be used to sort and classify natural phenomena. • Patterns of change can be used to make predictions. • Reproduction is essential to the continued existence of every kind of organism. • Plants and animals have unique and diverse life cycles.	*Students who understand the concepts are able to:* • Sort and organize (inherited traits) using similarities and differences in patterns. • Make predictions using patterns of change. • Develop models to describe phenomena. • Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. (I.e., Changes organisms go through during their life form a pattern.) (Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.)
Unit Resources	**District/School Summative Assessments**
Let's Hear It For Ladybugs! 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. Simply Butterflies! This article gives suggestions for building a simple walk-in classroom butterfly observatory and using the observatory to hatch out Painted Lady butterflies as part of a four-week unit on life cycle stages. www.betterlesson.com	Summative Assessment 1: Build an Animal

Unit Sequence

Part B: Are there advantages to being different?	
Concepts	**Formative Assessment**
• Cause-and-effect relationships are routinely identified and used to explain change. • Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.	*Students who understand the concepts are able to:* • Identify cause-and-effect relationships in order to explain change. • Use evidence (e.g., observations, patterns) to construct an explanation. • 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. Examples of cause and-effect relationships could include: ● Plants that have larger thorns than other plants may be less likely to be eaten by predators. ● Animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.
Unit Resources	**District/School Summative Assessments**
Let's Hear It For Ladybugs! 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. Simply Butterflies! This article gives suggestions for building a simple walk-in classroom butterfly observatory and using the observatory to hatch out Painted Lady butterflies as part of a four-week unit on life cycle stages. www.betterlesson.com	Summative Assessment 1: Animal Detectives

Interdisciplinary Connections
English Language Arts Students need opportunities to read about the life cycles and inherited traits of organisms in a variety of texts and resources. During discussions, teachers might pose questions such as ● What are the stages of an organism's life cycle? ● How do the life cycles of organisms compare? ● What makes an organism's life cycle unique? ● How do organisms use their characteristics to survive, find mates, and reproduce?

Students need access to a variety of books, pictures, and maps. They should be able to refer to these resources specifically when answering questions, articulating the main idea, and describing the key ideas using supporting details in their explanations. Additionally, they should describe the relationship between scientific ideas or concepts and using language that pertains to time, sequence, and cause and effect. Students also need opportunities to write informative/explanatory texts to convey ideas and information gathered through investigations and from other resources. For example, after reading texts about a given organism, students should be expected to use key details and appropriate facts about that organism to compose an informative piece of writing that lists some of the organism's traits that might give it an advantage in survival, growth, or reproduction over others of its kind. Students can also use Venn diagrams or T-charts to compare traits among individuals from a common species. These data can be used to explain how variations in characteristics can give an advantage to one or another individual in reproduction, growth, or survival. Students should also have the opportunity to report on how one or more traits of an organism give it an advantage in survival, growth, and/or reproduction in its environment. As students speak, they should share relevant facts, details, and information while speaking clearly and at an understandable pace.

Mathematics

Students can draw scaled picture graphs or bar graphs to represent a data set with several categories, such as the average length of the life span of a variety of organisms, which could range from days to hundreds of years, or the varying reproductive capacity of organisms, which could range from a single offspring to thousands. As students analyze their data, they may observe similarities within a category of organisms (e.g., mammals, reptiles, or insects) or marked differences across these same categories. Analyzing data will help students understand that organisms have unique and diverse life cycles, but all have in common birth, growth, reproduction, and death. As students collect, organize, and analyze their data, they have opportunities to reason abstractly and model with mathematics.

Future Learning

Grade 6 Unit 1: Growth, Development, and Reproduction of Organisms

• Animals engage in characteristic behaviors that increase the odds of reproduction.

• Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.

• Genetic factors as well as local conditions affect the growth of the adult plant.

Grade 6 Unit 2: Matter and Energy in Organisms and Ecosystems

• Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.

• In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.

• Growth of organisms and population increases are limited by access to resources.

• Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.

Grade 7 Unit 6: Inheritance and Variation of Traits

• In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.

• In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.

Grade 8 Unit 2: Selection and Adaptation

• Natural selection leads to the predominance of certain traits in a population, and the suppression of others.

• In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring.
Prior Learning
Grade 1 Unit 2: Characteristics of Living Things • Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

Modifications
Modifications for not only special education students but for English Language learners, students at risk for school failure and gifted students. • 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.

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Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy Environmental Literacy Health Literacy Creativity & Innovation Communication & Collaboration Media Literacy Critical Thinking & Problem Solving Information Literacy Information, Communication, & Technology Life & Career Skills

Commercial Township School District

Content Area: Science

Grade: 3

Unit: 6 Organisms and the Environment

Unit Summary
Why don't we see alligators in the arctic? In this unit of study, students develop an understanding of the idea that when the environment changes, some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. The crosscutting concepts of cause and effect and the interdependence of science, engineering, and technology are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in engaging in argument from evidence. Students are also expected to use this practice to demonstrate understanding of the core ideas. This unit is based on 3-LS2-1 and 3-LS4-3.
Student Learning Objectives

Construct an argument that some animals form groups that help members survive. (3-LS2-1)
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. [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.] (3-LS4-3)

Unit Sequence	
Part A: In a particular habitat, why do some organisms survive well, some survive less well, and some not survive at all?	
Concepts	**Formative Assessment**
• Cause-and-effect relationships are routinely identified and used to explain change. • Knowledge of relevant scientific concepts and research findings is important in engineering. • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. • Organisms and their habitat make up a system in which the parts depend on each other.	*Students who understand the concepts are able to:* • Identify cause-and-effect relationships in order to explain change. • Construct an argument with evidence. • Construct an argument with evidence (e.g., needs and characteristics of the organisms and habitats involved) that in a particular habitat, some organisms can survive well, some can survive less well, and some cannot survive at all.
Unit Resources	**District/School Summative Assessments**
Muskox Maneuvers In this activity, students create a physical model showing how muskoxen work together as a group to protect their young from predators (wolves). 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, yellow jackets, 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 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	Summative Assessment 1: Explain the Zoo Habitat- Create a Floor Plan, Prepare the Presentation

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 and survive there. A Walk in the Tundra (Biomes of North America) This nonfiction text describes the climate, soil, plants and animals of the North American tundra. It provides detailed information on how plants and animals adapt and survive there. A Walk in the Boreal Forest (Biomes of North America) This nonfiction text describes the climate, soil, plants and animals of the North American boreal forests. It provides detailed information on how plants and animals adapt and survive there. A Journey into the Ocean (Biomes of North America) This nonfiction text describes the organisms and features of the ocean environment. It provides detailed information on how plants and animals adapt and survive there. Journey Into an Estuary (Biomes of North America) This nonfiction text describes the features and plants and animals of North American estuaries. It provides detailed information on how plants and animals adapt and survive there. www.betterlesson.com	

Interdisciplinary Connections
English Language Arts

Students need opportunities use informational text and other resources to gather information about organisms and the environments in which they live. Students should be able to ask and answer questions to demonstrate understanding of content-specific text and be able to cite evidence from the text to support their thinking. For example, after reading an article about wolves, students ask and answer questions such as:

- How does being a member of a pack help wolves survive?
- What characteristics do wolves have that enable them to survive in their environment?
- What characteristics and resources does the environment have that allow wolves to survive and reproduce in that environment?

Students should be able to refer specifically to the text when answering questions, articulating the main idea and describing key details in their explanations. Students also need opportunities to write informative/explanatory texts and opinion pieces with supporting evidence to convey their ideas and understanding of cause-and-effect relationships between the environment and an organism's ability to survive and reproduce. For example, after reading text about a given animal, students should be expected to use key details and appropriate facts about that animal to compose an informative piece of writing that describes the animal's characteristics and behaviors that aid in its survival. Students should also have the opportunity to orally report on a given topic, sharing relevant facts and details while speaking clearly and at a reasonable pace.

Mathematics

Students can model with mathematics by graphing the average number of organisms that make up a group among a variety of species. For example, some species live in small groups of six to eight members, while others live in groups that include thousands of organisms. Students will also reason abstractly and quantitatively as they describe and compare these groups and their ability to survive and reproduce in a given environment.

Future Learning

Grade 6 Unit 2 Matter and Energy in Organisms and Ecosystems

• Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.

• In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.

• Growth of organisms and population increases are limited by access to resources.

• Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.

Grade 7 Unit 8: Earth systems

• The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.

Grade 8 Unit 2: Selection and Adaptation

• Natural selection leads to the predominance of certain traits in a population, and the suppression of others.

• In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring.

• Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.

Prior Learning
Kindergarten Unit 4: Basic Needs of Living Things • Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. Grade 1 Unit 2: Characteristics of Living Things • Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. Grade 2 Unit 1: Relationships in Habitats • Plants depend on water and light to grow. • Plants depend on animals for pollination or to move their seeds around. • There are many different kinds of living things in any area, and they exist in different places on land and in water.

Modifications
Modifications for not only special education students but for English Language learners, students at risk for school failure and gifted students. • 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

21st Century Themes and Skills
Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy Environmental Literacy Health Literacy Creativity & Innovation Communication & Collaboration Media Literacy Critical Thinking & Problem Solving Information Literacy Information, Communication, & Technology Life & Career Skills

Content Area: Science

Grade: 3

Unit: 7 Using Evidence to Understand Change in Environments

Instructional Days: 15

Unit Summary
What do fossils tell us about the organisms and the environments in which they lived? In this unit of study, students develop an understanding of the types of organisms that lived long ago and also about the nature of their environments. Students develop an understanding of the idea that when the environment changes, some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. The crosscutting concepts of systems and system models; scale, proportion, and quantity; and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems, analyzing and interpreting data, and engaging in argument from evidence. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 3-LS4-1, 3-LS4-4, and 3-5-ETS1-1.
Student Learning Objectives
Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. [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.] (3-LS4-1)
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.* [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.] (3-LS4-4)
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-ETS1-1)

Unit Sequence	
Part A: What do fossils tell us about the organisms and the environments in which they lived?	
Concepts	**Formative Assessment**
• Observable phenomena exist from very short to very long periods of time. • Science assumes consistent patterns in natural systems. • 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.	*Students who understand the concepts are able to:* • Observe that phenomena exist from very short to very long periods of time. • Analyze and interpret data to make sense of phenomena using logical reasoning. • 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. (Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.) Examples of fossils and environments could include: ● Marine fossils found on dry land;

	• Tropical plant fossils found in Arctic areas; or • Fossils of extinct organisms.
Unit Resources	**District/School Summative Assessments**
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. www.betterlesson.com	Summative Assessment 2 Mystery Science End of Unit Assessment

Unit Sequence	
Part B: What happens to the plants and animals when the environment changes?	
Concepts	**Formative Assessment**
• A system can be described in terms of its components and their interactions. • People's needs and wants change over time, as do their demands for new and improved technologies. • Populations live in a variety of habitats, and change in those habitats affects the organisms living there. • When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, others move into the transformed environment, and some die. • 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.	*Students who understand the concepts are able to:* . • Describe a system in terms of its components and interactions. • 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 a problem. • 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. (Assessment is limited to a single environmental change and does not include the greenhouse effect or climate change.) Examples of environmental changes could include changes in • Land characteristics, • Water distribution, • Temperature, Food, or • Other organisms. • Define a simple design problem that can be solved through the development of an object, tool, process, or system and that includes several criteria for success and constraints on materials, time, or cost. • Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, or cost.

Unit Resources	District/School Summative Assessments
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. www.betterlesson.com	Summative Assessment 2 Mystery Science End of Unit Assessment

Interdisciplinary Connections
English Language Arts Students use content-specific print and digital sources such as books, articles, and other reliable media to observe and analyze fossils, and they use their observations to describe the types of organisms that lived in the past and characteristics of the environments in which they lived. When using these types of resources, students should determine the main idea and key details and use this information as evidence to support their thinking. They should take notes as they read and observe and use their notes as they write opinion and/or informational/explanatory pieces that convey information and ideas about organisms, both past and present, and their environments. As students discuss and write about the effects of a changing environment on organisms, they should ask and answer questions to demonstrate understanding and should cite evidence from their observations or from texts to support their thinking. Third graders should also have the opportunity to use their work to report on their findings about the effects of a changing environment on organisms living today, as well as those that lived in the past. Students should use appropriate facts and relevant descriptive details as they report out, speaking clearly at an understandable pace. Mathematics In order to connect the CCSS for mathematics, students generate measurement data using appropriate tools, such as rulers marked with halves and fourths of an inch, and show the data by making a line plot where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. For example, students could make a line plot to show the length of a variety of fossils, then use that data, as well as other observational data, to make comparisons to modern-day organisms and to support their thinking. Questions such as the ones below might be used to guide students' analysis of data. ● Do any of the fossilized organisms resemble organisms that we see today? In what ways? ● Can you make any inferences about a fossilized organism's way of life based on size, body style, external features, or other similarities to modern-day organisms? (Where might it have lived? What might it have eaten? How might it have moved? Could it have been part of a group?)

Future Learning
Grade 4 Unit 2: Earth Processes • A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. Grade 4 Unit 7: Using Engineering Design with Force and Motion Systems

• 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. (secondary)

Grade 6 Unit 2: Matter and Energy in Organisms and Ecosystems

• Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.

• In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.

• Growth of organisms and population increases are limited by access to resources.

• Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.

Grade 6 Unit 3: Interdependent Relationships in Ecosystems

• Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.

• Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.

Grade 7 Unit 8: Earth Systems

• The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.

• Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.

Grade 8 Unit 1: Evidence of Common Ancestry and Diversity

• The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.

• Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.

• Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.

Grade 8 Unit 2: Selection and Adaptation

• Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.

Grade 8 Unit 4: Human Impacts

• Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.

• Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

Prior Learning

Kindergarten Unit 4: Basic Needs of Living Things
• Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.
• Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary)

Grade 2 Unit 1: Relationships in Habitats
• Plants depend on water and light to grow.
• Plants depend on animals for pollination or to move their seeds around.

Modifications

Modifications for not only special education students but for English Language learners, students at risk for school failure and gifted students.

• 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.

21st Century Themes and Skills

Global Awareness Financial, Business, & Entrepreneurial Literacy Civic Literacy Environmental Literacy Health Literacy

Creativity & Innovation Communication & Collaboration Media Literacy Critical Thinking & Problem Solving Information Literacy Information, Communication, & Technology Life & Career Skills

Technology Resources

- Mystery Science
- Better Lesson
- Discovery Education
- YouTube
- Scholastic
- National Geographic for Kids
- Kahoot
- Bill Nye the Science Guy
- Brain Pop