Greenwich-Stow Creek Partnership Schools Science Curriculum

Grades Kindergarten through Eight

Approved by the Stow Creek Township Board of Education: 8/18/2022
Approved by the Greenwich Township Board of Education: 8/17/2022

Subject: Science	Grade Level: K
Unit 1: Motion and Stability: Forces and Interactions	Pacing: 8 weeks
Essential Questions	Enduring Understandings
• Can pushes and pulls have different strengths and directions? • Can we change speed and direction of an object by pushing or pulling it? • What happens when objects touch or collide? • What does a bigger push or pull do to an object? • What tools can we use to increase the speed of an object or make the object turn? • What are characteristics of the sun? • Can structures reduce the warming effect of sunlight on Earth's surface?	PS2.A: Forces and Motion • Pushes and pulls can have different strengths and directions. (KPS2-1) (K-PS2-2) (W.K.7) (MP.2) (K.MD.A.1) (K.MD.A.2) • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1) (K-PS2-2) (W.K.7) (MP.2) (K.MD.A.1) (K.MD.A.2) PS2.B: Types of Interactions • When objects touch, or collide, they push on one another and can change motion. (K-PS2-1) (W.K.7) (MP.2) (K.MD.A.1) (K.MD.A.2) PS3.B: Conservation of Energy and Energy Transfer • Sunlight warms Earth's surface. (K-PS3-1) (K-PS3-2) (W.K.7) (K.MD.A.2) PS3.C: Relationship Between Energy and Forces • A bigger push or pull makes things speed up or slow down more quickly. (secondary to K-PS2-1) ETS1.A: Defining Engineering Problems

	• 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 to KPS2-2)
NJSL Standards	Classroom Applications
K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. • Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other. • Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets. K-PS2-2.	Objectives: Use evidence to relate the effects of various strengths and directions of pushes and pulls on the motion of an object. (PS2-1) (W.K.7) (MP.2) (K.MD.A.1) (K.MD.A.2) • Pushes and pulls can have different strengths and directions. • When objects touch, or collide they push on one another and change direction/motion. • Example: (Make their own golf-course to demonstrate the effects of force on the ball) https://njctl.org/courses/science/kindergarten-science/forces-and-motion/attachments/golf-course-lab-activity/ Use evidence to create a design solution to change the direction or speed of an object that has been pushed or pulled (PS2-2) (W.K.7) (MP.2) (K.MD.A.1) (K.MD.A.2). • Pushing or pulling on an object can change the speed or direction of its motion and start or stop it. • A larger push or pull makes things go faster. • Example: (Participate in whole-group potato sack race to visualize the variations of speed/motion and make a marble ramp in classroom centers) https://njctl.org/courses/science/kindergarten-

Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. • Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn. • Assessment Boundary: Assessment does not include friction as a mechanism for change in speed. K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. • Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water. • Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.	science/forces-and-motion/attachments/potato-sack-race-lab-activity/ Observe and examine the effects of sunlight on the Earth's surface areas (PS3-1) (W.K.7) (K.MD.A.2) • How sunlight effects different surfaces on Earth. They will use the terms warm, cool, and hot to describe what they learned. • Example: (https://njctl.org/courses/science/kindergarten-science/energy/attachments/sun-light-energy-lab-activity/) https://njctl.org/courses/science/kindergarten-science/energy/attachments/energy-lab-activity/ Create and use various tools/materials to build structures that will help reduce the warming effect of sunlight on the Earth's surface (PS3-2) (W.K.7) (K.MD.A.2) • Describe the sun's characteristics • Design and build a structure that will reduce the warming effect of sunlight on Earth's surface. They will choose materials for their design that will create shade.

K-PS3-2. Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. • Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.	**Teaching Strategies/Materials**: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation.
Connections to other content areas, including 21st Century Skills: ELA/Literacy – RI.K.1 With prompting and support, ask and answer questions about key details in a text.	

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

Mathematics –

MP.2 Reason abstractly and quantitatively.

K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has “more of”/”less of” the attribute, and describe the difference.

21st Century Skills –

9.2.4
A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4

A.2 Identify various life roles and civic and work
related activities in the school, home, and community.

9.2.4
A.3 Investigate both traditional and nontraditional careers and relate information to per sonal 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of books to be used:

Inquiry in Action: Investigating Matter through Inquiry

Conservation of Matter

http://strandmaps.nsdl.org/?id=SMS-MAP-1332

Science Refreshers

http://nsdl.org/refreshers/science/

Science Kids http://www.sciencekids.co.nz/gamesactivities/gases.html

http://archive.fossweb.com/modulesK-2/SolidsandLiquids/activities/changeit.swf

http://coolsciencelab.com/ice_cream.htm

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: K
Unit 2: Molecules to Organisms: Structures and Processes	Pacing: 8 weeks
Essential Questions	Enduring Understandings
• What are the basic needs of organisms? • What do animals need to live and grow? • Where do animals obtain their food? • Do all animals need the same kind of food? • What do plants need to live and grow? • Do all living things need water? Where can they get the water?	LS1.C: Organization for Matter and Energy Flow in Organisms • All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1) (W.K.7) (K.MD.A.2)

NJSL-S Standards	Classroom Applications
K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. • Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.	Objective: Use evidence to depict how plants and animals survive in their natural habitat (K-LS1-1) (W.K.7) (K.MD.A.2). • All animals need food in order to live and grow. • They obtain their food from plants or other animals. • Different kinds of food are needed by different types of animals. • Plants need light and water to live and grow. • All living things need water. • Differentiate between the needs of animals and plants. • Recognize the basic needs of organisms. • Example: https://njctl.org/courses/science/kindergarten-science/plant-animal-needs/attachments/plant-animal-needs-classwork-homework/ (Lima Bean Lab) **Teaching Strategies/Materials**: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations

	Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation.

Connections to other content areas, including 21st Century Skills:

ELA/Literacy-

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1)

Mathematics –

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has “more of”/”less of” the attribute, and describe the difference. (K-LS1-1)

21st Century Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a pe rson achieve personal and professional goals.

9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

9.2.4.A.Investigate both traditional and nontraditional careers and relate information to persona l likes and dislikes.

9.2.4.A.Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

Unit Resources: (*related websites, reference materials, etc.)*

List of books to be used:

Websites:

Education.com

Easyscienceforkids.org

Kidsgrowingstrong.org/Plant Needs

Ducksters.com/science/photosynthesis.php

Animalatlas.tv

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: K
Unit 3: Earth's Systems	Pacing: 20 weeks
Essential Questions	Enduring Understandings
• What are examples of qualitative observations of the local weather? • How can we record quantitative observations of the local weather and temperature? • What patterns were observed in their observations? • Does this pattern change with seasons? • What is the relationship between animals and what they eat, and how does that determine where they live? • What features help plants and animals survive in different environments? • How are these features used? • How do plants and animals depend on the land, air, and water to survive? • How do plants and animals change the	ESS2.D: Weather and Climate • 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. (K-ESS2-1) (W.K.7) (MP.2) (MP.4) (K.CC. A) (K.MD.A.1) (K.MD.B.3) ESS2.E: Biogeology • Plants and animals can change their environment. (KESS2-2) (RI.K.1) (W.K.I) (W.K.2) ESS3.A: Natural Resources • 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. (K-ESS3-1) (SL.K.5) (MP.2) (MP.4) (K.CC) ESS3.B: Natural Hazards • 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. (K-ESS3-2) (RI.K.1) (SL.K.3) (MP.4)

environment to meet their needs? • What are examples of things that people do to live comfortably that can affect the world around them? • How does man affect the forest/land with his choices? • How can man conserve water? • What can a child do to keep the air clean? • How can our families help keep the Earth healthy? • What can we do to reduce, reuse, and recycle our natural resources?	ESS3.C: Human Impacts on Earth Systems • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3- 3) (W.K.2) ETS1.A: Defining and Delimiting an Engineering Problem • Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary to K-ESS3-2) ETS1.B: Developing Possible Solutions • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary to K-ESS3-3)
NJSL Standards	Classroom Applications
K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time. • Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the	Objectives: Evaluate and record local weather observations to describe patterns over a period of time (K-ESS2-1) (W.K.7) (MP.2) (MP.4) (K.CC. A) (K.MD.A.1) (K.MD.B.3). . • How to make qualitative and quantitative observations of the local weather and temperature. This will include descriptions of the weather (such as sunny, cloudy, rainy, warm). • Measure these conditions to describe and record the local weather. • Use daily data of weather to notice patterns over time. • Use daily data of weather to compare two different seasons. (Morning Meeting discussions) • Example: https://njctl.org/courses/science/kindergarten-

afternoon and the number of sunny days versus cloudy days in different months. • Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler. K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. • Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete. K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. • Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need	science/weather-climate/attachments/weather-climate-classwork-homework/ Participate in a discussion to identify and support evidence of how plants and animals (humans included) can change the natural environment (KESS2-2) (RI.K.1) (W.K.I) (W.K.2) . • How plants and animals can change their environment. • Living things need water, air, resources from land to survive. • Living things live in places that have the things they need to survive. • Humans use natural resources from the environment. • Plants, animals and their surroundings make a system, they work together to meet needs. • Example: https://njctl.org/courses/science/kindergarten-science/plant-animal-environments/attachments/plant-and-animal-environments-classwork-homework/ Build a model to show the relationship between the needs of various plants or animals (humans included) and where they live (K-ESS3-1) (SL.K.5) (MP.2) (MP.4) (K.CC). . • Diagram/explain how plants and animals can change their environment to meet their needs. • Diagram/explain the relationship between the needs of different plants or animals and the places they live. • Diagram/explain what features animals and plants have to survive in different environments. • Sketch/explain how human use resources in different environments. • Example: https://njctl.org/courses/science/kindergarten-science/plant-animal-environments/attachments/plant-and-animal-environments-classwork-homework/

sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system. K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. • Clarification Statement: Emphasis is on local forms of severe weather. K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. • Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.	Inquire to gain knowledge about the purpose of weather forecasting to enable humans to prepare for and respond to severe weather (K-ESS3-2) (RI.K.1) (SL.K.3) (MP.4). . • There are different types of severe weather. • Where you live can determine what types of severe weather occurs. • Weather scientists help us prepare for severe weather. • We can prepare for severe weather. • Obtain information about weather forecasting to prepare for, and respond to, severe weather. • Presentation: https://njctl.org/courses/science/kindergarten-science/severe-weather/attachments/severe-weather-2/ Conduct classroom discussions about the solutions that will decrease the human impact on the Earth's natural environment and living things (K-ESS3- 3) (W.K.2). • There are specific things that people do to live comfortably that can affect the world around them. • We need to reduce, reuse, and recycle our resources. • Water conservation is saving our natural resources. We must try every day to conserve water. • Humans use natural resources for everything they do. • Resources are renewable or non-renewable. • Identify and practice activities they can do to reduce their impact on land, water, air, and other living things. • Identify and use water conservation practices. • Explore and communicate solutions that will reduce the impact of humans in their local environment. • Example: https://njctl.org/courses/science/kindergarten-science/human-impact-on-earth/attachments/human-impact-on-earth-classwork-homework/

	Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation
Connections to other content areas, including 21st Century Skills: ELA/Literacy – RI.K.1 With prompting and support, ask and answer questions about key details in a text.	

W.K.1 Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book.

W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail.

Mathematics –

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

K.CC.A Know number names and the count sequence.

K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count.

K.CC Counting and Cardinality

21st Century Skills –

9.2.4.
A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

9.2.4.
A.3 Investigate both traditional and nontraditional careers and relate information to personal lik es 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of books to be used:

Volcanoes! by Cy Armour

Vo*lcanoes* by Anne Schreiber

Landforms series (*Caves, Islands, Mountains, Volcanoes*) by Cassie Mayer

Looking at Earth series (*Earth's Mountains, Introducing Landforms, Earth's Rivers, Volcanoes on Earth, What Shapes the Land?*) by Bobbie Kalman

Hurricane! by Jonathan London

Earth by David Bennett

Rocking and Rolling -- The Earth by Phillip Steele

Inquiry in Action: Investigating Matter through Inquiry

Conservation of Matter

http://strandmaps.nsdl.org/?id=SMS-MAP-1332

Science Refreshers

http://nsdl.org/refreshers/science/

http://www.sciencekids.co.nz/earth.html

http://science.nationalgeographic.com/science/earth/

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and Discussions
- Comprehension Checks in Literature
- Class Webs
- Presentations
- Collaboration
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: K
Unit 4: Engineering Design	Pacing: Incorporate all year
Essential Questions	Enduring Understandings
• How have objects or tools been developed in the past to solve a simple problem? • What simple problem can I solve by developing a new object or tool? • Compare the strengths and weaknesses of two objects or tools that are designed to solve the same problem.	ETS1.A: Defining and Delimiting Engineering Problems • A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) • Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1) ETS1.B: Developing Possible Solutions • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2) ETS1.C: Optimizing the Design Solution • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)
NJSL Standards	Classroom Applications
K-2-ETS1-1. Ask questions, make observations, and gather	Objectives: Ask questions based on observations to find more information about the natural and/or designed world (K-2-ETS1-1)

information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps in function as needed to solve a given problem. K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2) Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3) **Teaching Strategies/Materials**: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications

	SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation

Connections to other content areas, including 21st Century Skills:

ELA/Literacy:

RI.2.1 Ask and answer such questions as who, what, where, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1)

W.2.6 With guidance and support from adults, use a variety of digital tools to produce a publish writing, including in collaboration with peers. (K-2-ETS1-1), K-2-ETS1-3)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1) (K-2-ETS1-3)

SL.2.5 Create audio recordings of stories or poems; ass drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2)

Mathematics-

2. MD.D.10 Draw a picture graph or bar graph (with single-unit scale) to represent a date set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1) (K-2-ETS1-3)

21st Century Skills –

9.2.4.
A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

9.2.4.
A.3 Investigate both traditional and nontraditional careers and relate information to personal lik es 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of Books to be read:

Inventions and Discovery Through Time-Graphic History: variety pack

Eli Whitney and the Cotton Gin

Henry Ford and the Model T

Samuel Morese and the Telegraph

Philo Farnsworth and the Television

Steve Jobs and Steven Wozniak and the Personal Computer

Books found in media center:

Inventing Things by Julie Brown

Now & Ben by Gene Barretta

Imaginative Inventions by Charise Mericle Harper

Who Invented It & What Makes it Work? By Sarah Leslie

What's Next? By Lisa Thompson

Hoop Genius by John Coy

Websites:

Inventions.org

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

First Grade Curriculum Guide

Subject: Science	Grade Level: 1
Unit 1: Waves and their Applications in Technologies for Information Transfer	Pacing: 9 Weeks
Essential Questions	Enduring Understandings
• What is light? • How does light travel? • What is the difference between a natural light source and an artificial light source? • What does illuminate mean? • What is reflection and how light reacts to reflective surfaces? • How does light react with different surfaces including transparent, translucent, opaque, and refraction? What devices are used to communicate long distances? • What tools can be used to design or build a device that uses light or sound to solve a problem of	PS4.A: Wave Properties • Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1) (W.1.7) (W.1.8) (Sl.1.1) PS4.B: Electromagnetic Radiation • Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4-2) (W.1.2) (W.1.7) (W.1.8) (Sl.1.1) • Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (1- PS4-3) (WSl.1.1) PS4.C: Information Technologies and Instrumentation • People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4) (W.1.7) (MP.5) (1. MD.A.1) (1.MD.A.2)

communicating over a distance? • What devices are used to communicate long distances? • What tools can be used to design or build a device that uses light or sound to solve a problem of communicating over a distance?	
NJSL-S Standards	Classroom Applications
1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. • Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork. 1-PS4-2.	Objectives: Use evidence from several sources to provide evidence that sound can make matter vibrate. People use a variety of sound devices to communicate. (PS4-1) (W.1.7) (W.1.8) (Sl.1.1) • Investigate, using real world materials, how to communicate over a distance sound. • Describe what a vibration is and give examples. • Demonstrate how vibrations are made. Use evidence from several sources to provide evidence that objects can be seen if there is a light source (PS-4-2) (W.1.2) (W.1.7) (W.1.8) (Sl.1.1) • Investigate the effects of varying amounts of light on objects, example day vs. night. • Describe how use of senses changes due to amount of light present.

Make observations to construct an evidence-based account that objects can be seen only when illuminated. • Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light. 1-PS4-3. Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. • Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror). • Assessment Boundary: Assessment does not include the speed of light.	Plan and investigate to determine the effect of placing transparent, translucent, opaque objects in the path of a beam of light. (PS-4-3) (WSl.1.1) • Describe what light is. • Describe how light travels. • Be able to name and explain sources of light. • Identify transparent, translucent, opaque. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. (PS-4-4) (W.1.7) (MP.5) (1. MD.A.1) (1.MD.A.2) • Identify what light and sound are. • Describe materials light will travel through. • Demonstrate the steps to build a communication device. Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects

1-PS4-4. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. • Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats. • Assessment Boundary: Assessment does not include technological details for how communication devices work.	Materials: Science A-Z, Reading A-Z, Scholastic News, Brain Pop, NJCTL.org, Teacher Pay Teacher, Pinterest, Sploder, Magic School Bus, Anchor Charts Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation

Connections to other content areas, including 21st Century Skills:

ELA/Literacy –

W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.

W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).

W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

SL.1.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.

Mathematics –

MP.5 Use appropriate tools strategically.

1. MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

1. MD.A.2 Express the length of an object as a whole number of length units, by layering multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

21st Century Skills –

9.2.4.
A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work
related activities in the school, home, and community.

9.2.4.
A.3 Investigate both traditional and nontraditional careers and relate information to per sonal 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of books to be used:

Inquiry in Action: Investigating Matter through Inquiry

Conservation of Matter

http://strandmaps.nsdl.org/?id=SMS-MAP-1332

Science Refreshers

http://nsdl.org/refreshers/science/

Science Kids http://www.sciencekids.co.nz/gamesactivities/gases.html

http://archive.fossweb.com/modulesK-2/SolidsandLiquids/activities/changeit.swf

http://coolsciencelab.com/ice_cream.htm

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: 1
Unit 2: Molecules to Organisms: Structures and Processes	Pacing: 9 Weeks
Essential Questions	Enduring Understandings
• What is structure and function? • How do animals use external structures to survive? • What are some examples of external parts of an animal? • What are the external structures of a plant? • How do plants and animals respond to their environments? • What is reproduction? • In what types of ways do animals reproduce? • How do plants reproduce? • How do eggs help offspring to survive? • How do nest/dens help offspring to survive? • How does parental care help the offspring to survive? • What offspring behaviors help the offspring to survive?	LS1.A: Structure and Function • All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1) (W.1.7) LS1.B: Growth and Development of Organisms • 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. (1-LS1-2) (RI.1.1) (RI.1.2) (RI.1.10) (1.NBT.B.3) (1.NBT.C.4) (1.NBT.C5) (1.NBT.C.6) LS1.D: Information Processing • Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1) (W.1.7) LS3.A: Inheritance of Traits • Young animals are very much, but not exactly like, their parents. Plants also are very much, but not

• How does the structure of seeds help plant offspring to survive? • How are young animals like their parents? • How are young plants similar to full grown plants of the same kind? • What are the similarities and differences between plants and animals of the same kind/breed? • What characteristics do most plants share? • What characteristics do animals share?	exactly, like their parents. (1- LS3-1) (MP.2) (MP.5) (1.MD.A.1) LS3.B: Variation of Traits • Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (1-LS3-1)
NJSL-S Standards	Classroom Applications
1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. • Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and,	Objectives: Use materials to solve human problems such as the need for food, shelter, and protection by mimicking how plants and animals meet their own needs for survival. (1-LS-1) (W.1.7) • Student will distinguish between needs and wants • Describe what plants need to survive • Explain how animals use external parts to protect themselves Explore texts and media to understand parent and offspring behavior that enables survival. (1-LS1-2) (RI.1.1) (RI.1.2) (RI.1.10) (1.NBT.B.3) (1.NBT.C.4) (1.NBT.C5) (1.NBT.C.6) • Give examples of signal and response behavior of offspring and parent. • Use video to explore animal behaviors

detecting intruders by mimicking eyes and ears. 1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. • Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring). 1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. • Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.	Describe how offspring are a combination of parent traits. (1-LS3-1) (MP.2) (MP.5) (1.MD.A.1) • Discuss that offspring will mostly resemble parents. • Classify living things according to their attributes; same and different Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Science A-Z, Reading A-Z, Scholastic News, Brain Pop, NJCTL.org, Teacher Pay Teacher, Pinterest, Sploder, Magic School Bus, Anchor Charts, Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation

• Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.	

Connections to other content areas, including 21st Century Skills:

ELA/Literacy-

RI.1.1 Ask and answer questions about key details in a text.

RI.1.2 Identify the main topic and retell key details of a text.

RI.1.10 With prompting and support, read informational texts appropriately complex for grade.

W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).

Mathematics –

MP.2 Reason abstractly and quantitatively.

MP.5 Use appropriate tools strategically.

1. MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

1.NBT.B.3 Compare two two-digit numbers based on the meanings of the tens and one digits, recording the results of comparisons with the symbols >, =, and <.

1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning uses. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

1.NBT.C.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

21st Century Skills –

9.2.4.
A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work-
related activities in the school, home, and community.

9.2.4.
A.3 Investigate both traditional and nontraditional careers and relate information to personal lik es 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of books to be used:

Websites:

Education.com

Easyscienceforkids.org

Kidsgrowingstrong.org/Plant Needs

Ducksters.com/science/photosynthesis.php

Animalatlas.tv

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: 1
Unit 3: Earth's Place in the Universe	Pacing: 9 Weeks
Essential Questions	Enduring Understandings
• What is the pattern of the sun's movement? • Can the patterns of the day sky be predicted? • What are the four directions displayed on a compass? • What makes something a moon? • Does the Moon create its own light? • How does the Moon's appearance change over time? • Why can we only see other distant stars at night? • What causes the seasons? • How does the Sun's path across the sky differ during the summer and winter?	ESS1.A: The Universe and its Stars • Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1) (W.1.7) (W.1.8) ESS1.B: Earth and the Solar System • Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1- ESS1-2) (W.1.7) (W.1.8) (MP.2) (MP.4) (MP.5) (1. OA.A.1) (1.MD.C.4)
NJSL-S Standards	Classroom Applications
1-ESS1-1. Use observations of the sun, moon, and stars to describe	Objectives: Use observations of the sun moon and starts to describe patterns such as day and night, movement of the moon in the

patterns that can be predicted. • Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day. • Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day. 1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year. • Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall. • Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.	night sky, and the sun throughout the day. (1-ESS1-1) (W.1.7) (W.1.8) • Describe the differences between the day and the night sky • Identify the patterns that cause day and night • Identify the rotation pattern of the Earth • Understand that the Earth revolves around the sun Observe the different amounts of day light throughout the seasons and the seasonal effect on the environment (1-ESS1-2) (W.1.7) (W.1.8) (MP.2) (MP.4) (MP.5) (1. OA.A.1) (1.MD.C.4) • Describe the seasons of the year • Identify the effects of the amount of daylight on the environment • Describe temperature and weather • Describe that seasons can be different in other parts of the world Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects

	Materials: Science A-Z, Reading A-Z, Scholastic News, Brain Pop, NJCTL.org, Teacher Pay Teacher, Pinterest, Sploder, Magic School Bus, Anchor Charts Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation

Connections to other content areas, including 21st Century Skills:

ELA/Literacy –

W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).

W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

Mathematics –

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

1.OA.A.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations to represent the problem.

1.MD.C.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

21st Century Skills –

9.2.4.
A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work-
related activities in the school, home, and community.

9.2.4.A.3 Investigate both traditional and nontraditional careers and relate information to perso nal 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of books to be used:

Volcanoes! by Cy Armour

Vo*lcanoes* by Anne Schreiber

Landforms series (*Caves, Islands, Mountains, Volcanoes*) by Cassie Mayer

Looking at Earth series (*Earth's Mountains, Introducing Landforms, Earth's Rivers, Volcanoes on Earth, What Shapes the Land?*) by Bobbie Kalman

Hurricane! by Jonathan London

Earth by David Bennett

Rocking and Rolling -- The Earth by Phillip Steele

Inquiry in Action: Investigating Matter through Inquiry

Conservation of Matter

http://strandmaps.nsdl.org/?id=SMS-MAP-1332

Science Refreshers

http://nsdl.org/refreshers/science/

http://www.sciencekids.co.nz/earth.html

http://science.nationalgeographic.com/science/earth/

Unit Assessment Opportunities:
• Journal Entries and Response Sheets • Observations, Questioning, and Discussions • Comprehension Checks in Literature • Class Webs • Presentations • Collaboration • Unit Test

Curriculum Guide

Subject: Science	Grade Level: 1
Unit 4: Engineering Design	Pacing: 9 Weeks
Essential Questions	Enduring Understandings
• How have objects or tools been developed in the past to solve a simple problem? • What simple problem can I solve by developing a new object or tool? • Compare the strengths and weaknesses of two objects or tools that are designed to solve the same problem.	ETS1.A: Defining and Delimiting Engineering Problems • A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) • Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1) ETS1.B: Developing Possible Solutions • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful

	in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2) ETS1.C: Optimizing the Design Solution • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)
NJSL-S Standards	Classroom Applications
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps in function as needed to solve a given problem. K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	Objectives: Ask questions based on observations to find more information about the natural and/or designed world (K-2-ETS1-1) Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2) Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects

	Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation

Connections to other content areas, including 21st Century Skills:

ELA/Literacy:

RI.2.1 Ask and answer such questions as who, what, where, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1)

W.2.6 With guidance and support from adults, use a variety of digital tools to produce a publish writing, including in collaboration with peers. (K-2-ETS1-1), K-2-ETS1-3)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1) (K-2-ETS1-3)

SL.2.5 Create audio recordings of stories or poems; ass drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2)

Mathematics-

2. MD.D.10 Draw a picture graph or bar graph (with single-unit scale) to represent a date set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1) (K-2-ETS1-3)

21st Century Skills –

9.2.4.A.Identify reasons why people work, different types of work, and how work can help a pers on achieve personal and professional goals.

9.2.4.A.2 Identify various life roles and civic and work-
related activities in the school, home, and community.

9.2.4.
A.3 Investigate both traditional and nontraditional careers and relate information to personal lik es 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of Books to be read:

Inventions and Discovery Through Time-Graphic History: variety pack

Eli Whitney and the Cotton Gin

Henry Ford and the Model T

Samuel Morese and the Telegraph

Philo Farnsworth and the Television

Steve Jobs and Steven Wozniak and the Personal Computer

Books found in media center:

Inventing Things by Julie Brown

Now & Ben by Gene Barretta

Imaginative Inventions by Charise Mericle Harper

Who Invented It & What Makes it Work? By Sarah Leslie

What's Next? By Lisa Thompson

Hoop Genius by John Coy

Websites:

Inventions.org

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

2nd Grade Curriculum Guide

Subject: Science	Grade Level: 2
Unit 1: Structures and Properties of Matter	Pacing: 10 Weeks (Sept-Nov.)
Essential Questions	Enduring Understandings
• How are materials similar and different from one another, and how do the properties of the materials relate to their use? • What are the different properties of matter? • What properties are best suited for different purposes? • What are the differences between a solid, a liquid and a gas? • How can a substance change? • Are changes to substances reversible or permanent?	PS1.A: Structure and Properties of Matter • Different kinds of matter exist and many of them can either be solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1) (RI.2.8) (W.2.7) (W.2.8) (MP.4) (2.MD.D.10). • Different properties are suited for different purposes. (2-PS1-2), (2-PS1-3) (W.2.7) (W.2.8) (MP.2) (MP.4) (MP.5) (2.MD.D.10) • A great variety of objects can be built up from a small set of pieces. (2-PS1-3) (W.2.7) (W.2.8) PS1.B: Chemical Reactions • Heating and cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes, they are not. (2-PS1-4) (RI.2.1) (RI.2.3) (RI.2.8) (W.2.1)

NJSL Standards	Classroom Applications
2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by its observable properties. • Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share. 2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for and intended purpose. • Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency. • Assessment Boundary: Assessment of quantitative measurements is limited to length. 2-PS1-3. Make observations to construct an evidence-	Objectives: Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1) (RI.2.8) (W.2.7) (W.2.8) (MP.4) (2.MD.D.10). • Properties of matter such as strength, hardness, flexibility and texture. • What materials are best suited for different purposes. • Properties of solids, liquids, and gas. Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2) (W.2.7) (W.2.8) (MP.2) (MP.4) (MP.5) (2.MD.D.10) • Simple tests can be designed to gather evidence to support or refute student ideas about causes. • Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. • Different properties are suited for different purposes. Make observations (firsthand and from media) to construct an evidence-based account for natural phenomena. (2-PS1-3) (W.2.7) (W.2.8) (MP.2) (MP.4) (MP.5) (2.MD.D.10) • Objects may break into smaller pieces and be put together into larger pieces, or change shapes.

based account of how an object made of a small set of pieces can be disassembled and made into a new object. • Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects. 2-PS1-4. Construct an argument with evidence that some changes caused by heating and cooling can be reversed, and some cannot. • Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.	• Some substances can experience reversible changes and some cannot. • An object built out of a small set of pieces can be deconstructed and built into a different object. Construct an argument with evidence to support a claim. (2-PS1-4) (RI.2.1) (RI.2.3) (RI.2.8) (W.2.1) • Heating and cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes, they are not. • Simple tests can be designed to gather evidence to support or refute student ideas about causes. Scientists search for cause-and-effect relationships to explain natural events. (2-PS1-4) (RI.2.1) (RI.2.3) (RI.2.8) (W.2.1) • Patterns in the natural and human designed world can be observed. Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint,

	Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation

Connections to other content areas, including 21st Century Skills:

ELA/Literacy –

RI.2.1 Ask and answer such questions as who? what? where? when? why? and how? to demonstrate understanding of details in a text.

RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in the technical procedures in a text.

R.I.2.8 Describe how reasons support specific points the author makes in a text.

W.2.1 Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section.

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

Mathematics –

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

2. MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

21st Century Skills –

9.2.4.
A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work related activities in the school, home, and community.

9.2.4.
A.3 Investigate both traditional and nontraditional careers and relate information to per sonal 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of books to be used:

Working With Materials: Changing Materials by Chris Oxlade

Matter by Christine Webber

Water by Charlotte Guillain

Materials by Clive Gifford

What is a Gas? by Jennifer Boothroyd

What is a Solid? by Jennifer Boothroyd

What is a Liquid? by Jennifer Boothroyd

Solids, Liquids and Gases by Charnan Simon

What is the world made of? : all about solids, liquids, and gases by Kathleen Weidner Zoehfeld

Inquiry in Action: Investigating Matter through Inquiry

Conservation of Matter

http://strandmaps.nsdl.org/?id=SMS-MAP-1332

Science Refreshers

http://nsdl.org/refreshers/science/

Science Kids http://www.sciencekids.co.nz/gamesactivities/gases.html

http://archive.fossweb.com/modulesK-2/SolidsandLiquids/activities/changeit.swf

http://coolsciencelab.com/ice_cream.htm

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: 2
Unit 2: Interdependent Relationships in Ecosystems	Pacing: 10 weeks Nov.-Feb.
Essential Questions	Enduring Understandings
• Do plants need water and sunlight to grow? • What role do animals play in dispersing seeds and pollination? • How is life diverse in different habitats? • What is biodiversity? • What is the relationship between producers, consumers and decomposers? • What types of organisms live on land? • What types of organisms live in water? • How do organism structures relate to their ecosystem? • How do humans impact biodiversity?	LS2.A: Interdependent Relationships in Ecosystems • Plants depend on water and light to grow. (2-LS2-1) (W.2.7) (W.2.8) (MP.2) (MP.4) (MP.5) • Plants depend on animals for pollination or to move their seeds around. (2-LS2-2) (SL.2.5) (MP.4) (2.MD.D.10) LS4.D: Biodiversity and Humans • There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1) (W.2.7) (W.2.8) (MP.2) (MP.4) (2.MD.D.10) ETS1.B: Developing Possible Solutions • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary to 2-LS2-2)
NJSL Standards	Classroom Applications
2-LS2-1. Plan and conduct an investigation to determine if	Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1) (W.2.7) (W.2.8) (MP.2) (MP.4) (MP.5)

plants need sunlight and water to grow. • Assessment Boundary: Assessment is limited to testing one variable at a time. 2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. 2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats. • Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats. • Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.	• The characteristics of plants. • The needs of plants. • Describe what plants need to survive. • Describe photosynthesis. • The inputs and outputs of photosynthesis. Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2) (SL.2.5) (MP.4) (2.MD.D.10) • How pollination occurs. • How dispersal occurs. • Develop a simple model to show how animals disperse seeds or pollinate plants. Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1) (W.2.7) (W.2.8) (MP.2) (MP.4) (2.MD.D.10) • Events have causes that generate observable patterns. (2-LS2-1) • The characteristics of animals. • The needs of animals. • The diversity of animal habitats • Compare and contrast diversity of life in different habitats. • The meaning of biodiversity. • That biodiversity is key to the planet's health as a system. • The roles of producers, consumers and decomposers on land and in water. • Characteristics of several ecosystems. • Organisms and their environments are directly related. How humans affect biodiversity. • Identify traits of organisms which help them survive in their environment

	• Sort organisms into producers, consumers and decomposers. • Sort animals into herbivores, carnivores and omnivores. Scientists look for patterns and order when making observations about the world. (2-LS4-1) (W.2.7) (W.2.8) (MP.2) (MP.4) (2.MD.D.10) • See above Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation

Connections to other content areas, including 21st Century Skills:

ELA/Literacy-

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

W.2.8 Recall information from experience or gather information from provided sources to answer a question.

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

Mathematics-

MP.2 Reason abstractly and quantitatively

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

2. MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems.

21st Century Skills –

9.2.4.
A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

9.2.4.
A.3 Investigate both traditional and nontraditional careers and relate information to personal lik es 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of books to be used:

Growing Things Variety Pack:

Catching Sunlight; A Book About Leaves

Plant Plumbing; A Book About Roots and Stems

Plant Packages; A Book About Seeds

Buds and Blossoms; A Book About Flowers

Plant Life Cycles: Variety Pack:

Apple Trees

Dandelions

Pumpkins

Strawberries

Sunflowers

Tomatoes

Life Cycle of Living Things: Variety Pack:

Life Cycles: Bamboo

Life Cycles: Sunflowers

Animal Habitats: Variety Pack

What Can Live in Grassland?

What Can Live in the Ocean?

What Can Live in a Desert?

What Can Live in a Forest?

What Can Live in the Lake?

What Can Live in the Mountains?

*See media center for additional resources

Websites:

Education.com

Easyscienceforkids.org

Kidsgrowingstrong.org/Plant Needs

Ducksters.com/science/photosynthesis.php

Animalatlas.tv
Unit Assessment Opportunities: • Journal Entries and Response Sheets • Observations, Questioning, and discussions • Comprehension Checks in literature • Class Webs • Presentations • Collaboration • Projects • Rubrics (http://www.nextgenscience.org/resources) • Unit Test

Curriculum Guide

Subject: Science	Grade Level: 2
Unit 3: Earth's Systems: Processes that Shape the Earth	Pacing: 10 Weeks (mid-February-April)
Essential Questions	Enduring Understandings
• How does change come about to the earth and what are the causes of these changes? • What types of events occur in cycles? • What types of events have a beginning and an end?	ESS1.C: The History of Planet Earth • Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1) (RI.2.1) (RI.2.3) (RI.2.9) (W.2.6) (W.2.7) (W.2.8) (SL.2.2) (MP.4) (2.NBT.A) ESS2.A: Earth Materials and Systems

• What type of events on Earth happen very quickly? 4 • What types of events on Earth happen very slowly? • What are the effects of wind & water on the land? • What are landforms that help prevent wind and water erosion? • How does wind and water shape the land? • How can the effects of wind and water erosion be controlled or reduced? • Where is water found on Earth? • How can we find water on earth? • In what forms does water exist? • How does water cycle through its different forms?	• Wind and water can change the shape of the land (2-ESS2-1) (RI.2.3) (MP.2) (MP.4) (MP.5) (2.MD.B.5) ESS2.B: Plate Tectonics and Large-Scale System Interactions • Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2) (MP.2) (2.NBT.A.3) ESS2.C: The Roles of Water in Earth's Surface Processes • Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3) (W.2.6) ETS1.C: Optimizing the Design Solution • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (secondary to 2-ESS2-1)
NJSL Standards	Classroom Applications
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly. • Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.	Objectives: Use information from several sources to provide evidence that Earth events can occur quickly or slowly. (2-ESS1-1) (RI.2.1) (RI.2.3) (RI.2.9) (W.2.6) (W.2.7) (W.2.8) (SL.2.2) (MP.4) (2.NBT.A) • Describe what a cycle is and give examples. • Describe events that have a beginning and an an end. • Describe events that happen quickly. • Describe events that happen very slowly. • Be able to describe events occur in cycles, such as day and night.

• Assessment Boundary: Assessment does not include quantitative measurements of timescales. 2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. • Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land. 2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area. • Assessment Boundary: Assessment does not include quantitative scaling in models. 2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be a solid or liquid.	• Identify events have a beginning and an end, like a volcanic eruption. • Explain that the impact of events can happen very quickly. • Describe that events can happen very slowly over a time period much longer than anyone can observe. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. (2-ESS2-1) (RI.2.3) (MP.2) (MP.4) (MP.5) (2.MD.B.5) • Explain how wind shapes the land. • Explain how water shapes the land. • Describe how wind erosion is reduced • Describe how water erosion is reduced. • What the effects of wind and water are on the land. • How wind erosion creates landforms • How water erosion creates landforms • Animals use landforms as homes. Develop a model to represent the shapes and kinds of land and bodies of water in an area. (2-ESS2-2) (MP.2) (2.NBT.A.3) • Describe some of the distinguishing characteristics of oceans, rivers, lakes, and ponds. • Recognize and name different bodies of water in pictures and on maps. • Describe some of the distinguishing characteristics of oceans, rivers, lakes, and ponds. • Recognize and name different bodies of water in pictures and on maps Obtain information to identify where water is found on Earth and that it can be solid or liquid. (2-ESS2-3) (W.2.6) • Describe where water may exist as a liquid or as a solid (ice). • Draw and discuss the steps of the water cycle.

	• Water is found in oceans, rivers, lakes, and ponds. • We can use a map to find where water is located on Earth. • Water exists in liquid or ice forms. • Water cycles through its different forms via the water cycle. • Water is found in oceans, rivers, lakes, and ponds. • We can use a map to find where water is located on Earth. • Water exists in liquid or ice forms. • Describe where water may exist as a liquid or as a solid (ice). • Draw and discuss the steps of the water cycle. Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation

Connections to other content areas, including 21st Century Skills:

ELA/Literacy –

RI.2.1 Ask and answer such questions as who? what? where? when? why? and how? to demonstrate understanding of details in a text.

RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in the technical procedures in a text.

RI.2.9 Compare and contrast the most important points presented by two texts on the same topic.

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

SL.2.2 Recount or describe key ideas or details from a text read aloud for information presented orally or through other media.

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

Mathematics –

MP.2 Reason abstractly and quantitatively. (2-ESS2-1), (2-ESS2-1), (2-ESS2-2)

MP.4 Model with mathematics. (2-ESS1-1), (2-ESS2-1) MP.5 Use appropriate tools strategically (2-ESS2-1)

2.NBT.A Understand place value (2-ESS1-1)

2. NBT.A.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. (2-ESS2-2)

2.MD.B.5 Use addition and subtraction within 100 to solve word problems involving length that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem (2-ESS2-1)

21st Century Skills –

9.2.4.
A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work-
related activities in the school, home, and community.

9.2.4.
A.3 Investigate both traditional and nontraditional careers and relate information to personal lik es 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of books to be used:

Volcanoes! by Cy Armour

Vo*lcanoes* by Anne Schreiber

Landforms series (*Caves, Islands, Mountains, Volcanoes*) by Cassie Mayer

Looking at Earth series (*Earth's Mountains, Introducing Landforms, Earth's Rivers, Volcanoes on Earth, What Shapes the Land?*) by Bobbie Kalman

Hurricane! by Jonathan London

Earth by David Bennett

Rocking and Rolling -- The Earth by Phillip Steele

Inquiry in Action: Investigating Matter through Inquiry

Conservation of Matter

http://strandmaps.nsdl.org/?id=SMS-MAP-1332

Science Refreshers

http://nsdl.org/refreshers/science/

http://www.sciencekids.co.nz/earth.html

http://science.nationalgeographic.com/science/earth/

Unit Assessment Opportunities:
• Journal Entries and Response Sheets • Observations, Questioning, and Discussions • Comprehension Checks in Literature • Class Webs • Presentations • Collaboration • Unit Test

Curriculum Guide

Subject: Science	Grade Level: 2
Unit 4: Engineering Design	Pacing: 10 weeks, Apr.-June
Essential Questions	Enduring Understandings
• How have objects or tools been developed in the past to solve a simple problem? • What simple problem can I solve by developing a new object or tool? • Compare the strengths and weaknesses of two objects or tools that are designed to solve the same problem.	ETS1.A: Defining and Delimiting Engineering Problems • A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) • Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1) ETS1.B: Developing Possible Solutions • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful

	in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2) ETS1.C: Optimizing the Design Solution • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)
NJSL Standards	Classroom Applications
K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps in function as needed to solve a given problem. K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	Objectives: Ask questions based on observations to find more information about the natural and/or designed world (K-2-ETS1-1) Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2) Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects

	Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation

Connections to other content areas, including 21st Century Skills:

ELA/Literacy:

RI.2.1 Ask and answer such questions as who, what, where, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1)

W.2.6 With guidance and support from adults, use a variety of digital tools to produce a publish writing, including in collaboration with peers. (K-2-ETS1-1), K-2-ETS1-3)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1) (K-2-ETS1-3)

SL.2.5 Create audio recordings of stories or poems; ass drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2)

Mathematics-

2. MD.D.10 Draw a picture graph or bar graph (with single-unit scale) to represent a date set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1) (K-2-ETS1-3)

21st Century Skills –

9.2.4.
A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work-
related activities in the school, home, and community.

9.2.4.
A.3 Investigate both traditional and nontraditional careers and relate information to personal lik es 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.

Unit Resources: (*related websites, reference materials, etc.)*

List of Books to be read:

Inventions and Discovery Through Time-Graphic History: variety pack

Eli Whitney and the Cotton Gin

Henry Ford and the Model T

Samuel Morese and the Telegraph

Philo Farnsworth and the Television

Steve Jobs and Steven Wozniak and the Personal Computer

Books found in media center:

Inventing Things by Julie Brown

Now & Ben by Gene Barretta

Imaginative Inventions by Charise Mericle Harper

Who Invented It & What Makes it Work? By Sarah Leslie

What's Next? By Lisa Thompson

Hoop Genius by John Coy

Websites:

Inventions.org

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

3rd Grade Curriculum Guide

Subject: Science	Grade Level: 3
Unit: Interdependent Relationships in Ecosystems	Pacing: 8 weeks (2 months)
Essential Questions	Enduring Understandings
• How is interdependence essential to maintain life on Earth? • How do environmental changes affect plants and animal's survival and reproduction? • What are the advantages of group living? • What are the disadvantages of group living? • How do animal groups differ from one another? • How and why a habitat of an organism can affect its survival over time? • What is the difference between biotic and abiotic factors?	S2.C: Ecosystem Dynamics, Functioning, and Resilience • 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. (secondary to 3-LS4-4) LS2.D: Social Interactions and Group Behavior • 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. (3-LS2-1) (RI.3.1) (RI.3.3) (MP.4) (3.NPT) LS4.A: Evidence of Common Ancestry and Diversity • Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (3-LS4-1) (RI.3.1) (RI.3.2) (RI.3.3) (W.3.1) (W.3.2) (W.3.3) (W.3.8) (MP.2) (MP.4) (MP.5) (3.MD.B.4) • Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4-1) (RI.3.1) (RI.3.2) (RI.3.3) (W.3.1) (W.3.2) (W.3.3) (W.3.8) (MP.2) (MP.4) (MP.5) (3.MD.B.4) LS4.C: Adaptation • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3) (RI.3.1) (RI.3.2) (RI.3.3) (W.3.1) (W.3.2) (SL.3.4) (MP.2) (MP.4) (3.MD.B.3)

• What are examples of adaptations to increase survival? • What happens to a species if it cannot survive changes in the environment? • How can we study extinct species? • What information about the environment can we learn from fossils?	LS4.D: Biodiversity and Humans • Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4) (RI.3.1) (RI.3.2) (RI.3.3) (W.3.1) (W.3.2) (SL.3.4) (MP.2) (MP.4)
NJSL Standards	Classroom Applications
3-LS2-1. Construct an argument that some animals form groups that help members survive. 3-LS4-1. 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	Objectives: Construct an argument with evidence, data, and/or a model. (3-LS2-1) (RI.3.1) (RI.3.3) (MP.4) (3.NPT) • Based on created groups, animals protect each other from predators and prey. • Animals form groups to help them survive. Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1) (RI.3.1) (RI.3.2) (RI.3.3) (W.3.1) (W.3.2) (W.3.3) (W.3.8) (MP.2) (MP.4) (MP.5) (3.MD.B.4) • Analyze and interpret data from fossils to provide evidence of organisms and environment in which they lived long ago. • Choose a site in New Jersey to research that supports the following evidence: • Organism found • Past and Present characteristics within the environment • Based on research create graphs, tables, and charts that include type size and distribution of fossils. Construct an argument with evidence. (3-LS4-3) (RI.3.1) (RI.3.2) (RI.3.3) (W.3.1) (W.3.2) (SL.3.4) (MP.2) (MP.4) (3.MD.B.3) • Label specific traits of forest, desert, freshwater and marine ecosystems.

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.]	• Compare and Contrast using Venn diagrams to identify similarities and differences in ecosystems. • Using this information create a diorama of a habitat to show animal adaptations to demonstrate animal adaptations of survival. 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) (RI.3.1) (RI.3.2) (RI.3.3) (W.3.1) (W.3.2) (SL.3.4) (MP.2) (MP.4) • Based on created groups, animals protect each other from predators and prey. • Animals form groups to help them survive. • Create a model to represent numbers in groups provide higher rates of survival.
3-LS4-3. 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.]	Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework

3-LS4-4. 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.]	Gifted/Enrichment: computer-based research, high level task, class presentation
Connections to other content areas, including 21st Century Skills: ELA/Literacy — RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.	

RI.3.2

Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3

Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

W.3.1

Write opinion pieces on topics or texts, supporting a point of view with reasons.

W.3.2

Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.3.8

Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

SL.3.4

Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

Mathematics —

MP.2

Reason abstractly and quantitatively.

MP.4

Model with mathematics.

MP.5

Use appropriate tools strategically.

3.NBT

Number and Operations in Base Ten.

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 Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve person al and professional goals.

9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

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.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
  - cK-12.org
  - eGFI
  - Earth Science Week
  - Education Place
  - http://studyjams.scholastic.com/studyjams/jams/science/ecosystems/changes-ecosystems.htm
  - http://youatthezoo.org/videos-and-teacher-resources.html
  - http://www.slideshare.net/MMoiraWhitehouse/interdependencyplants-and-animals-teach

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: 3
	Pacing: 8 weeks (2 months)

Unit: Inheritance and Variation of Traits: Life Cycles and Traits	
Essential Questions	Enduring Understandings
• What characteristic do organisms have and how does the environment provide advantages for the continuation of the species? • Why do organisms look similar and different among generations? • How does the environment affect genetic inheritance?	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) (RI.3.7) (SL.3.5) (MP.4) (3.NBT) (3.NF) LS3.A: Inheritance of Traits • Many characteristics of organisms are inherited from their parents. (3-LS3-1) (RI.31) (RI.3.2) (RI.3.3) (W.3.2) (SL.3.4) (MP.2) (MP.4) (3.MD.B.4) • 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) (RI.31) (RI.3.2) (RI.3.3) (W.3.2) (SL.3.4) (MP.2) (MP.4) (3.MD.B.4) LS3.B: Variation of Traits • Different organisms vary in how they look and function because they have different inherited information. (3-LS3- 1) (RI.31) (RI.3.2) (RI.3.3) (W.3.2) (SL.3.4) (MP.2) (MP.4) (3.MD.B.4) • The environment also affects the traits that an organism develops. (3-LS3-2) (RI.31) (RI.3.2) (RI.3.3) (W.3.2) (SL.3.4) (MP.2) (MP.4) (3.MD.B.4) 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)) (RI.3.1) (RI.3.2) (RI.3.3) (W.3.2) (SL.3.4) (MP.2) (MP.4) (3.MD.B.3)
NJSL Standards	Classroom Applications
3-LS1-1. Develop models to describe that organisms have unique and	Objectives: Develop models to describe phenomena. (3-LS1-1) (RI.3.7) (SL.3.5) (MP.4) (3.NBT) (3.NF) • Describe life cycle of plants and animals • Describe birth, growth, reproduction and death of specific plant and animal groups.

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-LS3-1. 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	Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1) (RI.31) (RI.3.2) (RI.3.3) (W.3.2) (SL.3.4) (MP.2) (MP.4) (3.MD.B.4) • Use geography to show the contributions of the environment to the success of individuals' needs for life cycle reproductions. Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) (RI.31) (RI.3.2) (RI.3.3) (W.3.2) (SL.3.4) (MP.2) (MP.4) (3.MD.B.4) • Create an experiment that shows the life cycle with affecting variables (i.e.- lack of water, light, etc.) Determine and discuss the impact of the different variables using cause and effect Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2) (RI.3.1) (RI.3.2) (RI.3.3) (W.3.2) (SL.3.4) (MP.2) (MP.4) (3.MD.B.3) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications

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-LS3-2. 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	SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

pet dog that is given too much food and little exercise may become overweight.] 3-LS4-2. 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.]	

Connections to other content areas, including 21st Century Skills:

Common Core State Standards Connections:

ELA/Literacy —

RI.3.1

Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2

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 illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

W.3.2

Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

SL.3.4

Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

SL.3.5

Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.

Mathematics —

MP.2

Reason abstractly and quantitatively.

MP.4

Model with mathematics.

3.NBT

Number and Operations in Base Ten

3.NF

Number and Operations—Fractions

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 Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

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.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
  - cK-12.org
  - eGFI
  - Earth Science Week
  - Education Place
  - http://studyjams.scholastic.com/studyjams/jams/science/animals/animal-adaptations.htm
  - http://studyjams.scholastic.com/studyjams/jams/science/plants/plant-adaptations.htm
  - http://studyjams.scholastic.com/studyjams/jams/science/animals/animal-life-cycles.htm

Unit Assessment Opportunities:

- Journal Entries and Response Sheets

• Observations, Questioning, and discussions • Comprehension Checks in literature • Class Webs • Presentations • Collaboration • Projects • Rubrics (http://www.nextgenscience.org/resources) • Unit Test

Curriculum Guide

Subject: Science	Grade Level: 3
Unit: Forces and Interactions	Pacing: 8 weeks (2 months)
Essential Questions	Enduring Understandings
• How do the basic principles of forces, motion, and movement interrelate? • What types of interactions are caused by forces?	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 additions of forces are used at this level.) (3-PS2-1) (RI.3.1) (W.3.7) (W.3.8) (MP.2) (MP.5) (3.MD.A.2) • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS2-2) (W.3.7) (W.3.8) PS2.B: Types of Interactions • Objects in contact exert forces on each other. (3-PS2-1) (RI.3.1) (W.3.7) (W.3.8) (MP.2) (MP.5) (3.MD.A.2) • Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the

	properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-3), (3-PS2-4) (RI.3.1) (RI.3.3) (RI.3.8) (SL.3.3)
NJSL Standards	Classroom Applications
3-PS2-1. 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	Objectives: 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) (RI.3.1) (W.3.7) (W.3.8) (MP.2) (MP.5) (3.MD.A.2) • Conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2) (W.3.7) (W.3.8) • Make observations and measurements of data of motion with predictable patterns. Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3) (RI.3.1) (RI.3.3) (RI.3.8) (SL.3.3) • Use questions (how, what, why, and when) to determine cause and effect relationships and interactions between two objects not in contact with each other. • Determine how electric and magnetic forces between a pair of objects do not require the objects to be in contact with each other, depending on the properties of the object, distance apart, and forces between the two. Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4) (RI.3.1) (RI.3.3) (RI.3.8) (SL.3.3) • Utilizing the performed investigations from above, determine how to create new or improved designs to resolve problems by applying scientific ideas.

pulls objects down.] 3-PS2-2. 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-PS2-3. Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.	Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

• [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-PS2-4. 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.]	

Connections to other content areas, including 21st Century Skills:

Common Core State Standards Connections:

ELA/Literacy -

RI.3.1

Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.3

Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

RI.3.8

Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).

W.3.7

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.

SL.3.3

Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

Mathematics -

MP.2

Reason abstractly and quantitatively.

MP.5

Use appropriate tools strategically.

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 Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

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.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
  - cK-12.org
  - eGFI
  - Earth Science Week
  - Education Place
  - https://www.brainpop.com/science/motionsforcesandtime/
  - http://studyjams.scholastic.com/studyjams/jams/science/forces-and-motion/force-and-motion.htm
  - http://www.slideshare.net/crautry/force-and-motion-review-ppt-18860522?qid=ba7da813-41c1-4365-907d-0d51a1e2b173&v=default&b=&from_search=1

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: 3
Unit: Earth's Systems	Pacing: 8 weeks (2 months)
Essential Questions	Enduring Understandings
What factors affect daily weather? What factors affect an areas climate?	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) (MP.2) (MP.4) (MP.5) (3. MD.A.2) (3.MD.B.3) • Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2) (RI.3.1) (RI.3.9) (W.3.8) (MP.2) (MP.4)

How can data be used to determine the climate of various regions?	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) (W.3.1) (W.3.7) (MP.2) (MP.4)
NJSL Standards	Classroom Applications
3-ESS2-1. 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.]	Objectives: Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1) (MP.2) (MP.4) (MP.5) (3.MD.A.2) (3.MD.B.3) • Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2) (RI.3.1) (RI.3.9) (W.3.8) (MP.2) (MP.4) • Using informational text complete a research activity to describe climates in different regions of the world. Patterns of change can be used to make predictions. (3-ESS2-1), (3-ESS2-2) (MP.2) (MP.4) (MP.5) (3. MD.A.2) (3.MD.B.3) • Use weather tools (barometers, weather vanes, rain gauge thermometers) to collect data to make predictions and patterns about what weather may come next. 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) (W.3.1) (W.3.7) (MP.2) (MP.4) • Show and discuss how climates vary around the world due to different amounts of rain, varying temperatures, and wind patterns. • Using constructed models to replicate buildings and landforms/structures determine the effects of natural disasters and create a solution to reduce the hazards

3-ESS2-2. Obtain and combine information to describe climates in different regions of the world 3-ESS3-1. 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.]	Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

Connections to other content areas, including 21st Century Skills:

ELA/Literacy -

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.

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.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Mathematics –

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

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 Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve person al and professional goals.

9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

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.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
  - cK-12.org
  - eGFI
  - Earth Science Week
  - Education Place

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Subject: Science	Grade Level: 3
Unit: Engineering Design	Pacing: 8 weeks (2 months)
Essential Questions	Enduring Understandings
What are the steps to the engineering design process?	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)

NJSL Standards	Classroom Applications
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	Objectives: 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 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.

prototype that can be improved.	•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) Teaching Strategies/Materials: Lesson Structure: Objective, Connection, Teach, Engage, Link, Assess Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigation, Guided Explorations, Data Collection, Materials: Mentor Texts, Internet, Supplemental Resources. Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented): Extra Support: 1:1 teacher redirect/re-teach, peer helper Enrichment: Computer-Based research, class presentation Limited English Proficiency: Vocabulary Support, word/picture association, listening center (books online)
Connections to other content areas, including 21st Century Skills: ELA/Literacy -	

RI.5.1

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

RI.5.1

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

RI.5.9

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

W.5.7

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

W.5.8

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

W.5.9

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

Mathematics -

3.OA

Operations and Algebraic Thinking.

MP.2

Reason abstractly and quantitatively.

MP.4

Model with mathematics.

MP.5

Use appropriate tools strategically.

Operations and Algebraic Thinking

Unit Resources: (*related websites, reference materials, etc.)*

Earth-Friendly Buildings, Bridges and More by Etta Kaner

Bridges! Amazing Structures to Design, Build & Test by Carol Johmann

Maker Faire by Samantha Roslund

Sky Boys How They Built the Empire State Building by Deborah Hopkinson & James Ransome

THe Boy Who Invented TV: THe Story of Philo Farnsworth by Kathleen Krull

Websites for instructional use

Website with experiments

http://tryengineering.org/lessons/playingwithparachutes.pdf

http://www.hookedonscience.org/nextgenerationsciencestandards.html

Unit Assessment Opportunities:

• Journal Entries and Response Sheets • Observations, Questioning, and Discussions • Data Collection & Representation • Comprehension Checks in Literature • Presentations • Collaboration • Unit Test

4th Grade Curriculum Guide

Subject: Science	Grade Level: 4
Unit: Structure, Function, And Information Processing	Pacing: 2 months
Essential Questions	Enduring Understandings
• What is light? • What other forms of electromagnetic radiation are there? • How do the structures of organisms enable life's functions? • How do organisms detect, process, and use information about the environment?	PS4.B: Electromagnetic Radiation •An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2) (SL. 4.5) (MP 4) (4.G.A.1) LS1.A: Structure and Function

	•Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) (W.4.1) (4.G.A.3) LS1.D: Information Processing •Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2) (SL.4.5) Cause and Effect •Cause and effect relationships are routinely identified. (4-PS4-2) Systems and System Models •A system can be described in terms of its components and their interactions. (4-LS1-1), (4-LS1-2)
NJSL-S Standards	Classroom Applications
4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. • Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works. 4-LS1-1.	Objectives: Develop a model or diagram to illustrate how light reflects on objects and enters the eye. (4-PS4-2) (SL. 4.5) (MP 4) (4.G.A.1) • Identify how light travels in a straight line • Explain light reflection, absorption and bending • Evaluate how light interacts with various surfaces Describe how animals receive, process, and respond to different types of information (4-LS1-2) (SL.4.5) • Interpret instinctive and learned behavior • Investigate the 5 senses • Analyze the role of each of the 5 senses

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. • Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin. • Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems. 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. • Clarification Statement: Emphasis is on systems of information transfer. • Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how	Explain that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. (4-LS1-1) (W.4.1) (4.G.A.3) • Identify basic parts of both plants and animals • Identify the basic needs of both plants and animals • Classify needs based on the reactions of the 5 senses • Construct and argument for the similarities and differences between plants and animals behavior **Teaching Strategies/Materials**: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

sensory receptors function.	

Connections to other content areas, including 21st Century Skills:

ELA/Literacy -

W.4.1 - Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

SL.4.5 - Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Mathematics -

MP.4 - Model with mathematics.

4. G.A.1 - Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

4. G.A.3 - Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

21st Century Skills –

9.2.4..1 Identify reasons why people work, different types of work, and how work can help a person achieve per sonal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

9.2.4.3 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.

Unit Resources: (*related websites, reference materials, etc.)*

Websites:

- PBS Learning Media
- The Concord Consortium
- cK-12.org
- eGFI
- Earth Science Week
- Education Place

Unit Assessment Opportunities:

- Journal Entries, Response Sheets, Writing Pieces
- Observations, Questioning, and Discussions
- Comprehension Checks in Literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Subject: Science	Grade Level: 4
Unit: Waves	Pacing: 2 months
Essential Questions	Enduring Understandings
• What are the characteristic properties and behaviors of waves? • How are instruments that transmit and detect waves used to extend human senses? • How are engineering, technology, science, and society interconnected?	PS4.A: Wave Properties •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 the water meets a beach. (Note: This grade band endpoint was moved from K–2.) (4-PS4-1) (SL.4.5) (MP. 4) •Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1) (SL.4.5) (MP. 4) PS4.C: Information Technologies and Instrumentation •Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS4-3) (RI. 4.1) RI. 4.9) 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. (secondary to 4-PS4-3) Patterns •Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena. (4-PS4-1)

	•Similarities and differences in patterns can be used to sort and classify designed products. (4-PS4-3) Interdependence of Science, Engineering, and Technology •Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3)
NJSL-S Standards	Classroom Applications
4-PS4-1 Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. • Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves. • Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength. 4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information.	Objectives: Develop a model or diagram to illustrate patterns in waves and that waves can cause objects to move. (4-PS4-1) (SL.4.5) (MP. 4) • Waves are regular patterns of motion caused by a disturbance. • In longitudinal waves, particles move in the same or opposite direction of the wave. • In transverse waves, particles move up or down as the wave moves right or left. Generate and compare multiple solutions that use patterns to transfer information. (4-PS4-3) (RI. 4.1) RI. 4.9) • In order for us to see, light must reflect off of objects. • We see colors when they are reflected and other colors are absorbed. When we see white, we are seeing all the colors reflected. When we see black, all the colors were absorbed. • A plane mirror reflects light at the same angle it hits it and reflects an object the same distance away as it is from the mirror. • Light bends as it passes from one material to another. • Computers communicate using Binary, converting information into a list of 1's and 0's that relay information.

• Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.	**Teaching Strategies/Materials**: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support: vocabulary support, word/picture association, visual aids

Connections to other content areas, including 21st Century Skills:

ELA/Literacy -

RI.4.1 - Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

RI.4.9 - Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

SL.4.5 - Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Mathematics -

MP.4 - Model with mathematics.

4. G.A.1 - Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

21st Century Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve p ersonal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work related activities in the school, home, and community.

9.2.4.A.3 Investigate both traditional and nontraditional careers and relate information to personal likes and disli kes.

9.2.4. A.4 - Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

Unit Resources: (*related websites, reference materials, etc.)*

Websites:

- PBS Learning Media
- The Concord Consortium
- cK-12.org
- eGFI

- Earth Science Week
- Education Place

Unit Assessment Opportunities:

- Journal Entries, Response Sheets, Writing Pieces
- Observations, Questioning, and Discussions
- Comprehension Checks in Literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Subject: Science	Grade Level: 4
Unit: Earth's Systems: Processes that Shape the Earth	Pacing: 2 months
Essential Questions	Enduring Understandings
• How do people reconstruct and date events in Earth's planetary history? • How and why is Earth constantly changing? • Why do the continents move, and what causes earthquakes and volcanoes? • How do living organisms alter Earth's	ESS1.C: The History of Planet Earth •Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) (W.4.7) (W. 4.8) (W .4.9) MP. 2) (MP.4) (4. MD.A.1) (4. MD.A.2) ESS2.A: Earth Materials and Systems

processes and structures? • How do natural hazards affect individuals and societies? • What is the process for developing potential design solutions?	•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. (4-ESS2-1) (W.4.8) (MP.2) (MP .4) (MP.5) (4.MD.A.1) ESS2.B: Plate Tectonics and Large-Scale System Interactions •The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2) (RI.4.7) (W.4.7) (4.MD.A.2) ESS2.E: Biogeology •Living things affect the physical characteristics of their regions. (4-ESS2-1) (W.4.8) (MP.2) (MP .4) (MP.5) (4.MD.A.1) ESS3.B: Natural Hazards •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. (4-ESS3-2) (RI.4.9) (MP.2) (MP.4) (4. OA.A.1) ETS1.B: Designing Solutions to Engineering Problems •Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)
NJSL-S Standards	Classroom Application
4-ESS1-1 Identify evidence from patterns in rock formations	Objectives:

and fossils in rock layers to support an explanation for changes in a landscape over time. • Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock. • Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time. 4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.	Observe evidence that shows that landscapes change over time. (4-ESS2-1) (W.4.8) (MP.2) (MP .4) (MP.5) (4.MD.A.1) • The Earth has four systems the work together. • Earth's four systems are the atmosphere, biosphere, geosphere, and hydrosphere. • The layer of Earth that tells us the most about Earth's history is the crust. • Sedimentary rocks form in layers and fossils in these layers can help geologists determine how old the rocks are relative to one another. • Earth's crust is made up of tectonic plates that float on the mantle and interact at their boundaries. • Many of the features on Earth's surface exist at tectonic plate boundaries. Identify evidence of weathering and erosion. (4-ESS2-2) (RI.4.7) (W.4.7) (4.MD.A.2) • Weathering is the break down or dissolving of rocks on Earth's surface. • Mechanical weathering is when physical processes break down rock. • Chemical weathering is when chemicals change the materials that make up a rock. • Erosion is the movement of broken down rocks Observe how living organisms affect their environment, the Earth. (4-ESS1-1) (W.4.7) (W. 4.8) (W .4.9) MP. 2) (MP.4) (4. MD.A.1) (4. MD.A.2) • All living things affect the physical characteristics of their environment Makes observations that natural hazards affect individuals and societies, but understand steps can be taken to reduce their impacts. (4-ESS3-2) (RI.4.9) (MP.2) (MP.4) (4. OA.A.1) • Rainfall impacts what an environment is like and what organisms live there.

• Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow. • Assessment is limited to a single form of weathering or erosion. 4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features. • Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes. 4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	**Teaching Strategies/Materials**: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

• Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity. • Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.	

Connections to other content areas, including 21st Century Skills:

ELA/Literacy -

RI.4.1 - Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

RI.4.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

RI.4.9 - Integrate information from two texts on the same topic to write or speak about the subject knowledgeably.

W.4.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

W.4.8 - Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

W.4.9 - Draw evidence from literary or informational texts to support analysis, reflection, and research.

Mathematics -

MP.2 - Reason abstractly and quantitatively.

MP.4 - Model with mathematics.

MP.5 - Use appropriate tools strategically.

4. MD.A.1 - Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

4. MD.A.2 - Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.OA.A.1 - Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

21st Century Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve p ersonal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work related activities in the school, home, and community.

9.2.4.A.3 Investigate both traditional and nontraditional careers and relate information to personal likes and disli kes.

9.2.4. A.4 - Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
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  - eGFI
  - Earth Science Week
  - Education Place

Unit Assessment Opportunities:

- Journal Entries, Response Sheets, Writing Pieces
- Observations, Questioning, and Discussions
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- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Subject: Science	Grade Level: 4
Unit: Energy	Pacing: 2 months
Essential Questions	Enduring Understandings
• How is energy transferred and conserved? • What is energy? • What is meant by conservation of energy? • How is energy transferred between objects or systems? • How are forces related to energy? • How do food and fuel provide energy? • How do humans depend on Earth's resources?	PS3.A: Definitions of Energy •The faster a given object is moving, the more energy it possesses. (4-PS3-1) (RI.4.1) (RI.4.3) (RI.4.9) (W.4.2) (W.4.8) (W.4.9) (MP.2) (MP.4) (4. OA.A.1) •Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2), (4-PS3-3) (W.4.7) (W.4.8) PS3.B: Conservation of Energy and Energy Transfer •Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; thus, the air gets heated and sound is produced. (4-PS3-2), (4-PS3-3) (W.4.7) (W.4.8) •Light also transfers energy from place to place. (4-PS3-2) (W.4.7) (W.4.8) •Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion

	into electrical energy. (4-PS3-2), (4-PS3-4) (W.4.7) (W.4.8) (4. OA.A.3) PS3.C: Relationship Between Energy and Forces •When objects collide, the contact forces transfer energy to change the objects' motions. (4-PS3- 3) (W.4.7) (W.4.8) PS3.D: Energy in Chemical Processes and Everyday Life •The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4) (W.4.7) (W.4.8) (4. OA.A.3) ESS3.A: Natural Resources •Energy and fuels that humans use is derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1) (W.4.7) (W.4.8) (W.4.9) (MP.2) (MP.4) (4. OA.A.1) ETS1.A: Defining 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 based on how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary to 4-PS3-4) • Most scientists and engineers work in teams. (4-PS3-4) • Science affects everyday life. (4-PS3-4)

NJSL-S Standards	Classroom Application
4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. • Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy. 4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. • Assessment Boundary: Assessment does not include quantitative measurements of energy. 4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide. • Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact. • Assessment Boundary: Assessment does not include quantitative measurements of energy. 4-PS3-4	Objectives: Use evidence to construct an explanation relating the speed of an object to the energy of that object. (4-PS3-1) (RI.4.1) (RI.4.3) (RI.4.9) (W.4.2) (W.4.8) (W.4.9) (MP.2) (MP.4) (4. OA.A.1) • Energy is an objects' ability to do work. • Energy shifts between kinetic and potential. • Energy is not created or destroyed. • Energy is transferred among its various forms. • Force is a way that energy can be transferred. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. (4-PS3-2) (4-PS3-4) (W.4.7) (W.4.8) (4. OA.A.3) • Energy can be kinetic or potential, and has many different forms Ask questions and predict outcomes about the changes in energy that occur when objects collide. (4-PS3-3) (W.4.7) (W.4.8) • Energy shifts between kinetic and potential. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. (4-PS3-4) (W.4.7) (W.4.8) (4. OA.A.3) • Energy is not created or destroyed. • Energy is transferred among its various forms. • Force is a way that energy can be transferred. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the

Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. • Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device. • Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound. 4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. • Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; nonrenewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.	environment. (4-ESS3-1) (W.4.7) (W.4.8) (W.4.9) (MP.2) (MP.4) (4. OA.A.1) **Teaching Strategies/Materials**: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support word/picture association, visual aids
Connections to other content areas, including 21st Century Skills:	

ELA/Literacy -

RI.4.1 - Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

RI.4.3 - Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.9 - Integrate information from two texts on the same topic to write or speak about the subject knowledgeably.

W.4.2 - Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.4.7 - Conduct short research projects that build knowledge through investigation of different aspects of a topic.

W.4.8 - Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

W.4.9 - Draw evidence from literary or informational texts to support analysis, reflection, and research.

Mathematics -

MP.2 - Reason abstractly and quantitatively.

MP.4 - Model with mathematics.

4.OA.A.1 - Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

4. OA.A.3 - Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

21st Century Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve p ersonal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work related activities in the school, home, and community.

9.2.4.A.3 Investigate both traditional and nontraditional careers and relate information to personal likes and disli kes.

9.2.4. A.4 - Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
  - cK-12.org
  - eGFI
  - Earth Science Week
  - Education Place

Unit Assessment Opportunities:

- Journal Entries, Response Sheets, Writing Pieces
- Observations, Questioning, and Discussions
- Comprehension Checks in Literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: 4
Unit: Engineering Design	Pacing: 2 months
Essential Questions	Enduring Understandings
• How do engineers solve problems? • What is a design for? • What is the process for developing potential design solutions? • How can the various proposed design solutions be compared and improved?	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 based on 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 to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3) 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)
NJSL-S Standards	Classroom Applications
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success	Objectives: Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several

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.	criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1) Plan and investigate 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) 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) **Teaching Strategies/Materials**: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications

	SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

Connections to other content areas, including 21st Century Skills:

ELA/Literacy -

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

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

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

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

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

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

Mathematics -

3.OA - Operations and Algebraic Thinking

MP.2 - Reason abstractly and quantitatively.

MP.4 - Model with mathematics.)

MP.5 - Use appropriate tools strategically.

3-5. OA - Operations and Algebraic Thinking

21st Century Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve p ersonal and professional goals.

9.2.4. A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

9.2.4.A.3 Investigate both traditional and nontraditional careers and relate information to personal likes and disli kes.

9.2.4. A.4 - Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

Unit Resources: (*related websites, reference materials, etc.)*

Websites:

- PBS Learning Media
- The Concord Consortium
- cK-12.org
- eGFI
- Earth Science Week
- Education Place

Unit Assessment Opportunities:

- Journal Entries, Response Sheets, Writing Pieces
- Observations, Questioning, and Discussions
- Comprehension Checks in Literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

5th Grade Curriculum Guide

Subject: Science	Grade Level: 5
Unit 1: Structure and Properties of Matter	Pacing: 6 weeks (Sept. – mid-Oct.)
Essential Questions	Enduring Understandings
• How can one explain the structure, properties, and interactions of matter? • How do particles combine to form the variety of matter one observes?	PS1.A: Structure and Properties of Matter • Matter of any type can be subdivided into particles that are too small to see, but even then, the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger

• How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them?	particles or objects. (5-PS1-1) (R.I.5.7) (MP.2) (MP.4) (5.NBT. A.1) (5. NF.B.7) (5. MD.C.3) (5.MD.C.4) • The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2) (W.5.7) (W.5.8) (W.5.9) (MP.2) (MP.4) (MP.5) (5.MD.A.1) • Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3) (W.5.7) (W.5.8) (MP.2) (MP.4) (MP.5) PS1.B: Chemical Reactions • When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4) (W.5.7) (W.5.8) (W.5.9) • No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2) W.5.7) (W.5.8) (W.5.9) (MP.2) (MP.4) (MP.5) (5.MD.A.1) ETS1.A: Defining and Delimiting Engineering Problems • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) ETS1.B: Developing Possible Solutions • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) • Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) • Models of all kinds are important for testing solutions. (MS-ETS1-4)

	ETS1.C: Optimizing the Design Solution • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4) Patterns • Patterns in the natural and human designed world can be observed. (2-PS1-1) Cause and Effect • Events have causes that generate observable patterns. (2-PS1-4) • Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2) Energy and Matter • Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3) Influence of Engineering, Technology, and Science, on Society and the Natural World • Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.
NJSL-S Standards	Classroom Applications
5-PS1-1. Develop a model to describe that matter is made of	Objectives:

particles too small to be seen. • Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water. • [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles. 5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. • Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.	Develop a model to describe that matter is made of particles too small to be seen. (5-PS1-1) (RI.5.7) (MP.2) (MP.4) (5.NBT. A.1) (5. NF.B.7) (5. MD.C.3) (5.MD.C.4) • Explain molecules in solid, liquid, gas, and plasma. • Identify physical properties of solids, liquids, and gases. • Introduce atom as building block of matter. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. (5PS1) (W.5.7) (W.5.8) (W.5.9) (MP.2) (MP.4) (MP.5) (5.MD.A.1) • Explain the movement of molecules due to temperature changes. • Explore phase changes in matter (melting, boiling, freezing) • Identify how to measure for volume and density of substances. Make observations and measurements to identify materials based on their properties. (5-PS1-3) (W.5.7) (W.5.8) (W.5.9) (MP.2) (MP.4) (MP.5) • Identify physical and chemical properties of matter. • Compare and contrast the three states of mater. Conduct an investigation to determine whether the mixing of 2 or more substances results in new substances. (5-PS1-4) (W.5.7) (W.5.8) (W.5.9) • Study the basic elements (oxygen, carbon, etc.) • Explore the periodic table • Explore compounds, mixtures, and solutions • Identify real world substances and their properties Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure

• Assessment Boundary: Assessment does not include distinguishing mass and weight. 5-PS1-3. Make observations and measurements to identify materials based on their properties. • Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property. • Assessment Boundary: Assessment does not include density or distinguishing mass and weight. 5-PS1-4.	Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	

Connections to other content areas, including 21st Century Skills:

ELA/Literacy -

RI.5.7 - Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

W.5.7 - Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2), (5-PS1-3), (5-PS1-4)

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

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

Mathematics -

MP.2 - Reason abstractly and quantitatively.

MP.4 - Model with mathematics.

MP.5 - Use appropriate tools strategically.

5.NBT.A.1 - Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

5.NF.B.7 - Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

5.MD.A.1 - Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems.

5.MD.C.3 - Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

5.MD.C.4 - Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft., and improvised units.

21st Century Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve p ersonal and professional goals.

9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

9.2.4.A.3 Investigate both traditional and nontraditional careers and relate information to personal likes and di slikes.

9.2.4.A.4 - Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
  - cK-12.org
  - eGFI
  - Earth Science Week
  - Education Place

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Subject: Science	Grade Level: 5
Unit 2: Matter and Energy in Organisms and Ecosystems	Pacing: 9 weeks (mid-Oct. – mid-Dec.)
Essential Questions	Enduring Understandings
• How do food and fuel provide energy? If energy is conserved, why do people say it is produced or used? • How do organisms obtain and use the matter and energy they need to live and grow? • How and why do organisms interact with their environment and what are the effects of these interactions? How do organisms interact with the living and nonliving environments to obtain matter and energy? • How do matter and energy move through and ecosystem?	PS3.D: Energy in Chemical Processes and Everyday Life • The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1) (RI.5.7) (SL.5.5) LS1.C: Organization for Matter and Energy Flow in Organisms • Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1) (RI.5.7) (SL.5.5) • Plants acquire their material for growth chiefly from air and water. (5-LS1-1) (RI.5.1) (RI.5.9) (W.5.1) (MP.2) (MP.4) (MP.5) (5.MD.A.1) LS2.A: Interdependent Relationships in Ecosystems • The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1) (RI.5.7) (SL.5.5) (MP.2) (MP.4) LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

	• Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1) (RI.5.7) (SL.5.5) (MP.2) (MP.4) Energy and Matter • Energy can be transferred in various ways and between objects. (5-PS3-1) • Matter is transported into, out of, and within systems. (5-LS1-1) Systems and System Models • A system can be described in terms of its components and their interactions. (5-LS2-1)
NJSL-S Standards	Classroom Applications
5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. • Clarification Statement: Examples of models could include diagrams, and flow charts. 5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water. • Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.	Objectives: Develop a model to describe that matter is made of particles too small to be seen. (5-PS1-1) (R.I.5.7) (MP.2) (MP.4) (5.NBT. A.1) (5. NF.B.7) (5. MD.C.3) (5.MD.C.4) • Explain formation of molecules in solids, liquids, gases, and plasma. • Explore phase changes in matter. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. (5-PS1-2) (W.5.7) (W.5.8) (W.5.9) (MP.2) (MP.4) (MP.5) (5.MD.A.1) • Explain the movement of molecules due to temperature changes. • Identifying (graphing) boiling, melting, and freezing points. • Put into practice using a thermometer and scale.

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. • Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth. • Assessment Boundary: Assessment does not include molecular explanations.	Make observations and measurements to identify materials based on their properties. (5-PS1-3) (W.5.7) (W.5.8) (MP.2) (MP.4) (MP.5) • Identify physical and chemical properties of matter. • Relate volume and density to known materials • Categorize substances based on properties. Conduct an investigation to determine whether the mixing of two or more substances results in new substances. (5-PS1-4) (W.5.7) (W.5.8) (W.5.9) • Identify basic elements of matter. • Explore periodic table of elements. • Distinguish the difference between mixtures and solutions. • Evaluate know substances Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework

	Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

Connections to other content areas, including 21st Century Skills:

ELA/Literacy -

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

RI.5.7 - Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

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

SL.5.5 - Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

W.5.1 - Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

Mathematics -

MP.2 - Reason abstractly and quantitatively.

MP.4 - Model with mathematics.

MP.5 - Use appropriate tools strategically.

5.MD.A.1 - Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

21st Century Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal a nd professional goals.

9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

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.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
  - cK-12.org
  - eGFI
  - Earth Science Week
  - Education Place

Unit Assessment Opportunities: • Journal Entries and Response Sheets • Observations, Questioning, and discussions • Comprehension Checks in literature • Class Webs • Presentations • Collaboration • Projects • Rubrics (http://www.nextgenscience.org/resources) • Unit Test

Curriculum Guide

Subject: Science	Grade Level: 5
Unit 3: Earth Systems	Pacing: 9 weeks (Jan. – Feb.)
Essential Questions	Enduring Understandings

• How and why is Earth constantly changing? • How do the properties and movements of water shape Earth's surface and affect its systems? • How do humans change the planet?	ESS2.A: Earth Materials and 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. (5-ESS2-1) (RI.5.7) (SL.5.5) (MP.2) (MP.4) (5.G.A.2) ESS2.C: The Roles of Water in Earth's Surface Processes • Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2) (RI.5.7) (W.5.8) (SL.5.5) (MP.2) (MP.4) ESS3.C: Human Impacts on Earth Systems • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1) (RI.5.1) (RI.5.7) (RI.5.9) (W.5.8) (W.5.9) (MP.2) (MP.4) (9. 3..12.AG-NR.3) Scale, Proportion, and Quantity • Standard units are used to measure and describe physical quantities such as weight and volume. (5-ESS2-2) (RI.5.7) (W.5.8) (SL.5.5) (MP.2) (MP.4) Systems and System Models • A system can be described in terms of its components and their interactions. (5-ESS2-1), (5-ESS3-1) (RI.5.7) (SL.5.5) (MP.2) (MP.4) (5.G.A.2) (RI.5.1) (RI.5.7) (RI.5.9) (W.5.8) (W.5.9) (MP.2) (MP.4) Science Addresses Questions About the Natural and Material World. • Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1) (RI.5.1) (RI.5.7) (RI.5.9) (W.5.8) (W.5.9) (MP.2) (MP.4)
NJSL-S Standards	Classroom Applications

5-ESS2-1.

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

- Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.
- Assessment Boundary: Assessment is limited to the interactions of two systems at a time.

5-ESS2-2.

Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

- Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice

Objectives:

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. (5-ESS2-1) (RI.5.7) (SL.5.5) (MP.2) (MP.4) (5.G.A.2)

- Identify the 4 spheres of earth.
- Explore various ways the 4 spheres interact with one another.
- Analyze influence of the oceans on land ecosystems.

Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. (5-ESS2-2) (RI.5.7) (W.5.8) (SL.5.5) (MP.2) (MP.4)

- Explore the different levels of salt water, water vapor, and liquid ground water.
- Determine the distribution pattern of water in the local area.
- Examine local sources of water.

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. (5-ESS3-1) (RI.5.1) (RI.5.7) (RI.5.9) (W.5.8) (W.5.9) (MP.2) (MP.4)

- Research examples of conserving resources (reduce, reuse, recycle)
- Explore the effects of pollution on earth.
-

Teaching Strategies/Materials:

Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure

caps, and does not include the atmosphere. 5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

Connections to other content areas, including 21st Century Skills:

ELA/Literacy -

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

RI.5.7 - Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

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

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

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

SL.5.5 - Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Mathematics -

MP.2 - Reason abstractly and quantitatively.

MP.4 - Model with mathematics.

5.G.A.2 - Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

21st Century Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal a nd professional goals.

9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

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.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
  - cK-12.org
  - eGFI
  - Earth Science Week
  - Education Place
  - Geography4kids
  - National Geographic Education

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: 5
Unit 4: Space Systems: Stars and the Solar System	Pacing: 8 weeks (Mar. – Apr.)

Essential Questions	Enduring Understandings
• What underlying forces explain the variety of interactions observed? • What is the universe? What is the Earth's place in it? What goes on in stars? • What are the predictable patterns caused by Earth's movement in the solar system?	PS2.B: Types of Interactions • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1) (RI.5.1) (RI.5.9) ESS1.A: The Universe and its Stars • The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1) (RI.5.1) (RI.5.7) (RI.5.8) (RI.5.9) (W.5.1) (5.MP.2) (5.MP.4) (5.NBT.A2) ESS1.B: Earth and the Solar System • The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2) (SL.5.5) (5.MP.2) (5.MP.4) (5. GA.2) Cause and Effect • Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1) (RI.5.1) (RI.5.9) Patterns • Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2) (SL.5.5) (5.MP.2) (5.MP.4) (5. GA.2) Scale, Proportion, and Quantity • Natural objects exist from the very small to the immensely large. (5-ESS1-1) (RI.5.1) (RI.5.7) (RI.5.8) (RI.5.9) (W.5.1) (5.MP.2) (5.MP.4) (5.NBT.A2)
NJSL-S Standards	Classroom Applications
5-PS2-1.	Objectives:

Support an argument that the gravitational force exerted by Earth on objects is directed down. • Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth. • Assessment Boundary: Assessment does not include mathematical representation of gravitational force. 5-ESS1-1. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth. • Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage). 5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. • Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.	Support an argument that the gravitational force exerted by Earth on objects is directed down. (5-PS2-1) (RI.5.1) (RI.5.9) • Identify that celestial bodies are held in motion by gravitational pull. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth. (5-ESS1-1) (RI.5.1) (RI.5.7) (RI.5.8) (RI.5.9) (W.5.1) (5.MP.2) (5.MP.4) (5.NBT.A2) • Investigate the difference between apparent and absolute magnitude. (compare the appearance of stars based on distance and mass) Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. (5-ESS1-2) (SL.5.5) (5.MP.2) (5.MP.4) (5. GA.2) • Identify patterns associated with the sun's position relative to Earth based on time of day and year. • Recognize that the movement of the sun and moon create days, months, years, and seasons. • Explore differences between the positions of the stars at various times of year (i.e.: constellations). Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects

• Assessment Boundary: Assessment does not include causes of seasons.	Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

Connections to other content areas, including 21st Century Skills:

Common Core State Standards Connections:

ELA/Literacy -

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

RI.5.7 - Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

RI.5.8 - Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).

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

W.5.1 - Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

SL.5.5 - Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Mathematics -

MP.2 - Reason abstractly and quantitatively.

MP.4 - Model with mathematics.

5.NBT.A.2 - Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

5.G.A.2 - Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

21st Century Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal a nd professional goals.

9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

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.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
  - cK-12.org
  - eGFI
  - Earth Science Week
  - Education Place
  - Cosmos4kids

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

Curriculum Guide

Subject: Science	Grade Level: 5
Unit 5: Engineering Design	Pacing: 4 weeks (May – Jun.)

Essential Questions	Enduring Understandings
• How do engineers solve problems? What is a design for? What are the criteria and constraints of a successful solution? • What is the process for developing potential design solutions? • How can the various proposed design solutions be compared and improved?	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) 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)
NJSL-S Standards	Classroom Applications
3-5-ETS1-1.	Objectives:

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.	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) 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) 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) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications SWD/ Students at risk of failure: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Gifted/Enrichment: computer-based research, high level task, class presentation ELL: vocabulary support

Connections to other content areas, including 21st Century Skills:

Common Core State Standards Connections:

ELA/Literacy -

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

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

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

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

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

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

Mathematics –

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

3-5.OA Operations and Algebraic Thinking.

21st Century Skills –

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal a nd professional goals.

9.2.4.A.2 Identify various life roles and civic and work-related activities in the school, home, and community.

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.

Unit Resources: (*related websites, reference materials, etc.)*

- Websites:
  - PBS Learning Media
  - The Concord Consortium
  - cK-12.org
  - eGFI
  - Earth Science Week
  - Education Place

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions

- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Unit Test

6th Grade Curriculum Guide

Subject: Science	Grade Level: 6
Unit 1: Earth's Place in the Universe	Pacing: 38 days
Essential Questions	Enduring Understandings (DCI)
• What is the universe, and what is Earth's place in it? (ESS1.A) • What are the predictable patterns caused by Earth's movement in the solar system? (ESS1.B) • How do people reconstruct and date events in Earth's planetary history? (ESS1.C)	ESS1.A: The Universe and Its Stars • Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) • Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) ESS1.B: Earth and the Solar System • 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. (MS-ESS1-2), (MS-ESS1-3) • 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 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. (MS-ESS1-1) • The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2) ESS1.C: The History of Planet Earth • 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. (MS-ESS1-4) ETS1.A: Defining and Delimiting Engineering Problems • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints

	includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) ETS1.B: Developing Possible Solutions • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) • Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) • Models of all kinds are important for testing solutions. (MS-ETS1-4) ETS1.C: Optimizing the Design Solution • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4) Patterns • Patterns can be used to identify cause-and-effect relationships. (ESS1-1) Scale, Proportion, and Quantity • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (ESS1-3), (ESS1-4) System and Systems Models

	• Models can be used to represent systems and their interactions. (ESS1-2) Interdependence of Science, Engineering, and Technology • Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3)
NGSS Standards	Classroom Applications
MS-ESS1 Earth's Place in the Universe	Objectives: • Develop and use a model of the Earth-sun-moon system to describe the cyclical patterns of lunar phases, eclipses of the sun and moon, and seasons. (MS-ESS1-1) o Compare and contrasts revolution and rotation, and explain the connect to the changing seasons o Describe the apparent motions and positions of Earth, stars, and other planets throughout the year o Explain what causes the cycle of seasons on Earth o Explain phenomena caused by the moon (eclipses, tides, phases) • Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system (MS-ESS1-2) o Describe two factors that keep the moon and Earth in orbit o Identify the strength of gravity between two objects • Analyze and interpret data to determine scale properties of objects in the solar system. (MS-ESS1-3) • Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. (MS-ESS1-4) • Describe how and why the geologic time scale is used to show Earth's history

	• Describe how geologists determine the relative age of rocks • Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (MS-ETS1-1) • Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2) • Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3) • Develop a model to generate for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (Smart Board, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented): Extra Support: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework

	Enrichment: computer-based research, high level task, class presentation Limited English Proficiency: vocabulary support, word/picture association, visual aids
Unit Resources: (related websites, reference materials, etc.) Reference Materials: Dependent upon district resources Houghton Mifflin Harcourt Science Dimensions -SPACE SCIENCE MODULE H www.thesciencequeen.net www.sciencespot.net www.sanandreasfault.org http://astro.unl.edu/naap/lps/animations/lps.swf http://www.need.org www.internet4classrooms.com www.smartexchange.com http://ngss.nsta.org/Classroom-Resources.aspx http://www.earthsciweek.org/for-teachers http://education.usgs.gov/index.html	
Unit Assessment Opportunities: • Journal Entries and Response Sheets • Observations, Question, and discussions • Comprehension Checks in literature • Class Webs • Presentations • Collaboration • Projects • Rubrics (http://www.nextgenscience.org/resources) • Lab Investigations • Quizzes • Unit Test	

Subject: Science	Grade Level: 6
Unit 2: Earth's Systems	Pacing: 75 days
Essential Questions	Enduring Understandings (DCI)
• How and why is Earth constantly changing?	ESS1.C: The History of Planet Earth • Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS. ESS1.C GBE), (secondary to MS-ESS2-3)

• How do Earth's major systems interact? (ESS2.A) • Why do the continents move, and what causes earthquakes and volcanoes? (ESS2.B) • How do the properties and movements of water shape Earth's surface and affect its systems? (ESS2.C) • What regulates weather and climate? (ESS2.D)	ESS2.A: Earth's Materials and Systems • All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1) • The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2) ESS2.B: Plate Tectonics and Large-Scale System Interactions • 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. (MS-ESS2-3) ESS2.C: The Roles of Water in Earth's Surface Processes • Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4) • The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5) • Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) • Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) • Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface

	features and create underground formations. (MS-ESS2-2) ESS2.D: Weather and Climate • Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6) • Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5) • The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6) ETS1.A: Defining and Delimiting Engineering Problems • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) ETS1.B: Developing Possible Solutions • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) • Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) • Models of all kinds are important for testing solutions. (MS-ETS1-4) ETS1.C: Optimizing the Design Solution • Although one design may not perform the best across all tests, identifying the

	characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4) Patterns • Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3) Cause and Effect • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5) Scale Proportion and Quantity • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS2-2) Systems and System Models • Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6) Energy and Matter • Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4) Stability and Change • Explanations of stability and change in natural or designed systems can be constructed by examining the changes over

	time and processes at different scales, including the atomic scale. (MS-ESS2-1) Influence of Science, Engineering, and Technology on Society and the Natural World • All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) • The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)
NGSS Standards	Classroom Applications

MS-ESS2
Earth's Systems
	Objectives:
	• Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. (MS-ESS2-1)
	  • Define and explain how minerals are identified and how they form
	  • Identify the 3 major groups of rocks and their characteristics
	  • Describe the rock cycle
	• Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. (MS-ESS2-2)
	  • Explain the theory of plate tectonics
	  • Correlate the boundaries of plate tectonics to Earth's catastrophic events, such rapid landslides, volcanoes & earthquakes.
	  • Describe geoscience processes including weathering and deposition
	• Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. (MS-ESS2-3)
	  • Define & describe mid-ocean ridges
	  • Explain how sea-floor spreading affects Earth's crust

	• Explain deep-ocean trenches & the process of subduction • Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. (MS-ESS2-4) • Trace a drop of water as it changes state throughout the water cycle • Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. (MS-ESS2-5) • Describe how water moves to & from the atmosphere during the water cycle. • Describe humidity & how it is measured • Identify the common types of precipitation • Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. (MS-ESS2-6). • Identify factors that influence temperature & precipitation • Identify factors used to define climates • Describe the main climate regions • Identify natural factors that can cause climate change • Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (MS-ETS1-1) • Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2) • Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3) • Develop a model to generate for iterative testing and modification of a proposed object,

	tool, or process such that an optimal design can be achieved. (MS-ETS1-4) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (SmartBoard, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented): Extra Support: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Enrichment: computer-based research, high level task, class presentation Limited English Proficiency: vocabulary support, word/picture association, visual aids

Connections to other content areas, including 21st Century Skills:

MS.PS1.A (MS-ESS2-1), (MS-ESS2-4), (MS-ESS2-5); MS.PS1.B (MS-ESS2-1), (MS-ESS2-2); MS.PS2.A (MS-ESS2-5), (MS-ESS2-6); MS.PS2.B (MS-ESS2-4); MS.PS3.A(MS-ESS2-4), (MS-ESS2-5); MS.PS3.B (MS-ESS2-1), (MS-ESS2-5), (MS-ESS2-6); MS.PS3.D (MS-ESS2-4); MS.PS4.B (MS-ESS2-6); MS.LS2.B (MS-ESS2-1), (MS-ESS2-2); MS.LS2.C (MS-ESS2-1); MS.LS4.B (MS-ESS2-3); MS. ESS1.B (MS-ESS2-1); MS. ESS3.C (MS-ESS2-1

Articulation of DCIs across grade-bands:

3.PS2.A (MS-ESS2-4),(MS-ESS2-6); 3.LS4.A (MS-ESS2-3); 3.ESS2.D (MS-ESS2-5),(MS-ESS2-6); 3.ESS3.B (MS-ESS2-3); 4.PS3.B (MS-ESS2-1),(MS-ESS2-4); 4.ESS1.C(MS-ESS2-2),(MS-ESS2-3); 4.ESS2.A (MS-ESS2-1),(MS-ESS2-2); 4.ESS2.B (MS-ESS2-3); 4.ESS2.E (MS-ESS2-2); 4.ESS3.B (MS-ESS2-3); 5.PS2.B (MS-ESS2-4);5.ESS2.A (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-5),(MS-ESS2-6); 5.ESS2.C (MS-ESS2-4); HS.PS1.B (MS-ESS2-1); HS.PS2.B (MS-ESS2-4),(MS-ESS2-6); HS.PS3.B (MS-ESS2-1),(MS-ESS2-4),(MS-ESS2-6);

HS.PS3.D (MS-ESS2-2),(MS-ESS2-6); HS.PS4.B (MS-ESS2-4); HS.LS1.C (MS-ESS2-1); HS.LS2.B (MS-ESS2-1),(MS-ESS2-2);HS.LS4.A (MS-ESS2-3); HS.LS4.C (MS-ESS2-3); HS.ESS1.B (MS-ESS2-6); HS.ESS1.C (MS-ESS2-2),(MS-ESS2-3); HS.ESS2.A (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-3),(MS-ESS2-4),(MS-ESS2-6); HS.ESS2.B (MS-ESS2-2),(MS-ESS2-3); HS.ESS2.C (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-4),(MS-ESS2-5); HS.ESS2.D (MS-ESS2-2),(MS-ESS2-4),(MS-ESS2-5),(MS-ESS2-6); HS.ESS2.E (MS-ESS2-1),(MS-ESS2-2); HS.ESS3.D (MS-ESS2-2)

Common Core State Standards Connections:
ELA/Literacy –

RST.6-8.1Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-5)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS2-3)

RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3), (MS-ESS2-5)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS2-2)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS2-5)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-1), (MS-ESS2-2), (MS-ESS2-6)

Mathematics -

MP.2 Reason abstractly and quantitatively. (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-5)

6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-5)

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS2-2), (MS-ESS2-3)

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS2-2), (MS-ESS2-3)

Unit Resources: (related websites, reference materials, etc.)

Reference Materials: Dependent upon district resources
Houghton Mifflin Harcourt Science Dimensions
-GEOLOGIC PROCESSES & HISTORY MODULE F
-EARTH'S WATER & ATMOSPHERE MODULE E
www.thesciencequeen.net
www.sciencespot.net
www.sanandreasfault.org
http://astro.unl.edu/naap/lps/animations/lps.swf
http://www.need.org
www.internet4classrooms.com
www.smartexchange.com
http://ngss.nsta.org/Classroom-Resources.aspx
http://www.earthsciweek.org/for-teachers
http://education.usgs.gov/index.html

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Lab Investigations
- Quizzes
- Unit Test

Subject: Science	Grade Level: 6
Unit 3: Earth and Human Activity	Pacing: 67 days
Essential Questions	Enduring Understandings (DCI)
• How do Earth's surface processes and human activities affect each other? (ESS3)	ESS3.A: Natural Resources • Humans depend on Earth's land, ocean, atmosphere, and biosphere for many

• How do natural hazards affect individuals and societies? (ESS3.B) • How do humans change the planet? (ESS3.C) • How do people model and predict the effects of human activities on Earth's climate? (ESS3.D) • How do humans depend on Earth's resources? (ESS3.A)	different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1 ESS3.B: Natural Hazards • Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2) ESS3.C: Human Impacts on Earth Systems • 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. (MS-ESS3-3) • 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. (MS-ESS3-3), (MS-ESS3-4) ESS3.D: Global Climate Change • Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)

	ETS1.A: Defining and Delimiting Engineering Problems • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) ETS1.B: Developing Possible Solutions • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) • Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) • Models of all kinds are important for testing solutions. (MS-ETS1-4) ETS1.C: Optimizing the Design Solution • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4) Patterns • Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2) Cause and Effect • Relationships can be classified as causal or correlational, and correlation does not

	necessarily imply causation. (MS-ESS3-3) • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1), (MS-ESS3-4) Stability and Change • Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5) Influence of Science, Engineering, and Technology on Society and the Natural World • All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-1), (MS-ESS3-4) • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2), (MS-ESS3-3) Connections to Nature of Science Science Addresses Questions About the Natural and Material World • Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-ESS3-4)
NGSS Standards	Classroom Applications
Students who demonstrate understanding can: MS - ESS3 Earth and Human Activity	Objectives: • Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. (ESS3-1)

	- Identify the origin of renewable & non-renewable resources - Compare and contrast the benefits of renewable energy - Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. (ESS3-2) - Use evidence to predict Earth's catastrophic events and severe weather - Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. (ESS3-3) - Describe why soil management is important - Design methods used to help control & reduce waste disposal, air pollution, water pollution - Construct an argument supported by evidence for how increase in human population and per-capita consumption of natural resources impact Earth's systems. (ESS3-4) - Explain how the human population has grown - Identify factors that affect the rate of human population growth - Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. (ESS3-5) - Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (MS-ETS1-1) - Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2) - Analyze data from tests to determine similarities and differences among several

	design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3) • Develop a model to generate for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (SmartBoard, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented): helper, visual aids, modified tests/quizzes, modified homework Enrichment: computer-based research, high level task, class presentation Limited English Proficiency: vocabulary support, word/picture association, visual aids

Connections to other content areas, including 21st Century Skills:

Common Core State Standards Connections:

ELA/Literacy -

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-4), (MS-ESS3-5)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-2)

WHST.6-8.1 Write arguments focused on discipline content. (MS-ESS3-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS3-1)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS3-3)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1), (MS-ESS3-4)

Mathematics -

MP.2 Reason abstractly and quantitatively. (MS-ESS3-2), (MS-ESS3-5)

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-3), (MS-ESS3-4)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-ESS3-3), (MS-ESS3-4)

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-3), (MS-ESS3-4), (MS-ESS3-5)

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-3), (MS-ESS3-4), (MS-ESS3-5)

TECHNOLOGY STANDARDS ADDRESSES

Understand and use technology systems

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.Select and use applications effectively and productively.

8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results
8.1.8.A.5 Create a database query, sort and create a report and describe the process and explain report results.

Unit Resources: (related websites, reference materials, etc.)

Reference Materials: Dependent upon district resources
Houghton Mifflin Harcourt Science Dimensions
-EARTH & HUMAN ACTIVITY MODULE G
www.thesciencequeen.net
www.sciencespot.net
www.sanandreasfault.org
http://astro.unl.edu/naap/lps/animations/lps.swf
http://www.need.org
www.internet4classrooms.com
www.smartexchange.com
http://ngss.nsta.org/Classroom-Resources.aspx
http://www.earthsciweek.org/for-teachers
http://education.usgs.gov/index.html

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Lab Investigations
- Quizzes
- Unit Test

7th Grade Curriculum Guide

Subject: Science	Grade Level: 7
Unit 1: Matter and Its Interactions	Pacing: 62 days
Essential Questions	Enduring Understandings (DCI)
How can one explain the structure, properties, and interactions of matter? • How do particles combine to form the variety of matter one observes? (PS1.A) • How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them? (PS1.B) • What forces hold nuclei together and mediate nuclear processes? (PS1.C)	PS1.A: Structure and Properties of Matter • Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1) • Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2), (MS-PS1-3) • Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4) • In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4) • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1) • The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4) PS1.B: Chemical Reactions • Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-3), (MS-PS1-5) • The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5) • Some chemical reactions release energy, others store energy. (MS-PS1-6) PS3.A: Definitions of Energy • The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that

	thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4) • The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4) ETS1.B: Developing Possible Solutions • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (secondary to MS-PS1-6) ETS1.C: Optimizing the Design Solution • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process - that is, some of the characteristics may be incorporated into the new design. (secondary to MS-PS1-6) • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (secondary to MS-PS1-6) Patterns • Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-2) Cause and Effect • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4) Scale, Proportion, and Quantity • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)

	Energy and Matter • Matter is conserved because atoms are conserved in physical and chemical processes. (MS-PS1-5) • The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS1-6) Structure and Function • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3) Interdependence of Science, Engineering, and Technology • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3) Influence of Science, Engineering and Technology on Society and the Natural World • The uses of technologies and any limitation on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)
NGSS Standards	Classroom Applications

MS-PS1
Matter and Its Interactions
	Objectives:
	• Develop models to describe the atomic composition of simple molecules and extended structures (MS-PS1-1).
	  • Describe the components of the atom and how they combine to form molecules
	
	• Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. (MS-PS1-2).
	  • Explain the chemical and physical properties of compounds and their variations

	• Gather and make sense of information to describe that synthetic materials come from natural resources and impact society (MS-PS1-3.).
	  • Explain that all matter (natural and man-made) is made up of atoms.
	
	• Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed (MS-PS1-4)
	  • Describe how energy changes when matter changes
	
	• Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. MS-PS1-5.
	  • Define the law of conservation of matter and use it to balance equations
	
	• Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. * (MS-PS1-6).
	
	• Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (MS-ETS1-1)
	
	• Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2)
	
	• Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3)
	
	• Develop a model to generate for iterative testing and modification of a proposed object, tool, or

	process such that an optimal design can be achieved. (MS-ETS1-4) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented): Extra Support: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Enrichment: computer-based research, high level task, class presentation Limited English Proficiency: vocabulary support, word/picture association, visual aids

Connections to other DCIs in this grade-band:

MS.PS3.D (MS-PS1-2),(MS-PS1-6); MS.LS1.C (MS-PS1-2),(MS-PS1-5); MS.LS2.A (MS-PS1-3); MS.LS2.B (MS-PS1-5); MS.LS4.D (MS-PS1-3); MS.ESS2.A (MS-PS1-2),(MS-PS1-5); MS.ESS2.C (MS-PS1-1),(MS-PS1-4); MS.ESS3.A (MS-PS1-3); MS.ESS3.C (MS-PS1-3)

Articulation of DCIs across grade-bands:

5.PS1.A (MS-PS1-1); 5.PS1.B (MS-PS1-2),(MS-PS1-5); HS.PS1.A (MS-PS1-1),(MS-PS1-3),(MS-PS1-4),(MS-PS1-6); HS.PS1.B (MS-PS1-2),(MS-PS1-4),(MS-PS1-5),(MS-PS1-6); HS.PS3.A (MS-PS1-4),(MS-PS1-6); HS.PS3.B (MS-PS1-6); HS.PS3.D (MS-PS1-6); HS.LS2.A (MS-PS1-3); HS.LS4.D (MS-PS1-3); HS.ESS1.A (MS-PS1-1);HS.ESS3.A (MS-PS1-3)

Common Core State Standards Connections:
ELA/Literacy –

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.(MS-PS1-2),(MS-PS1-3)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1),(MS-PS1-2),(MS-PS1-4),(MS-PS1-5)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-PS1-3)

Mathematics -

MP.2 Reason abstractly and quantitatively. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5)

MP.4 Model with mathematics. (MS-PS1-1),(MS-PS1-5)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5)

6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS1-4)

8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. (MS-PS1-1)

6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (MS-PS1-2)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-PS1-2)

Unit Resources: (related websites, reference materials, etc.)

Reference Materials: Dependent upon district resources
Houghton Mifflin Harcourt Science Dimensions
-CHEMISTRY MODULE J
www.thesciencequeen.net
www.sciencespot.net
www.sanandreasfault.org
http://astro.unl.edu/naap/lps/animations/lps.swf
http://www.need.org
www.internet4classrooms.com
www.smartexchange.com

http://ngss.nsta.org/Classroom-Resources.aspx http://www.earthsciweek.org/for-teachers http://education.usgs.gov/index.html
Unit Assessment Opportunities: • Journal Entries and Response Sheets • Observations, Questioning, and discussions • Comprehension Checks in literature • Class Webs • Presentations • Collaboration • Projects • Rubrics (http://www.nextgenscience.org/resources) • Lab Investigations • Quizzes • Unit Test

Subject: Science	Grade Level: 7
Unit 2: Motion and Stability: Forces and Interactions	Pacing: 43 days
Essential Questions	Enduring Understandings (DCI)
• How can one explain and predict interactions between objects and within systems of objects? • How can one predict an object's continued motion, changes in motion, or stability? (PS2.A) • What underlying forces explain the variety of interactions observed? (PS2.B) • Why are some physical systems more stable than others? (PS2.C)	PS2.A: Forces 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). (MS-PS2-1) • 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, its 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. (MS-PS2-2) • 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. (MS-PS2-2) PS2.B: 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. (MS-PS2-3) • 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. (MS-PS2-4) • 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). (MS-PS2-5) Cause and Effect • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS2-3), (MS-PS2-5) Systems and System Models • Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS2-1), (MS-PS2-4) Stability and Change • Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2) Influence of Science, Engineering, and Technology on Society and the Natural World • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1)
NGSS Standards	Classroom Applications
MS-PS2 Motion and Stability: Forces and Interactions	Objectives: • Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. (MS-PS2-1). o Explain the principles of Newton's 3 laws

	○ Describe how the motion of an object is determined by the sum of the forces acting on it ○ Explain how mass and acceleration influence force • Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. (MS-PS2-2). • Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. (MS-PS2-3). ○ Explain the factors that determine attraction and repulsion in magnets • Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. (MS-PS2-4). ○ Explain Newton's Law of gravitational forces between objects • Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. (MS-PS2-5). • Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (MS-ETS1-1) • Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2) • Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can

	be combined into a new solution to better meet the criteria for success (MS-ETS1-3) • Develop a model to generate for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented): Extra Support: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Enrichment: computer-based research, high level task, class presentation Limited English Proficiency: vocabulary support, word/picture association, visual aids
Connections to other DCIs in this grade-band: MS.PS3.A (MS-PS2-2); MS.PS3.B (MS-PS2-2); MS.PS3.C (MS-PS2-1); MS. ESS1.A (MS-PS2-4); MS. ESS1.B (MS-PS2-4); MS. ESS2.C (MS-PS2-2), (MS-PS2-4)	
Articulation of DCIs across grade-bands: 3.PS2.A (MS-PS2-1),(MS-PS2-2); 3.PS2.B (MS-PS2-3),(MS-PS2-5); 5.PS2.B (MS-PS2-4); HS.PS2.A (MS-PS2-1),(MS-PS2-2); HS.PS2.B (MS-PS2-3),(MS-PS2-4),(MS-PS2-5); HS.PS3.A (MS-PS2-5); HS.PS3.B (MS-PS2-2),(MS-PS2-5); HS.PS3.C (MS-PS2-5); HS.ESS1.B (MS-PS2-2),(MS-PS2-4)	
Common Core State Standards Connections: ELA/Literacy – RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-PS2-1),(MS-PS2-3)	

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS2-1),(MS-PS2-2),(MS-PS2-5)

WHST.6-8.1 Write arguments focused on discipline-specific content. (MS-PS2-4)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS2-1),(MS-PS2-2),(MS-PS2-5)

Mathematics –

MP.2 Reason abstractly and quantitatively. (MS-PS2-1),(MS-PS2-2),(MS-PS2-3)

6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS2-1)

6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. (MS-PS2-1),(MS-PS2-2)

7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-PS2-1),(MS-PS2-2)

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-PS2-1),(MS-PS2-2)

Unit Resources: (related websites, reference materials, etc.)

Reference Materials: Dependent upon district resources
Houghton Mifflin Harcourt Science Dimensions
-FORCES, MOTIONS, & FIELDS MODULE K
www.thesciencequeen.net
www.sciencespot.net
www.sanandreasfault.org
http://astro.unl.edu/naap/lps/animations/lps.swf
http://www.need.org
www.internet4classrooms.com
www.smartexchange.com
http://ngss.nsta.org/Classroom-Resources.aspx
http://www.earthsciweek.org/for-teachers
http://education.usgs.gov/index.html

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature

- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Lab Investigations
- Quizzes
- Unit Test

Subject: Science	Grade Level: 7
Unit 3: Energy	Pacing: 35 days
Essential Questions	Enduring Understandings (DCI)
• How is energy transferred and conserved? • What is energy? (PS3.A) • What is meant by conservation of energy? (PS3.B) • How is energy transferred between objects or systems? (PS3.B) • How are forces related to energy? (PS3.C) • How do food and fuel provide energy? (PS3.D) • If energy is conserved, why do people say it is produced or used? (PS3.D)	PS3.A: Definitions of Energy • Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1) • A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2) • Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3), (MS-PS3-4) PS3.B: Conservation of Energy and Energy Transfer • When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5) • The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4) • Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3) PS3.C: Relationship Between Energy and Forces • When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)

	ETS1.A: Defining and Delimiting an Engineering Problem • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (secondary to MS-PS3-3) ETS1.B: Developing Possible Solutions • A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary to MS-PS3-3)
NGSS Standards	Classroom Applications
MS - PS3 Earth and Human Activity	Objectives: • Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. (MS-PS3-1). o develop a graph that correlates the variables of mass and speed • Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. (MS-PS3-2). o Explain the relationship between position and mass (gravitational potential energy) • Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. (MS-PS3-3). o Analyze factors that affect energy transfer o Compare and contrast convection, conduction, and radiation • Plan an investigation to determine the relationships among the energy transferred, the

	type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. (MS-PS3-4) o Understand and implement kinetic theory of matter • Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. (MS-PS3-5). o Explain the law of conservation of energy • Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (MS-ETS1-1) • Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2) • Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3) • Develop a model to generate for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented):

	Helper, visual aids, modified tests/quizzes, modified homework Enrichment: computer-based research, high level task, class presentation Limited English Proficiency: vocabulary support, word/picture association, visual aids

Connections to other DCIs in this grade-band:

MS.PS1.A (MS-PS3-4); MS.PS1.B (MS-PS3-3); MS.PS2.A (MS-PS3-1),(MS-PS3-4),(MS-PS3-5); MS.ESS2.A (MS-PS3-3); MS.ESS2.C (MS-PS3-3),(MS-PS3-4);MS.ESS2.D (MS-PS3-3),(MS-PS3-4); MS.ESS3.D (MS-PS3-4)

Articulation of DCIs across grade-bands:

4.PS3.B (MS-PS3-1),(MS-PS3-3); 4.PS3.C (MS-PS3-4),(MS-PS3-5); HS.PS1.B (MS-PS3-4); HS.PS2.B (MS-PS3-2); HS.PS3.A (MS-PS3-1),(MS-PS3-4),(MS-PS3-5);HS.PS3.B (MS-PS3-1),(MS-PS3-2),(MS-PS3-3),(MS-PS3-4),(MS-PS3-5); HS.PS3.C (MS-PS3-2)

Common Core State Standards Connections:

ELA/Literacy -

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-PS3-1),(MS-PS3-5)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3),(MS-PS3-4)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1)

WHST.6-8.1 Write arguments focused on discipline content. (MS-PS3-5)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS3-3),(MS-PS3-4)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS3-2)

Mathematics -

MP.2 Reason abstractly and quantitatively. (MS-PS3-1),(MS-PS3-4),(MS-PS3-5)

6.RP.A.1 Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1),(MS-PS3-5)

6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. (MS-PS3-1)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-PS3-1),(MS-PS3-5)

8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1)

8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. (MS-PS3-1)

8.F.A.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1),(MS-PS3-5)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-PS3-4)

Unit Resources: (related websites, reference materials, etc.)

Reference Materials: Dependent upon district resources
Houghton Mifflin Harcourt Science Dimensions
-ENERGY & ENERGY TRANSFER MODULE I
www.thesciencequeen.net
www.sciencespot.net
www.sanandreasfault.org
http://astro.unl.edu/naap/lps/animations/lps.swf
http://www.need.org
www.internet4classrooms.com
www.smartexchange.com
http://ngss.nsta.org/Classroom-Resources.aspx
http://www.earthsciweek.org/for-teachers
http://education.usgs.gov/index.html

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Lab Investigations
- Quizzes
- Unit Test

Subject: Science	Grade Level: 7
Unit 4: Waves and Their Applications in Technology for Information Transfer	Pacing: 40 days
Essential Questions	Enduring Understandings
• How are waves used to transfer energy and information? • What are the characteristic properties and behaviors of waves? (PS4.A) • What is light? (PS4.B) • How can one explain the varied effects that involve light? (PS4.B) • What other forms of electromagnetic radiation are there? PS4.B) • How are instruments that transmit and detect waves used to extend human senses? (PS4.C).	PS4.A: Wave Properties • A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1) • A sound wave needs a medium through which it is transmitted. (MS-PS4-2) PS4.B: Electromagnetic Radiation • When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2) • The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS4-2) • A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2) • However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2) PS4.C: Information Technologies and Instrumentation • Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)
NGSS Standards	Classroom Applications

Waves and Their Applications in Technology for Information Transfer	Objectives:
	• Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. (MS-PS4-1).
	  • Explain the different types of waves and their properties
	  • Explain how a wave's speed is related to its wavelength and frequency

	• Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. (MS-PS4-2)
	  • Describe how reflection, refraction and diffraction change a wave's direction
	  • State different types of interference
	
	• Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. (MS-PS4-3).
	  • Compare and contrast digital and analog signals using a data table
	
	• Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (MS-ETS1-1)
	• Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2)
	• Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3)
	• Develop a model to generate for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4)
	
	Teaching Strategies/Materials:
	
	Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure
	
	Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects

	Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented): Extra Support: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Enrichment: computer-based research, high level thinking tasks, class presentations Limited English Proficiency: vocabulary support, word/picture association, visual aids

Connections to other DCIs in this grade-band:

MS.LS1.D (MS-PS4-2)

Articulation of DCIs across grade-bands:

4.PS3.A (MS-PS4-1); 4.PS3.B (MS-PS4-1); 4.PS4.A (MS-PS4-1); 4.PS4.B (MS-PS4-2); 4.PS4.C (MS-PS4-3); HS.PS4.A (MS-PS4-1),(MS-PS4-2),(MS-PS4-3); HS.PS4.B(MS-PS4-1),(MS-PS4-2); HS.PS4.C (MS-PS4-3); HS.ESS1.A (MS-PS4-2); HS.ESS2.A (MS-PS4-2); HS.ESS2.C (MS-PS4-2); HS.ESS2.D (MS-PS4-2)

Common Core State Standards Connections:

ELA/Literacy -

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3)

RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-PS4-3)

RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS4-1),(MS-PS4-2)

Mathematics -

MP.2 Reason abstractly and quantitatively. (MS-PS4-1)

MP.4 Model with mathematics. (MS-PS4-1)

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS4-1)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS4-1)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-PS4-1)

8.F.A.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS4-1)

Connections to other content areas, including 21st Century Skills:

Common Core State Standards Connections:

ELA/Literacy -

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-4), (MS-ESS3-5)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-2)

TECHNOLOGY STANDARDS ADDRESSES

Understand and use technology systems

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.Select and use applications effectively and productively.

8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results

8.1.8.A.5 Create a database query, sort and create a report and describe the process and explain report results.

Unit Resources: (related websites, reference materials, etc.)

Reference Materials: Dependent upon district resources

Houghton Mifflin Harcourt Science Dimensions

-WAVES & THEIR APPLICATIONS MODULE L

www.thesciencequeen.net

www.sciencespot.net

www.sanandreasfault.org

http://astro.unl.edu/naap/lps/animations/lps.swf

http://www.need.org

www.internet4classrooms.com

www.smartexchange.com

http://ngss.nsta.org/Classroom-Resources.aspx

http://www.earthsciweek.org/for-teachers

http://education.usgs.gov/index.html

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Lab Investigations
- Quizzes
- Unit Test

8th Grade Curriculum Guide

Subject: Science	Grade Level: 8
Unit 1: From Molecules to Organisms: Structures and Processes	Pacing: 38 days
Essential Questions	Enduring Understandings (DCI)
• How do organisms live, grow, respond to their environment, and reproduce? • How do the structures of organisms enable life's functions? (LS1.A) • How do organisms grow and develop? (LS1.B) • How do organisms obtain and use the matter and energy they need to live and grow? (LS1.C) • How do organisms detect, process, and use information about the environment? (LS1.D)	LS1.A: Structure and Function • All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) • Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2) • In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3) LS1.B: Growth and Development of Organisms • Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4) • Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4) • Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5) LS1.C: Organization for Matter and Energy Flow in Organisms • Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6) • Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7) LS1.D: Information Processing

	• Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8) PS3.D: Energy in Chemical Processes and Everyday Life • The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6) • Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.(secondary to MS-LS1-7) Cause and Effect • Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8) • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4),(MS-LS1-5) Scale, Proportion, and Quantity • Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1) Systems and System Models • Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3) Energy and Matter • Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7) • Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6) Structure and Function

	• Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2) Interdependence of Science, Engineering, and Technology • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1) Science is a Human Endeavor • Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)
NGSS Standards	Classroom Applications

MS-LS1 From Molecules to Organisms: Structures and Processes	Objectives:
	• Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. (MS-LS1-1).
	  • Compare & contrast the benefits & limitations of single-celled & multicellular organisms
	  • Discover and differentiate between cells using a microscope
	  • Observe behaviors of a variety of cells
	  • Describe the difference between living cells that are organisms and those that are not considered organisms
	• Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. (MS-LS1-2).
	  • Describe and observe how cells are organized in a variety of organisms
	  • Identify the responsibility of each organelle, and analyze how it contributes to the overall function of the cell
	  • Compare and contrast between prokaryotic and eukaryotic organisms

	• Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. (MS-LS1-3)
	  • Explain the organization of life (atom, molecule, organism, cell, tissue, organ, organ system, organism, etc)
	• Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.(MS-LS1-4).
	  • Differentiate between asexual and sexual reproduction
	  • Label the reproductive parts of plants
	  • Investigate the early development of two groups of plants: monocots & dicots (seed structures & pollination).
	  • Observe germinating seeds to determine the sequence of developments
	  • Examine a variety of seeds to discover their dispersal mechanisms and how they contribute to a plant's survival
	• Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. (MS-LS1-5).
	  • Analyze the genetic and local factors that contribute to the growth of a plant or animal
	  • Define the probability and describe how it helps explain the results of genetic crosses
	  • Explain what is meant by genotype and phenotype
	• Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. (MS-LS1-6)
	  • Explain how living things get energy from the sun
	  • Describe the chemical change that happens during photosynthesis
	  • Differentiate between autotrophs and heterotrophs
	  • Trace the flow of energy through the ecosystem

	• Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. MS-LS1-7
	  • Name and describe energy roles that organisms play in an ecosystem
	  • Identify how energy moves in an ecosystem
	• Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. MS-LS1-8.)
	  • Describe inputs (electromagnetic, mechanical, chemical)
	  • Identify changes in the structure of millions of interconnected nerve cells and how they allow combined inputs to create and store memories and reflexes
	• Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (MS-ETS1-1)
	
	• Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2)
	
	• Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3)
	  • Identify plant succession and survival of the fittest
	
	• Develop a model to generate for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4)
	
	Teaching Strategies/Materials:

	Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (SmartBoard, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented): Extra Support: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Enrichment: computer-based research, high level task, class presentation Limited English Proficiency: vocabulary support, word/picture association, visual aids

Connections to other DCIs in this grade-band: MS.PS1.B (MS-LS1-6),(MS-LS1-7); MS.LS2.A (MS-LS1-4),(MS-LS1-5); MS.LS3.A (MS-LS1-2); MS.ESS2.A (MS-LS1-6)
Articulation of DCIs across grade-bands: 3.LS1.B (MS-LS1-4),(MS-LS1-5); 3.LS3.A (MS-LS1-5); 4.LS1.A (MS-LS1-2); 4.LS1.D (MS-LS1-8); 5.PS3.D (MS-LS1-6),(MS-LS1-7); 5.LS1.C (MS-LS1-6),(MS-LS1-7);5.LS2.A (MS-LS1-6); 5.LS2.B (MS-LS1-6),(MS-LS1-7); HS.PS1.B (MS-LS1-6),(MS-LS1-7); HS.LS1.A (MS-LS1-1),(MS-LS1-2),(MS-LS1-3),(MS-LS1-8); HS.LS1.C (MS-LS1-6),(MS-LS1-7); HS.LS2.A (MS-LS1-4),(MS-LS1-5); HS.LS2.B (MS-LS1-6),(MS-LS1-7); HS.LS2.D (MS-LS1-4); HS.ESS2.D (MS-LS1-6)
Common Core State Standards Connections: ELA/Literacy - RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3),(MS-LS1-4),(MS-LS1-5),(MS-LS1-6) RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5),(MS-LS1-6) RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3),(MS-LS1-4)

WHST.6-8.1 Write arguments focused on discipline content. (MS-LS1-3),(MS-LS1-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-5),(MS-LS1-6)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-LS1-1)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.(MS-LS1-8)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5),(MS-LS1-6)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2),(MS-LS1-7)

Mathematics -

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1),(MS-LS1-2),(MS-LS1-3),(MS-LS1-6)

6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4),(MS-LS1-5)

6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4),(MS-LS1-5)

Unit Resources: (related websites, reference materials, etc.)

Reference Materials: Dependent upon district resources
Houghton Mifflin Harcourt Science Dimensions
-CELLS & HEREDITY MODULE B
www.thesciencequeen.net
www.sciencespot.net
www.sanandreasfault.org
http://astro.unl.edu/naap/lps/animations/lps.swf
http://www.need.org
www.internet4classrooms.com
www.smartexchange.com
http://ngss.nsta.org/Classroom-Resources.aspx
http://www.earthsciweek.org/for-teachers
http://education.usgs.gov/index.html

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Lab Investigations
- Quizzes
- Unit Test

Subject: Science	Grade Level: 8
Unit 2: Ecosystems: Interactions, Energy, and Dynamics	Pacing: 60 days
Essential Questions	Enduring Understandings (DCI)
• How and why do organisms interact with their environment and what are the effects of these interactions? • How do organisms interact with the living and nonliving environments to obtain matter and energy? (LS2.A) • How do matter and energy move through an ecosystem? (LS2.B) • What happens to ecosystems when the environment changes? (LS2.C) • How do organisms interact in groups so as to benefit individuals? (LS2.D)	• Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (MS-LS2-1). • Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. (MS-LS2-2) • Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. (MS-LS2-3). • Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. (MS-LS2-4). • Evaluate competing design solutions for maintaining biodiversity and ecosystem services (MS-LS2-5). Patterns • Patterns can be used to identify cause and effect relationships. (MS-LS2-2)

	Cause and Effect • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1) Energy and Matter • The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3) Stability and Change • Small changes in one part of a system might cause large changes in another part. (MS-LS2-4),(MS-LS2-5) Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World • The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-5) Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems • Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3) Science Addresses Questions About the Natural and Material World • Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5)
NGSS Standards	Classroom Applications

MS-LS2
Ecosystems: Interactions, Energy, and Dynamics
	Objectives:
	
	• Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (MS-LS2-1).
	  • Identify interactions between biotic and abiotic factors
	  • Identify the needs that must be met by an organism's surroundings
	  • Describe the levels of organization of an ecosystem
	  • Explain the resource limitations that populations and communities encounter
	  • Describe how populations change in size and identify the factors that limit and promote growth
	
	• Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. (MS-LS2-2)
	  • Differentiate between competitive, predatory, and mutually beneficial interactions
	  • Explain how adaptations help an organism survive
	
	• Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. (MS-LS2-3).
	  • Name and describe energy roles that organisms play in an ecosystem (producers, consumers, and decomposers)
	  • Identify how energy moves in an ecosystem
	
	• Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. (MS-LS2-4).
	  • Identify dynamic ability of characteristics and resources to vary over time.
	  • Explain the physical and biological characteristics may affect populations.
	  • Describe biodiversity can be used as a measure of ecosystem's health.

	• Explain the difference between primary and secondary succession • Evaluate competing design solutions for maintaining biodiversity and ecosystem services. (MS-LS2-5). • Identify importance of genetic relatedness and physical proximity to groups in an ecosystem. • Behaviors (signaling) maintain each group's health and survival. • Identify factors within a group that influence the demise of the group (no longer meet needs, members are lost through removal, predation, death) • Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (MS-ETS1-1) • Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2) • Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3) • Develop a model to generate for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (SmartBoard, student computers/laptops, PowerPoint,

	Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented): Extra Support: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework Enrichment: computer-based research, high level task, class presentation Limited English Proficiency: vocabulary support, word/picture association, visual aids
Connections to other DCIs in this grade-band: MS.PS1.B (MS-LS2-3); MS.LS1.B (MS-LS2-2); MS.LS4.C (MS-LS2-4); MS.LS4.D (MS-LS2-4); MS.ESS2.A (MS-LS2-3),(MS-LS2-4); MS.ESS3.A (MS-LS2-1),(MS-LS2-4);MS.ESS3.C (MS-LS2-1),(MS-LS2-4),(MS-LS2-5)	
Articulation of DCIs across grade-bands: 1.LS1.B (MS-LS2-2); 3.LS2.C (MS-LS2-1),(MS-LS2-4); 3.LS4.D (MS-LS2-1),(MS-LS2-4); 5.LS2.A (MS-LS2-1),(MS-LS2-3); 5.LS2.B (MS-LS2-3); HS.PS3.B (MS-LS2-3);HS.LS1.C (MS-LS2-3); HS.LS2.A (MS-LS2-1),(MS-LS2-2),(MS-LS2-5); HS.LS2.B (MS-LS2-2),(MS-LS2-3); HS.LS2.C (MS-LS2-4),(MS-LS2-5); HS.LS2.D (MS-LS2-2);HS.LS4.C (MS-LS2-1),(MS-LS2-4); HS.LS4.D (MS-LS2-1),(MS-LS2-4),(MS-LS2-5); HS.ESS2.A (MS-LS2-3); HS.ESS2.E (MS-LS2-4); HS.ESS3.A (MS-LS2-1),(MS-LS2-5);HS.ESS3.B (MS-LS2-4); HS.ESS3.C (MS-LS2-4),(MS-LS2-5); HS.ESS3.D (MS-LS2-5)	
Common Core State Standards Connections: ELA/Literacy – RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-1),(MS-LS2-2),(MS-LS2-4) RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS2-1) RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5) RI.8.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-4),(MS-LS2-5) WHST.6-8.1 Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4) WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS2-2)	

WHST.6-8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2),(MS-LS2-4)

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS2-2)

SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS2-2)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS2-3)

Mathematics –

MP.4 Model with mathematics. (MS-LS2-5)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-LS2-5)

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS2-3)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS2-2)

Unit Resources: (related websites, reference materials, etc.)

Reference Materials: Dependent upon district resources
Houghton Mifflin Harcourt Science Dimensions
-ECOLOGY & THE ENVIRONMENT MODULE C
www.thesciencequeen.net
www.sciencespot.net
www.sanandreasfault.org
http://astro.unl.edu/naap/lps/animations/lps.swf
http://www.need.org
www.internet4classrooms.com
www.smartexchange.com
http://ngss.nsta.org/Classroom-Resources.aspx
http://www.earthsciweek.org/for-teachers
http://education.usgs.gov/index.html

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs

• Presentations • Collaboration • Projects • Rubrics (http://www.nextgenscience.org/resources) • Lab Investigations • Quizzes • Unit Test

Subject: Science	Grade Level: 8
Unit 3: Heredity: Inheritance and Variation of Traits	Pacing: 27 days
Essential Questions	Enduring Understandings (DCI)
How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics? • How are the characteristics of one generation related to the previous generation? (LS3.A) • Why do individuals of the same species vary in how they look, function, and behave? (LS3.B)	LS1.B: Growth and Development of Organisms • Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2) LS3.A: Inheritance of Traits • 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 affects 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. (MS-LS3-1) • Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2) LS3.B: 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. (MS-LS3-2) • 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. (MS-LS3-1) Cause and Effect • Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2) Structure and Function • Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)
NGSS Standards	Classroom Applications

MS - LS3
Heredity: Inheritance and Variation of Traits.
	Objectives:
	• Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. (MS-LS3-1).
	  • Explain what forms the genetic code
	  • Describe how DNA copies itself
	  • Identify how mutations can affect an organism
	  • Explain how cancer is related to mutations and the cell cycle
	
	• Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. (MS-LS3-2).
	  • Identify the stages of a plant's life cycle & describe how plants reproduce
	  • Compare asexual & sexual reproduction in invertebrates & vertebrates
	• Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions (MS-ETS1-1)

	• Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2) • Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3) • Develop a model to generate for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4) Teaching Strategies/Materials: Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects Materials: Mentor Texts, DVDs, Internet, Technology (SmartBoard, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented): Helper, visual aids, modified tests/quizzes, modified homework Enrichment: computer-based research, high level task, class presentation Limited English Proficiency: vocabulary support, word/picture association, visual aids
Connections to other DCIs in this grade-band: MS.LS1.A (MS-LS3-1); MS.LS4.A (MS-LS3-1)	
Articulation of DCIs across grade-bands: 3.LS3.A (MS-LS3-1),(MS-LS3-2); 3.LS3.B (MS-LS3-1),(MS-LS3-2); HS.LS1.A (MS-LS3-1); HS.LS1.B (MS-LS3-1),(MS-LS3-2); HS.LS3.A (MS-LS3-1),(MS-LS3-2);HS.LS3.B (MS-LS3-1),(MS-LS3-2)	

Common Core State Standards Connections:

ELA/Literacy -

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS3-1),(MS-LS3-2)

RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. (MS-LS3-1),(MS-LS3-2)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-1),(MS-LS3-2)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS3-1),(MS-LS3-2)

Mathematics -

MP.4 Model with mathematics. (MS-LS3-2)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS3-2)

Unit Resources: (related websites, reference materials, etc.)

Reference Materials: Dependent upon district resources
Houghton Mifflin Harcourt Science Dimensions
- CELLS & HEREDITY MODULE B
www.thesciencequeen.net
www.sciencespot.net
www.sanandreasfault.org
http://astro.unl.edu/naap/lps/animations/lps.swf
http://www.need.org
www.internet4classrooms.com
www.smartexchange.com
http://ngss.nsta.org/Classroom-Resources.aspx
http://www.earthsciweek.org/for-teachers
http://education.usgs.gov/index.html

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration

- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Lab Investigations
- Quizzes
- Unit Test

Subject: Science	Grade Level: 8
Unit 4: Biological Evolution: Unity and Diversity	Pacing: 55 days
Essential Questions	Enduring Understandings
How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms? How does biodiversity affect humans? • What evidence shows that different species are related? (LS4.A) • How does genetic variation among organisms affect survival and reproduction? (LS4.B) • How does the environment influence populations of organisms over multiple generations? (LS4.C) • What is biodiversity, how do humans affect it, and how does it affect humans? (LS4.D)	LS4.A: 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. (MS-LS4-1) • 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. (MS-LS4-2) • Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3) LS4.B: Natural Selection • Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4) • 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. (MS-LS4-5) LS4.C: 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. (MS-LS4-6) Patterns • Patterns can be used to identify cause and effect relationships. (MS-LS4-2) • Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1),(MS-LS4-3) Cause and Effect • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-5),(MS-LS4-6) Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5) Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems • Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2) Science Addresses Questions About the Natural and Material World • Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5)
NGSS Standards	Classroom Applications
MS-LS4 Biological Evolution: Unity and Diversity	Objectives: • Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the

	history of life on Earth under the assumption that natural laws operate today as in the past. (MS-LS4-1) • Identify fossils as mineral replacements, preserved remains, or traces of the past. • Describe how sedimentary layers provide evidence of Earth's history as well as changes in organisms over time (fossil record). • Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. (MS-LS4-2). • Compare and contrast the anatomical similarities and differences enable construction of evolutionary history and lines of evolutionary descent. • Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. (MS-LS4-3). • Compare and contrast life cycles in various organisms • Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. (MS-LS4-4). • Explain how natural selection leads to evolution • Describe how Darwin's observations helped him develop his hypothesis • Explain natural selection and how it leads to the predominance or suppression of certain traits in a population. • Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. (MS-LS4-5). • Analyze how selective breeding can influence certain characteristics of organisms

	and how selective breeding identifies genes responsible for desired traits.
	
	• Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. (MS-LS4-6).
	  • Explain how new species form
	  • Identify the patterns that describe the rate of evolution
	
	Teaching Strategies/Materials:
	
	Lesson Structure: Anticipatory Set, Mini-Lesson, Whole Group, Small Group, Independent Work, Closure
	
	Strategies: Think-Pair-Share, Read Aloud, Jigsaw, Investigations, Guided Explorations, Projects
	
	Materials: Mentor Texts, DVDs, Internet, Technology (SmartBoard, student computers/laptops, PowerPoint, Websites, etc.), supplemental books, visual aids, manipulatives, supplemental materials for investigations
	
	Differentiation Strategies/Modifications (i.e. ESL, Special Education, Gifted & Talented):
	
	Extra Support: 1:1 teacher redirect / re-teach, peer helper, visual aids, modified tests/quizzes, modified homework
	Enrichment: computer-based research, high level thinking tasks, class presentations
	Limited English Proficiency: vocabulary support, word/picture association, visual aids

Connections to other DCIs in this grade-band: MS.LS2.A (MS-LS4-4),(MS-LS4-6); MS.LS2.C (MS-LS4-6); MS.LS3.A (MS-LS4-2),(MS-LS4-4); MS.LS3.B (MS-LS4-2),(MS-LS4-4),(MS-LS4-6); MS.ESS1.C (MS-LS4-1),(MS-LS4-2),(MS-LS4-6); MS.ESS2.B (MS-LS4-1)	
Common Core State Standards Connections: ELA/Literacy -	

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-LS4-1),(MS-LS4-2),(MS-LS4-3),(MS-LS4-4),(MS-LS4-5)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS4-1),(MS-LS4-3)

RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3),(MS-LS4-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-2),(MS-LS4-4)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS4-5)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2),(MS-LS4-4)

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-2),(MS-LS4-4)

SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4-2),(MS-LS4-4)

Mathematics -

MP.4 Model with mathematics. (MS-LS4-6)

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4),(MS-LS4-6)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS4-4),(MS-LS4-6)

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1),(MS-LS4-2)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-LS4-4),(MS-LS4-6)

TECHNOLOGY STANDARDS ADDRESSES

Understand and use technology systems

8.1.8.A.1 Demonstrate knowledge of a real-world problem using digital tools. Select and use applications

effectively and productively.

8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real-world problem or theory.

8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results

8.1.8.A.5 Create a database query, sort and create a report and describe the process and explain report results.

Unit Resources: (related websites, reference materials, etc.)

Reference Materials: Dependent upon district resources
Houghton Mifflin Harcourt Science Dimensions
-DIVERSITY OF LIVING THINGS MODULE D
www.thesciencequeen.net
www.sciencespot.net
www.sanandreasfault.org
http://astro.unl.edu/naap/lps/animations/lps.swf
http://www.need.org
www.internet4classrooms.com
www.smartexchange.com
http://ngss.nsta.org/Classroom-Resources.aspx
http://www.earthsciweek.org/for-teachers
http://education.usgs.gov/index.html

Unit Assessment Opportunities:

- Journal Entries and Response Sheets
- Observations, Questioning, and discussions
- Comprehension Checks in literature
- Class Webs
- Presentations
- Collaboration
- Projects
- Rubrics (http://www.nextgenscience.org/resources)
- Lab Investigations
- Quizzes
- Unit Test