Milltown School District
Milltown, NJ 08850

BASED ON
NEXT GENERATION SCIENCE STANDARDS 2013
and NEW JERSEY STUDENT LEARNING STANDARDS 2016

Science Curriculum

Kindergarten through Fifth Grade

Adoption Date: January 23, 2017

Milltown School District
Milltown, NJ 08850

SCIENCE CURRICULUM

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Foreword

Humankind is developing in an increasingly technological environment. With the greatest of rapidity, we can retrieve enormous amounts of data. Communication is becoming more accelerated as the Earth continues to shrink. People, out of necessity, are compelled to interact more as one than as different societies.

Education today requires a cadre of highly skilled teachers to bring forward to the minds of the children entrusted to their care the very best that there is to offer. The role of the classroom teacher can only be successful with the support of a Board of Education committed to excellence and parents and guardians who are knowledgeable and supportive of the individual needs of their own children. Teaching is best accomplished when the home, school, and community respond in this positive way.

A well-developed curriculum is one of the most fundamental ingredients for every child's educational success. It is the curriculum that melds into one the most current educational trends, the philosophy of education of the school district, and the desires of each and every parent and guardian to have his or her child reach the optimum of success. Education is global and addresses current as well as past events, offering students opportunities to make real world connections across every curricular area. In preparing our students for the 21st century, we must provide classroom instruction that prepares them with the skills necessary to access and connect information in a rapidly changing world.

There will be a continuing need to reach across the subject areas if we are to develop the child into a wholly educated individual. The skills of reading must be taught and reinforced in every subject, as must those of writing and mathematics. For the present time, and for the reasonably foreseeable future, these three fundamental areas will continue to be the core of the strength of the American society. Collectively they open the doors to all learning. In order for one to understand the laws of the nation, to make a contribution to society, and to value one's self and the rest of humankind, it is essential that this cross-curricular approach be embraced with enthusiasm.

This curriculum guide seeks to foster these ideals, so that the children of Milltown will be as well prepared as those from any other educational system. This guide emphasizes decision-making and citizenship skills and the need to conceptualize, rather than to learn by rote.

The educators of this district and the community are encouraged to utilize this guide as a vehicle to help assure that in Milltown we have indeed fulfilled our obligation to create a better world. A world in which there is more understanding for what is the common good of its entire people. A world in which our children will be better communicators and fully able to interact more as one, than as different societies.

Affirmative Action Statement

It is the policy of the Board of Education to provide equal employment and educational opportunities, regardless of race, color, creed, religion, sex, ancestry, national origin, place of residence, social or economic condition, or non-applicable handicap.

Affirmative Action Officer:

Norma Tursi, Business Administrator
Milltown Board of Education
21 West Church Street
Milltown, New Jersey 08850
(732) 214-2365

Adaptation for Special Education Statement

Although this curriculum guide has been developed for general education delivery, the knowledge, skills, attitudes, and behaviors identified are appropriate for the special education pupils in Milltown. Modifications necessary to accommodate the educational needs of an individual pupil's disability will be described in the Individualized Educational Program (IEP). They are on file at:

Office of Student Support Services
c/o Joyce Kilmer School
21 West Church Street
Milltown, NJ 08850
(732) 214-2365

Philosophy of Education

(Board Policy File # 6010)

The Milltown Board of Education accepts the responsibility for coordinating the available resources for home, school, and community in a mutual effort to guide every pupil's growth towards becoming a self-respecting individual who can effectively function politically, economically, and socially in a democratic society.

The Board believes New Jersey State goals should be applicable for every pupil in the Milltown School District to the limit to which the Board possesses jurisdiction, financial and staff resources.

A. All children should start school ready to learn.

   1. Quality preschool opportunities shall be provided for all specially eligible children, through collaboration between public schools and community agencies.

   2. Within financial and staff resources parent education programs shall be designed and implemented by the District to assist parents in providing readiness experiences for their preschool children.

B. The high school graduation rate shall be at least 90 percent (the receiving high school district shall be encouraged to embrace and implement these goals).

   1. The District shall provide least restrictive, alternative programs for pupils who cannot succeed in the regular high school environment, including those students with disabilities.

   2. The District shall provide dropout prevention programs for pupils at risk.

C. Pupils shall leave grades four, eight and eleven having demonstrated competency in challenging subject matter including Language Arts/ literacy, mathematics, science, and social studies (civics, history and geography), health, physical education, visual and performing arts and world languages.

   1. The District shall implement state-approved curriculum content standards and appropriate assessments to enable pupils to succeed and to evaluate their performance.

   2. The District shall provide staff development opportunities to ensure that teachers are adequately equipped to teach challenging and up-to-date subject matter and to implement effective teaching techniques.

D. Pupils shall learn to use their minds well, so that they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy.

   1. The District shall provide students with experiences in higher-level thinking, information processing, the responsibilities of citizenship, and employability skills.

   2. All pupils shall demonstrate competency in the skills identified in the cross-content workplace readiness standards.

3. All pupils shall demonstrate respect for racial, cultural, ethnic and religious diversity.

E. All pupils shall increase their achievement levels in science and mathematics to contribute to our country's ability to compete academically with other countries of the world.

1. The District shall revise its curriculum offerings in science and mathematics according to state standards as they are developed.

2. The District shall provide staff training in the teaching of mathematics and science at grades K-8 to increase teachers' understanding of and ability to teach these subjects.

F. Every adult shall be literate and possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.

1. Adult education programs shall be increased in conjunction with other local districts, community colleges and other educational agencies, to provide greater opportunities for adults to continue learning for work skills, leisure pursuits, intellectual and cultural growth and to assist their children in learning.

2. Business and industry shall be encouraged to collaborate with educational agencies to design and increase access to educational programs for adults, such as flex time, distance learning and interactive technology.

G. District schools shall be free of drugs and violence and offer a safe, disciplined environment conducive to learning.

1. The District shall develop partnerships with parents to establish the responsibilities of each to create and maintain safe and healthy educational environments for all pupils.

2. The District shall provide programs and staffing to deal with pupils at risk.

3. The school and community shall expand their cooperative efforts to create drug and violence-free environments.

4. All students shall develop a positive view of self and learn to use effective interpersonal skills.

The Board shall develop, in consultation with the chief school administrator and teaching staff members, a written educational plan for the District. This plan shall be reviewed and adopted annually and shall include:

A. Written educational goals;

B. An assessment of pupil needs;

C. Specific annual objectives based on identified needs and action plans to implement them;

D. Standards for assessing and evaluating the achievement of objectives;

E. The establishment of reasonable pupil minimum proficiency levels in the areas addressed in the core curriculum content standards;

F. An educational program consistent with these goals, objectives, standards and needs;

G. An evaluation of pupil progress.

Adopted: September 23, 1997
Revised: March 29, 1999
Revised: May 27, 2008

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KINDERGARTEN

PERFORMANCE EXPECTATIONS

In the kindergarten performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

STANDARDS

K-PS2 Motion and Stability: Forces and Interactions
K-PS3 Energy
K-LS1 From Molecules to Organisms: Structures and Processes
K-ESS2 Earth's Systems
K-ESS3 Earth and Human Activity
K-2 ETS1 Engineering Design

CORE IDEAS

K-PS2 Motion and Stability: Forces and Interactions

What happens if you push or pull an object harder?

Students are able to apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution.

K-ESS2 Earth's Systems

What is the weather like today and how is it different from yesterday?

Students are expected to develop understanding of patterns and variations in local weather and the purpose of weather forecasting to prepare for, and respond to, severe weather.

K-ESS3 Earth and Human Activity

Where do animals live and why do they live there?

Students are also expected to develop understanding of what plants and animals (including humans) need to survive and the relationship between their needs and where they live.

CROSSCUTTING CONCEPTS

Patterns; cause and effect; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

WEATHER & CLIMATE

How can we record observations of the local weather and temperature?

What patterns were observed in their observations?

Does this pattern change with seasons?

NJCTL Unit 2 MP 1

BIG IDEAS

WEATHER IS THE COMBINATION OF SUNLIGHT, WIND, SNOW OR RAIN, AND TEMPERATURE IN A PARTICULAR REGION AND TIME. PEOPLE RECORD WEATHER PATTERNS OVER TIME.

SCIENTIFIC INQUIRY

Core

- Weather Observation Activity
- Analyzing Data – Weather Journal Lab

Supplemental

- Describing Weather- Temperature Lab
- Describing Weather – Wind Speed Lab
- Describing Weather – Wind Direction Lab
- Describing Weather – Clouds Lab
- Describing Weather – Precipitation Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION SCIENCE STANDARDS

Weather and Climate

K-ESS2.D 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.

COMMON CORE STATE STANDARDS

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.

FOCUS AREAS

Knowledge

- 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).

Skills

- 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.

Understandings

- Use and share observations of local weather conditions to describe patterns over time.

SEVERE WEATHER

What types of severe weather can you name?

How can you prepare for severe weather?

Who helps us prepare for severe weather?

NJCTL Unit 6 MP 1

BIG IDEAS

IN A REGION, SOME KINDS OF SEVERE WEATHER ARE MORE LIKELY THAN OTHERS. FORECASTS ALLOW COMMUNITIES TO PREPARE FOR SEVERE WEATHER.

SCIENTIFIC INQUIRY

Core

- National Weather Service Activity
- Blizzards Activity
- Hurricanes Activity
- Tornadoes Activity
- Tornado Lab
- Sand Storms Activity
- Preparing for Severe Weather Activity

Supplemental

- Types of Weather Activity
- Weather Forecasting Activity
- Weather Tools Activity
- Air Pressure Activity
- Making a Barometer Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Natural Hazards

K-ESS3.B 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.

Defining and Delimiting an Engineering Problem

K-ESS3.A Asking questions, making observations, and gathering information are helpful in thinking about problems.

FOCUS AREAS

Knowledge

- 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.

Skills

- 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.

Understandings

- Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.

PLANT & ANIMAL NEEDS

What are the basic needs of plants and animals?

NJCTL Unit 3 MP 2

BIG IDEAS

ANIMALS OBTAIN FOOD THEY NEED FROM PLANTS OR OTHER ANIMALS.
PLANTS NEED WATER AND LIGHT.

SCIENTIFIC INQUIRY

Core

- Lima Bean Lab
- Sunlight Lab
- Exploring Plants and Animals Activity
- Animals Babies Needs Activity

Supplemental

- Birdseed Lab
- Sweet Potato Lab
- Carrot top Lab
- Searching for Light Lab
- Leaves & Buds Lab
- Celery Lab
- Water & Leaves Lab
- Parts of a Plant Activity
- Plant Needs Activity
- Plant Life Cycle Activity
- Brain Pop Jr. Parts of a Plant
- Brain Pop Jr. Plant Life Cycle

CROSS CURRICULAR

- Animal Research Poster (Birds and Fish)
- *The Tiny Seed* by Eric Carle
- *From Seed to Plant* by Gail Gibbons
- *Tops and Bottoms* by Janet Stevens
- *Michael Recycle* by Ellie Bethel
- *The Lorax* by Dr. Seuss

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Organization For Matter And Energy Flow In Organisms

K-LS1.C 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.

COMMON CORE STATE STANDARDS

Mathematics

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

FOCUS AREAS

Knowledge

- 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.

Skills

- Differentiate between the needs of animals and plants.
- Recognize the basic needs of organisms.
- Describe patterns of what plants and animals (including humans) need to survive.

Understandings

- Use observations to describe patterns of what plants and animals (including humans) need to survive.

PLANT & ANIMAL ENVIRONMENTS

What features help plants and animals survive in different environments? How do plants and animals depend on the land, air, and water to survive? How do plants and animals change the environment to meet their needs?

NJCTL Unit 4 MP 2

BIG IDEAS

PLANTS AND ANIMALS CAN CHANGE THEIR LOCAL ENVIRONMENT. LIVING THINGS NEED WATER, AIR, AND RESOURCES FROM THE LAND, AND THEY LIVE IN PLACES THAT HAVE THE THINGS THEY NEED. HUMANS USE NATURAL RESOUCES FOR EVERYTHING THEY DO.

SCIENTIFIC INQUIRY

Core

- Environment Activity
- Transfer of Energy – Owl Activity
- Food Chain, Activity
- Ecosystem Animals, Activity
- Hibernation Activity
- Migration Activity
- Desert Environment, Activities 25-28

Supplemental

- Wetlands Activities

- Forest Activities
- Camouflage Activities
- Winter Survival “Warmth” Lab
- Nature Walk Activity

CROSS CURRICULAR

- Arctic Animals Informative Writing (Penguins, Polar Bears, Seals, Walruses)

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Biogeology

K-ESS2.E Plants and animals can change their environment.

Natural Resources

K-ESS3.A 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.

COMMON CORE STATE STANDARDS

Mathematics

MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
K.CC Counting and Cardinality

FOCUS AREAS

Knowledge

- 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.

Skills

- 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.

Understandings

- Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
- Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

FORCES & MOTION

Can pushes and pulls have different strengths and directions?

What can increase the speed of an object or make the object turn?

NJCTL Unit 7 MP 3

BIG IDEAS

PUSHES AND PULLS CAN HAVE DIFFERENT STRENGTHS AND DIRECTIONS,
AND CAN CHANGE THE SPEED OR DIRECTION OF ITS MOTION OR START OR STOP IT.
BIGGER PUSHES AND PULLS CAUSE BIGGER CHANGES IN AN OBJECT'S MOTION OR SHAPE.

SCIENTIFIC INQUIRY

Core

- Pushes and Pulls Lab
- Different Forces Lab
- Transferring Energy – Types of Interactions Lab
- Relationship of Energy and Force -Changing Speed Lab
- Investigation and Analyzing Data – Changing Speed (Problem Solving) Lab

Supplemental

- Investigation and Analyzing Data –Changing Direction (Problem Solving) Lab
- Brain Pop Jr. Pushes and Pulls
- Brain Pop Jr. Sink or Float
- Sink or Float Experiment
- Brain Pop Jr. Magnets
- Magnet Experiment

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Forces and Motion

K-PS2.A Pushes and pulls can have different strengths and directions.

K-PS2.A Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

Type of Interactions

K-PS2.B When objects touch or collide, they push on one another and can change motion.

Relationship Between Energy and Forces

K-PS3.C A bigger push or pull makes things go faster.

Defining Engineering Problems

K-ETS1.A 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.

COMMON CORE STATE STANDARDS

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.

FOCUS AREAS

Essential Knowledge

- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and start or stop it.
- When objects touch or collide, they push on one another and can change motion.
- A larger push or pull makes things go faster

Essential Skills

- With guidance, students will plan and conduct an investigation of forces and interactions, in collaboration with peers. They will be able to design solutions (through engineering) to change the speed or direction of an object with pushes or pulls. The students may include tools (such as a ramp or structure) to solve this problem.
- Analyze data from force and interaction tests (with tools) to determine if plan work as intended.

Understandings

- 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.
- 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.

HUMAN IMPACT ON EARTH

How do people affect the world around them?

How can you help keep the Earth healthy?

What can we do to reduce, reuse, and recycle our natural resources?

NJCTL Unit 5 MP 4

BIG IDEAS

THINGS PEOPLE DO CAN AFFECT THE ENVIRONMENT BUT THEY CAN MAKE CHOICES TO REDUCE THEIR IMPACTS.

SCIENTIFIC INQUIRY

Core

- Human Impact Activity 1
- Earth's Resources Activity 2
- Reduce, Reuse, Recycle Activities 5-7 and Lab 3
- What Can You Do? Activity 20

Supplemental

- Soil Samples Lab
- Compost Activity
- Recycling Activity
- Keeping Environment Clean Activity
- Plant a Tree Activity
- Cleaning Dirty Water Activity

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Human Impacts on Earth Systems

K-ESS2.C 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.

Developing Possible Solutions

K-ESS3.B 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.

FOCUS AREAS

Knowledge

- 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.

Skills

- 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.

Understandings

- Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
- Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment

THE SUN

What are characteristics of the sun?

Can structures reduce the warming effect of sunlight on Earth's surface?

NJCTL Unit 1 MP 4

BIG IDEAS

SUNLIGHT WARMS EARTH'S SURFACE.

SCIENTIFIC INQUIRY

Core

- Does the sun give heat energy? Lab
- Sun's Effect on Earth's Surface Lab
- Design Shade Structure Lab
- Build Shade Structure Lab

Supplemental

- Sun's Effect on Sand vs. Grass Lab
- Sun's Effect Hard Surfaces Lab

- Sun's Effect on Ocean's Surface Lab
- Sun's Effect on Water vs. Sand Lab
- Build a Solar Stove Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Conservation of Energy and Energy Transfer

K-PS3.B Sunlight warms Earth's surface.

COMMON CORE STATE STANDARDS

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.

FOCUS AREAS

Knowledge

- How sunlight affects different surfaces on Earth. Use the terms warm, cool, and hot.

Skills

- 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.

Understandings

- Make observations to determine the effect of sunlight on Earth's surface.
- Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area

MATTER (SUPPLEMENTAL)

What are observable properties of different materials?

What similar properties do different materials share?

How does temperature affect the state of matter?

Does a material occur naturally or is it manufactured?

NJCTL Unit 8 MP 4

BIG IDEAS

MATTER EXISTS AS DIFFERENT SUBSTANCES THAT HAVE OBSERVABLE DIFFERENT PROPERTIES. DIFFERENT PROPERTIES ARE SUITED TO DIFFERENT PURPOSES. OBJECTS CAN BE BUILT UP FROM SMALLER PARTS.

SCIENTIFIC INQUIRY

Supplemental

- Matter – Liquids Lab
- Liquids –Density Lab
- Liquids Hot and Cold Lab

- It's a Gas Lab
- Gas Bubbles Lab
- Liquids to Solids Lab
- Liquid to Gas Lab
- Gas to Liquid Lab
- States of Matter – In Nature Lab
- States of Matter – In Nature Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Structure and Properties of Matter

K-PS1.A-a Design and conduct an investigation of different kinds of materials to describe their observable properties and classify the materials on the patterns observed.

K-PS1.A-b Design and conduct investigations to test the idea that some materials can be solid or liquid depending on the temperature.

K-PS1.A-c Ask questions, based on observations, to classify different objects by their use and to identify whether they occur naturally or are human made**.**

2-PS1.A-a Different properties are suited to different purposes.

2-PS1.A-b A great variety of objects can be built up from a small set of pieces (e.g., blocks, construction sets).

2-PS1.A-c Objects or samples of a substance can be weighed, and their size can be described and measured. (Boundary: volume is introduced only for liquid measure.)

COMMON CORE STATE STANDARDS

Mathematics

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

FOCUS AREAS

Knowledge

- That objects can be solid, liquid, or gas.
- Everything you see is made of matter.
- Properties can include height, weight, color, texture, and hardness.
- Liquids take the shape of the container they occupy.
- Solid retain their shape regardless of the container they occupy.
- Different types of matter (wood, metal, water) can be solid or liquid depending on the temperature.
- Matter can occur naturally or can be manufactured.

Skills

- Design and conduct investigations of materials to describe their properties and classify materials based on observations.
- Design and conduct investigations to test whether a material is solid or liquid depending on temperature.
- Classify different objects by their use and decide if the object occurs naturally or is human-made.

Understandings

- Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

- Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

FIRST GRADE

PERFORMANCE EXPECTATIONS

In the first grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

STANDARDS

1-PS4 Waves and their Applications in Technologies for Information Transfer

1-LS1 From Molecules to Organisms: Structures and Processes

1-LS3 Heredity: Inheritance and Variation of Traits

1-ESS1 Earth's Place in the Universe

CORE IDEAS

1-PS4.A Wave Properties

What happens when materials vibrate?

Students are expected to develop understanding of the relationship between sound and vibrating materials as well as between the availability of light and ability to see objects.

1-PS4.B Electromagnetic Radiation

What happens when there is no light?

The idea that light travels from place to place can be understood by students at this level through determining the effect of placing objects made with different materials in the path of a beam of light.

1-LS1.A-B Structure and Function & Growth and Development of Organisms

What are some ways plants and animals meet their needs so that they can survive and grow?

Students are also expected to develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive.

1-LS3.A Inheritance of Traits

How are parents and their children similar and different?

The understanding is developed that young plants and animals are like, but not exactly the same as their parents.

1-ESS1.A The Universe and Stars

What objects are in the sky and how do they seem to move?

Students are able to observe, describe, and predict some patterns of the movement of objects in the sky.

CROSSCUTTING CONCEPTS

Patterns; cause and effect; structure and function; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

THE SUN, MOON, EARTH AND STARS

What is the pattern of the sun's movement?
Does the Moon create its own light?
What causes the seasons?

NJCTL Unit 1 MP 1

BIG IDEAS

PATTERNS OF MOVEMENT OF THE SUN, MOON AND STARS AS SEEN FROM EARTH CAN BE OBSERVED AND PREDICTED.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 7, Weather
- Chapter 11, Day and Night Sky

Leveled Readers

- *Weather, What is Weather, Places in the World*
- *Day and Night Sky, The Sky, The Sun*

SCIENTIFIC INQUIRY

Core

- Shadow Tracking Lab
- Shining Moon Activity
- Seasons Activity
- Where Do the Stars Go? Lab

Supplemental

- Energy from the Sun Activity
- The Sun's Motion Lab
- Compass Rose Lab
- Moon Phase Activity
- Earth's Tilt Activity
- Seasonal Sun Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

The Universe and Its Stars

1-ESS1.A Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.

Earth and the Solar System

1-ESS1.B Seasonal patterns of sunrise and sunset can be observed, described, and predicted.

COMMON CORE STATE STANDARDS

Mathematics

As part of this work, teachers should give students opportunities to practice addition and subtraction and represent and interpret data:

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. Science example: There were 16 hours of daylight yesterday. On December 21, there were only 8 hours of daylight. How many more hours of daylight were there yesterday?

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. Science example: Based on the data we have collected so far on the bulletin board, which day has been the longest of the year so far? Which day has been the shortest of the year so far?

FOCUS AREAS

Knowledge

- How the Sun appears to travel across the sky and that this is due to the Earth's motion, not the Sun's.
- The four cardinal directions.
- Moons are objects that revolve around planets.
- The Moon shines because it is reflecting sunlight.
- The Moon appears to grow and shrink in the sky based on how much reflected sunlight we can see.
- Because the Sun is so close, its brightness keeps us from seeing other stars during the day.
- Seasons are caused by the Earth's tilt.
- The Sun appears to be higher in the sky during the summer and lower in the winter.

Skills

- Make predictions about the Sun's location at various times of the day.
- Label a compass rose.
- Explain how moons are different than planets.
- Make predictions about the Moon's phases.
- Explain how the Sun's presence during the day keeps other stars from being seen.
- Explain how the Earth's tilt causes the seasons.
- Compare and contrast the Sun's location in the sky during the summer and winter months.

Understandings

- Use observations of the sun, moon, and stars to describe patterns that can be predicted.
- Make observations at different times of year to relate the amount of daylight to the time of year.

WAVES

What is light?

How does light travel?

NJCTL Unit 2 MP 1-2

BIG IDEAS

SOUND CAN MAKE MATTER VIBRATE, AND VIBRATING MATTER CAN MAKE SOUND.
OBJECTS CAN BE SEEN ONLY WHEN LIGHT IS AVAILABLE TO ILLUMINATE THEM

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 10, Learning About Energy

Leveled Readers

- *Learning About Energy, Energy, All About Electricity*

SCIENTIFIC INQUIRY

Core

- String Phone Lab
- Object's in Light's Path Lab
- Light Cave Explorer Activity

Supplemental

- Light and Reflection Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION SCIENCE STANDARDS

Wave Properties

1-PS4.A Sound can make matter vibrate, and vibrating matter can make sound.

Electromagnetic Radiation

1-PS4.B Objects can be seen if light is available to illuminate them or if they give off their own light.

1-PS4.B 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.)

COMMON CORE STATE STANDARDS

Mathematics

1.MD.A.1. Order three objects by length; compare the lengths of two objects indirectly by using a third object. Science example: The class makes string phones. Maria's string is longer than Sue's...Sue's string is longer than Tia's...so without measuring directly we know that Maria's string is longer than Tia's.

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. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.* Science example: Using a shoe as the length unit, the string for Sue's string phone is 11 units long.

FOCUS AREAS

Knowledge

- Light is energy we see.
- Shadows are areas of darkness behind an object that is illuminated.
- Light travels in a straight line.
- Natural sources include the sun while artificial sources include light bulbs and TV.
- Illuminate means to light up.
- Reflect means to bounce as seen when light hits a mirror and some metal objects. Depending on how the light hits, depends on what kind of image is formed.
- Transparent surfaces allow light to easily pass through like a window.
- Translucent surfaces allow some light to pass through like waxpaper.

- Opaque surfaces absorb light and reflect the color or colors we see such as a red apple.
- Refraction is the bending of light as it passes through water as seen with rainbows and rulers in water.

Skills

- Define and apply the terms opaque, transparent, translucent, refraction, and reflection.
- Discover the differences between the terms opaque, transparent, translucent, refraction and reflection.
- Discover differences in shadows.
- Identify different sources of light.
- Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.
- Use tools and materials to design and build a device that uses light or sound to solve the problem.

Understandings

- Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
- Make observations to construct an evidence-based account that objects can be seen only when illuminated.
- Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.

INFORMATION TECHNOLOGIES

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?

NJCLT Unit 3 MP 2

BIG IDEAS

PEOPLE USE DEVICES AND SENSES TO SEND AND RECEIVE INFORMATION.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 9, Movement and Sound

Leveled Readers

- *Movement and Sound, Forces and Sounds, Making Music*

SCIENTIFIC INQUIRY

Core

- Braille Activity

Supplemental

- Think Like a Computer Activity
- Flashlight Morse Code
- Marine Mammal Communication Activity

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Information Technologies and Instrumentation

1-PS4.C People also use a variety of devices to communicate (send and receive information) over long distances.

FOCUS AREAS

Essential Knowledge

- Devices that are used to communicate.
- Examples of devices they can design or build.
- Technology is used to communicate by sending and receiving information.

Essential Skills

- Design or use tools to build a device that uses light or sound to solve a problem of communicating.
- List devices that are used to communicate long distances.

Understandings

- Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

PLANT & ANIMAL STRUCTURES, FUNCTIONS & INFORMATION PROCESSING

What is structure and function?

How do animals use external structures to survive?

What are some examples of external parts of a plant and animal?

NJCTL Unit 4 MP 3

BIG IDEAS

ALL ORGANISMS HAVE EXTERNAL PARTS THAT THEY USE TO PERFORM DAILY FUNCTIONS. ANIMALS SENSE AND COMMUNICATE INFORMATION AND RESPOND TO INPUTS WITH BEHAVIORS THAT HELP THEM GROW AND SURVIVE.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 2, Habitats

Leveled Readers

- *Habitats, Places, Swamp Life*

SCIENTIFIC INQUIRY

Core

- Structure and Function Lab
- Why are Flowers Colorful Lab
- Walking Field Trip

Supplemental

- Plant Response Demo

- Design a Solution Activity
- Build a Monster Activity

ENDURING UNDERSTANDING

NEXT GENERATION STANDARDS

Structure and Function

1-LS1.A 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.

Information Processing

1-LS1.D 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.

COMMON CORE STATE STANDARDS

Mathematics

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.

FOCUS AREAS

Knowledge

- All organisms have external parts.
- Different animals use their body parts in different ways to see hear, grasp objects, protect themselves and survive.
- Plants have different parts that help them survive and grow.
- Plants and animals respond to their environments.

Skills

- Describe how structure relates to function.
- Describe/list external parts of an animal.
- Explain how plants and animals respond to their environment to help them survive.
- List parts of a plant (roots, stems, leaves, flower and fruit).

Understandings

- 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.

PLANT & ANIMAL GROWTH AND DEVELOPMENT

How do plants grow and develop?
How do plants and animals help their offspring survive?

NJTCL Unit 5 MP 3-4

BIG IDEAS

PARENTS AND OFFSPRING OFTEN ENGAGE IN BEHAVIORS THAT HELP THE OFFSPRING SURVIVE.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008
- Chapter 1, Living and Nonliving
- Chapter 3, How Plants and Animals Live
- Chapter 4, Life Cycles

Leveled Readers
- *Living and Nonliving, Is it a Living Thing?, What We Need*
- *How Plants and Animals Live, Animals and Plants, Many Leaves*
- *Life Cycles, Living Things Grow and Change, Egg to Owl*

SCIENTIFIC INQUIRY

Core
- Germination Lab
- Seed Lab
- Baby Robins Activity
- How Strong is an Egg? Activity

Supplemental
- Egg Membrane Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Growth and Development of Organisms

1-LS1.B Adult plants and animals can have young. In many kinds of animals, parents and offspring themselves engage in behaviors that help the offspring to survive.

FOCUS AREAS

Knowledge
- Adult plants and animals can have young.
- Animals can develop by direct development or metamorphosis.
- Plant parents help their offspring by creating seed coats and dispersal methods.
- Animal parents help their offspring to survive in many ways.

Skills
- Describe the stages of life for plants and animals.
- Describe how plants and animals grow and develop.
- Describe how plant and animal parents help their offspring survive.

Understandings
- Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

INHERITANCE OF TRAITS

How are young animals and plants like their parents?

What are the similarities and differences between plants and animals of the same kind/breed?

What characteristics do most plants and animals share?

NJCTL Unit 6 MP 4

BIG IDEAS

YOUNG ORGANISMS ARE VERY MUCH, BUT NOT EXACTLY, LIKE THEIR PARENTS AND ALSO RESEMBLE OTHER ORGANISMS OF THE SAME KIND.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 3, How Plants and Animals Live
- Chapter 4, Life Cycles

Leveled Readers

- *How Plants and Animals Live, Animals and Plants, Many Leaves*
- *Life Cycles, Living Things Grow and Change, Egg to Owl*

SCIENTIFIC INQUIRY

Core

- Comparing Carrots

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Inheritance of Traits

1-LS3.A Young animals are very much, but not exactly like their parents. Plants also are very much, but not exactly, like their parents.

Variation of Traits

1-LS3.B Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

COMMON CORE STATE STANDARDS

Mathematics

1.MD.A.1. Order three objects by length; compare the lengths of two objects indirectly by using a third object. Science example: Every sunflower is taller than the ruler…every daisy is shorter than the ruler…so without measuring directly we know that every sunflower is taller than every daisy. The sunflowers and daisies are not exactly like the plants from which they grew, but they resemble the plants from which they grew in being generally tall or generally short.

FOCUS AREAS

Knowledge

- Young animals are very much, but not exactly like their parents.
- Plants are very much, but not exactly, like their parents.
- Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

Skills

- Describe the difference between an adult animal and a baby animal of the same kind.

- Sort pictures of similar plants and/or animals.
- Describe the different features of plants of the same kind.

Understandings

- Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

SECOND GRADE

PERFORMANCE EXPECTATIONS

In the second grade performance expectations, students are expected to demonstrate grade appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

STANDARDS

2-PS1 Matter and its Interactions

2-LS2 Ecosystems: Interactions, Energy, and Dynamics
2-LS4 Biological Evolution: Unity and Diversity
2-ESS1 Earth's Place in the Universe
2-ESS2 Earth's Systems

CORE IDEAS

2-ESS2.A Earth Materials and Systems

How does land change and what are some things that cause it to change?

Students are able to apply their understanding of the idea that wind and water can change the shape of the land to compare design solutions to slow or prevent such change.

2-ESS2.B Plate Tectonics and Large-Scale System Interactions

What are the different kinds of land and bodies of water?

Students are able to use information and models to identify and represent the shapes and kinds of land and bodies of water in an area and where water is found on Earth.

2-PS1.A Structure and Properties of Matter

How are materials similar and different from one another, and how do the properties of the materials relate to their use?

An understanding of observable properties of materials is developed by students at this level through analysis and classification of different materials.

2-LS2.A Interdependent Relationships in Ecosystems

What do plants need to grow?

Students are expected to develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination.

2-LS4.D Biodiversity and Humans

How many types of living things live in a place?

Students are also expected to compare the diversity of life in different habitats.

CROSSCUTTING CONCEPTS

Patterns; cause and effect; energy and matter; structure and function; stability and change; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

MATTER

What are the different properties of matter?
What are the differences between a solid, a liquid and a gas?
How can a substance change?

NJCTL Unit 1 MP 1-2

BIG IDEAS

MATTER EXISTS AS DIFFERENT SUBSTANCES THAT HAVE OBSERVABLE DIFFERENT PROPERTIES.
DIFFERENT PROPERTIES ARE SUITED TO DIFFERENT PURPOSES.
OBJECTS CAN BE BUILT UP FROM SMALLER PARTS.
HEATING AND COOLING SUBSTANCES CAUSE CHANGES THAT ARE SOMETIMES REVERSIBLE AND SOMETIMES NOT.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 8, Properties of Matter

Leveled Reader

- *Matter*

SCIENTIFIC INQUIRY

Core

- Boat Design Challenge
- Balloon States of Matter Activity
- What is Goop? Activity
- Melting Crayons Activity

Supplemental

- Absorbency Lab
- Ball Bounce Lab
- Texture Activity
- House Design Challenge
- Molecules and States of Matter Activity
- Inflate a Balloon Activity
- Snowman Change of Matter Activity
- Ice Cream Activity

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Structure And Properties Of Matter

2-PS1.A Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.
2-PS1.A Different properties are suited to different purposes.
P-PS1.A A great variety of objects can be built up from a small set of pieces.

Chemical Reactions

2-PS1.B Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.

COMMON CORE STATE STANDARDS

Mathematics

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 problems8 using information presented in a bar graph. Science examples: (1) Make a bar graph with a single-unit scale showing how many samples in a mineral collection are red, green, purple, or various other colors. Based on the graph, how many samples are represented in all? (2) As part of an investigation of which materials are best for different intended uses, make a picture graph with a single-unit scale showing how many tools in a toolbox are made of metal, wood, rubber/plastic, or a combination. Based on the graph, how many tools are represented in all?

FOCUS AREAS

Knowledge

- Properties of matter such as strength, hardness, flexibility and texture.
- What materials are best suited for different purposes.
- An object built out of a small set of pieces can be deconstructed and built into a different object.
- Properties of solids, liquids, and gas.
- Some substances can experience reversible changes and some cannot.

Skills

- Determine different properties of objects.
- Group objects according to their properties.
- Construct an object out of a small set of pieces.
- Conduct experiments to change the state of liquids and solids.

Understandings

- Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
- Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

ROLE OF WATER ON EARTH

Where is water found on Earth?

How can we find water on Earth?

How does water cycle through its different forms?

NJCTL Unit 2 MP 1-2

BIG IDEAS

MAPS SHOW WHERE THINGS ARE LOCATED.

ONE CAN MAP THE SHAPES AND KINDS OF LAND AND WATER IN ANY AREA.

WATER IS FOUND IN MANY TYPES OF PLACES AND IN DIFFERENT FORMS ON EARTH.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 5, lesson 1, Earth's Land, Air, and Water

SCIENTIFIC INQUIRY

Core

- States of Water Activity
- Water Cycle Activity
- Landforms and Maps Activity

Supplemental

- Earth's Water Demo
- Land Versus Water Activity
- Bodies of Water Demo
- Bodies of Water Venn Diagram

ENDURING UNDERSTANDINGS

NEXT GENERATION SCIENCE STANDARDS

Plate Tectonics and Large-Scale System

2-ESS2.B Maps show where things are located. One can map the shapes and kinds of land and water in any area.

The Roles of Water in Earth's Surface

2-ESS2.C Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.

COMMON CORE STATE STANDARDS

Mathematics

2.NBT.A.3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. Science example: Students write about a lake that is 550 feet deep, a river that is 687 miles long, a forest that began growing about 200 years ago, and so on.

2.MD.B.5. Use addition and subtraction within 100 to solve word problems involving lengths 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. Science example: A gulley is 17 inches deep before a rainstorm and 42 inches deep after a rainstorm. How much deeper did it get during the rainstorm?

FOCUS AREAS

Knowledge

- 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.

Skills

- 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 where water may exist as a liquid or as a sold (ice).
- Draw and discuss the steps of the water cycle.

Understandings

- Develop a model to represent the shapes and kinds of land and bodies of water in an area.
- Obtain information to identify where water is found on Earth and that it can be solid or liquid.

WIND, WATER & LAND

What are the effects of wind & water on the land?

What are landforms that help prevent wind and water erosion?

How can the effects of wind and water erosion be controlled or reduced?

NJCTL Unit 3 MP 3

BIG IDEAS

WIND AND WATER CHANGE THE SHAPE OF THE LAND.

SCIENTIFIC INQUIRY

Core

- Erosion Activity
- Coastal Erosion Activity

Supplemental

- Anemometer Activity

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Earth Materials And Systems

2-ESS2.A Wind and water can change the shape of the land.

Optimizing The Design Solution

2-ESS2.C Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

COMMON CORE STATE STANDARDS

Mathematics

2.NBT.A.3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. Science example: Students write about a lake that is 550 feet deep, a river that is 687 miles long, a forest that began growing about 200 years ago, and so on.

2.MD.B.5. Use addition and subtraction within 100 to solve word problems involving lengths 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.

FOCUS AREAS

Knowledge

- 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.

Skills

- Explain how wind shapes the land.
- Explain how water shapes the land.
- Describe how wind erosion is reduced
- Describe how water erosion is reduced.

Understandings

- Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

CHANGING OF EARTH

What types of events occur in cycles?

What types of events on Earth happen very quickly or very slowly?

NJCTL Unit 4 MP 3-4

BIG IDEAS

SOME EVENTS ON EARTH OCCUR VERY QUICKLY; OTHERS CAN OCCUR VERY SLOWLY

SCIENTIFIC INQUIRY

CORE

- Earth, Sun and Moon Model
- Seasons Activity

SUPPLEMENTAL

- Rock Cycle Activity
- Weathering Activity

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

The History Of Planet Earth

2-ESS1.C Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.

COMMON CORE STATE STANDARDS

Mathematics

2.NBT.A.11 Understand place value. Science example: As part of comprehending media to identify the varying timescales on which Earth events can occur, students understand that a period of thousands of years is much longer than a period of hundreds of years, which is in turn much longer than a period of tens of years.

FOCUS AREAS

Knowledge

- Be able to describe events occur in cycles, such as day and night.
- Identify events have a beginning and an end, like a volcanic eruption.
- Explain the impact of events can happen very quickly.
- Describe events can happen very slowly over a time period much longer than anyone can observe.

Skills

- Describe what a cycle is and give examples.
- Describe events that have a beginning and an end.
- Describe events that happen quickly.
- Describe events that happen very slowly.

Understandings

- Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

BIODIVERSITY & HUMANS

What is the relationship between producers, consumers and decomposers?

What types of organisms live on land and water?

How do organism structures relate to their ecosystem?

NJCTL Unit 5 MP 4

BIG IDEAS

A RANGE OF DIFFERENT ORGANISMS LIVE IN DIFFERENT PLACES.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 2, All About Animals
- Chapter 3, How Plants and Animals Live Together
- Chapter 4, How Living Things Grow and Change

Leveled Readers

- *Plants*
- *Animals*
- *Plants and Animals*
- *Growing and Changes*

SCIENTIFIC INQUIRY

Core

- Biodiversity Collage
- Living Things in Ecosystems Activity

Supplemental

- Squirmy Wormy Lab
- Animal Teeth Activity

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Biodiversity And Humans

2-LS4.D There are many different kinds of living things in any area, and they exist in different places on land and in water.

COMMON CORE STATE STANDARDS

Mathematics

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 problems10 using information presented in a bar graph. Science example: Make a picture graph with single-unit scale showing the number of plant, vertebrate-animal, and invertebrate-animal species observed during a field trip or in a nature photograph; how many more plant species were observed than animal species?

FOCUS AREAS

Knowledge

- 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.

Skills

- 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.

Understandings

- Make observations of plants and animals to compare the diversity of life in different habitats.

PLANTS

What resources are needed for plants to grow?

In what ways does an animal help disperse plant seeds?

In what ways do animals help plants pollinate?

NJCTL Unit 6 MP 4

BIG IDEAS

PLANTS DEPEND ON WATER AND LIGHT TO GROW,
AND ALSO DEPEND ON ANIMALS FOR POLLINATION OR TO MOVE THEIR SEEDS AROUND.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 1, All About Plants

Leveled Readers

- *All About Plants*

SCIENTIFIC INQUIRY

Core

- Effect of Sunlight
- Effect of Gases
- Stems Transfer Water from Roots

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Interdependent Relationships in Ecosystems

2-LS2.A Plants depend on water and light to grow.
2-LS2.A Plants depend on animals for pollination or to move their seeds around.

COMMON CORE STATE STANDARDS

Mathematics

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 problems9 using information presented in a bar graph. Science example: Make a bar graph with single-unit scale showing the number of seedlings that sprout with and without watering.

FOCUS AREAS

Knowledge

- Plants need water and light to grow.

Skills

- Plan and conduct an investigation that determines plants need sunlight and water to grow
- Describe what happens when plants do not get water.
- Describe what happens when plants don't get sunlight.
- Develop a simple model to show how animals disperse seeds or pollinate plants.

Understandings

- Plan and conduct an investigation to determine if plants need sunlight and water to grow.
- Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

THIRD GRADE

PERFORMANCE EXPECTATIONS

In the third grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems; developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

STANDARDS

3-PS2 Motion and Stability: Forces and Interactions
3-LS1 From Molecules to Organisms: Structures and Processes
3-LS2 Ecosystems: Interactions, Energy, and Dynamics
3-LS3 Heredity: Inheritance and Variation of Traits
3-LS4 Biological Evolution: Unity and Diversity
3-ESS2 Earth's Systems
3-ESS3 Earth and Human Activity

CORE IDEAS

3-PS2.A Forces and Motion

How do equal and unequal forces on an object affect the object?

Students are able to determine the effects of balanced and unbalanced forces on the motion of an object and the cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

3-PS2.B Types of Interactions

How can magnets be used?

Apply their understanding of magnetic interactions to define a simple design problem that can be solved with magnets.

3-LS1.B Growth and Development of Organisms

Students are expected to develop an understanding of the similarities and differences of organisms' life cycles.

3-LS2.D Social Interactions and Group Behavior

What happens to organisms when their environment changes?

Develop an understanding of the idea that when the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die.

3-LS3.B Variation of Traits

How do organisms vary in their traits?

An understanding that organisms have different inherited traits, and that the environment can also affect the traits that an organism develops, is acquired by students at this level.

3-LS4.A Evidence of Common Ancestry and Diversity

How are plants, animals, and environments of the past similar or different from current plants, animals, and environments?

Students are expected to develop an understanding of types of organisms that lived long ago and also about the nature of their environments.

3-LS4.B Biodiversity and Humans

Construct an explanation using evidence for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

3-ESS2.D Weather and Climate

What is typical weather in different parts of the world and during different times of the year?

Students are able to organize and use data to describe typical weather conditions expected during a particular season.

3-ESS3.B Natural Hazards

How can the impact of weather-related hazards be reduced?

By applying their understanding of weather-related hazards, students are able to make a claim about the merit of a design solution that reduces the impacts of such hazards.

CROSSCUTTING CONCEPTS

Patterns; cause and effect; scale, proportion, and quantity; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

MOTION AND STABILITY

How and why do objects move?

NJCTL Unit 1 MP 1

BIG IDEAS

THE EFFECT OF UNBALANCED FORCES ON AN OBJECT RESULTS IN A CHANGE OF MOTION. PATTERNS OF MOTION CAN BE USED TO PREDICT FUTURE MOTION. SOME FORCES ACT THROUGH CONTACT, SOME FORCES ACT EVEN WHEN THE OBJECTS ARE NOT IN CONTACT. THE GRAVITATIONAL FORCE OF EARTH ACTING ON AN OBJECT NEAR EARTH'S SURFACE PULLS THAT OBJECT TOWARD THE PLANET'S CENTER.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 12, Forces and Motion

Leveled Readers

- *Light*
- *How Bikes Work*
- *Everyday Reactions*
- *How Sound Works*
- *So Much Energy*
- *Sonic Booms*
- *How do Boats Float*
- *Everyday Reactions*
- *Matter: Solid, Liquid, or Gas*
- *Ways Matter Changes*
- *How Matter Works*
- *Matter and Its Properties*
- *How Things Move*
- *Changes in Matter*
- *Energy*
- *Forces and Motion*
- *Sound*

SCIENTIFIC INQUIRY

Core

- Electricity Lab
- Predicting Motion Lab
- Magnetic Interactions Lab
- Balanced & Unbalanced Forces Lab
- Distance, Time Speed Lab
- Magnetic Train Lab

Supplemental

- Building with Magnets Lab
- Performance Based Assessment

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Forces and Motion

3-PS2.A 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.

3-PS2.A 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.

Types of Interactions

3-PS2.B Objects in contact exert forces on each other.

3-PS2.B Electric, and magnetic forces between a pair of objects do not require that the objects be in

3-PS2.B 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.

COMMON CORE STATE STANDARDS

Mathematics

As part of this work, teachers should give students opportunities to work with continuous quantities:

3.MD.A.2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).13 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.14 Science example: Estimate, then measure, the masses of two objects being used in an investigation of the effect of forces; observe that the change of motion due to an unbalanced force is larger for the smaller mass (students need not explain or quantify this observation in terms of Newton's laws of motion).

FOCUS AREAS

Knowledge

- Forces are pushes and pulls.
- Motion occurs in predictable patterns.
- The cause and effect relationships of electric interactions.
- The cause and effect relationships of magnetic interactions.
- Magnets can be used to solve design problems.

Skills

- Plan and conduct investigations about forces.
- Make observations and measurements of motion.
- Ask questions about electric and magnetic interactions.
- Define a problem that can be solved with magnets

Understandings

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

GROWTH AND DEVELOPMENT OF ORGANISMS

What is a life cycle?
What changes do organisms go through during their life cycle?
Is a plant life cycle similar and different compared to an animal's life cycle?

NJCTL Unit 2 MP 1-2

BIG IDEAS

REPRODUCTION IS ESSENTIAL TO EVERY KIND OF ORGANISM.
ORGANISMS HAVE UNIQUE AND DIVERSE LIFE CYCLES.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 1, Plants and How They Grow
- Chapter 2, How Animals Live

Leveled Readers

- *Plants and How They Grow*
- *Plants and Trees Growing*
- *Tree Life*

SCIENTIFIC INQUIRY

Core

- Seed Lab Part 1
- Seed Lab Part 2
- Seed Lab Part 3
- Animal Life Cycle Activity

ENDURING UNDERSTANDINGS

NEXT GENERATION SCIENCE STANDARDS

Growth and Development Of Organisms

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

COMMON CORE STATE STANDARDS

Mathematics

As part of this work, teachers should give students opportunities to be quantitative in giving descriptions:

3.NF. Number and Operations—Fractions

3.NBT. Number and Operations in Base Ten

Science example: Be quantitative when describing the life cycles of organisms, such as their varying lifespans (e.g., ranging from a fraction of a year up to thousands of years) and their varying reproduction (e.g., ranging from a handful of offspring to thousands).

FOCUS AREAS

Knowledge

- The pattern of life cycles includes birth, growth, reproduction, and death.
- Plant life cycles start with a seed.
- Some animal life cycles start with an egg.

- Plants develop different parts as they grow.
- Animals change as they grow.
- Plants and animals reproduce to create more plants and animals.
- Plants and animals die.

Skills

- Create a model of flowering plant life cycle.
- Create a model of an animal life cycle.
- Distinguish the similarities and differences between the life cycles of plants and animals.

Understandings

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

WEATHER AND CLIMATE

What factors affect daily weather?

What factors affect an area's climate?

How data can be used to determine the climate of various regions?

NJCTL Unit 6 MP 2

BIG IDEAS

CLIMATE DESCRIBES PATTERNS OF TYPICAL WEATHER CONDITIONS OVER DIFFERENT SCALES AND VARIATIONS. HISTORICAL WEATHER PATTERNS CAN BE ANAYLZED.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 5, Water
- Chapter 6, Weather

Leveled Readers

- *Weather Record Breakers*
- *Fertile Floods*
- *Earth's Natural Resources*
- *Followa River*
- *Followa Raindrop*
- *Water*
- *Weather*
- *Rocks and Soil*
- *Natural Resources*
- *Changeson Earth*

SCIENTIFIC INQUIRY

Core

- Collecting Weather and Data
- Thermometer Activity
- Water Cycle in a Jar
- Cloud in the Jar

Supplemental

- Toasty Wind
- Convection
- Hot Goes Up
- Analyzing Weather
- Climate Zone

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Weather and Climate

3-ESS2.D 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.D Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.

COMMON CORE STATE STANDARDS

Mathematics

As part of this work, teachers should give students opportunities to work with continuous quantities and represent and interpret categorical data.

3.MD.A.2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).15 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.16 Science examples: (1) Estimate the mass of a large hailstone that damaged a car on a used-car lot. (2) Measure the volume of water in liters collected during a rainstorm.

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. Science example: Make a picture graph or bar graph to show the number of days with high temperature below freezing in December, January, February, and March. How many days were below freezing this winter?

FOCUS AREAS

Knowledge

- Weather includes temperature, precipitation, and wind on a day to day basis.
- Climate is the typical weather patterns over many years.
- How to use tools such as a thermometer, rain gauge, and wind vane to collect weather data.
- Climates vary around the world due to different amounts of rain, varying temperatures, and wind patterns.

Skills

- Predict weather conditions based on information collected.
- Analyze and interpret data to understand what is the climate in different parts of the world
- Ask questions about what caused changes in weather patterns.
- Collect data using tools such as thermometers, rain gauge, and a wind vane.

Understandings

- Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

ECOSYSTEMS: GROUP BEHAVIOR

What are the advantages and disadvantages of group living?

How do animal groups differ from one another?

NJCTL Unit 4 MP 3

BIG IDEAS

BEING PART OF A GROUP HELPS ANIMALS OBTAIN FOOD, DEFEND THEMSELVES, AND COPE WITH CHANGES.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008

- Chapter 3, Where Plants and Animals Live

Leveled Readers

- *How Animals Live*
- *Earth's Ecosystems*
- *Animal's Way of Life*

SCIENTIFIC INQUIRY

Core

- Solitary Versus Group Lab
- Who has the Advantage? Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Social Interactions and Group Behavior

3-LS2.D Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.

COMMON CORE STATE STANDARDS

Mathematics

3.NBT. Number and Operations in Base Ten. Science example: Be quantitative when describing the group behaviors of animals

FOCUS AREAS

Knowledge

- ☐ Animals either are either solitary or live in groups.
- ☐ Animals cannot spend their entire lives alone; they need each other in order to breed.
- ☐ Living in a group has advantages and disadvantages.
- ☐ Animal groups form for different reasons.
- ☐ Animal groups vary widely in size, even among the same species.

Skills

- ☐ Understand advantages and disadvantages of group living through experience working in a group.
- ☐ Explain some animal behavior in relation to group or solitary living.

Understandings

- ☐ Construct an argument that some animals form groups that help members survive.

BIOLOGICAL EVOLUTION

How and why a habitat of an organism can affect its survival over time?
What are examples of adaptations to increase survival and what happens to a species if it cannot adapt?
What information about the environment can we learn from fossils?

NJCTL Unit 5 MP 3

BIG IDEAS

WHEN THE ENVIRONMENT CHANGES SOME ORGANISMS SURVIVE AND REPRODUCE, SOME MOVE TO NEW LOCATIONS, SOME MOVE INTO THE TRANSFORMED ENVIRONMENT AND SOME DIE. SOME LIVING ORGANISMS RESEMBLE ORGANISMS THAT ONCE LIVED ON EARTH. FOSSILS PROVIDE EVIDENCE ABOUT THE TYPES OF ORGANISMS AND ENVIRONMENTS THAT EXISTED LONG AGO. PARTICULAR ORGANISMS CAN ONLY SURVIVE IN PARTICULAR ENVIRONMENTS. POPULATIONS OF ORGANISMS LIVE IN A VARIETY OF HABITATS.

SUPPLEMENTAL RESOURCES

Scott Foresman Science, Pearson, 2008
- ☐ Chapter 4, Plants and Animals Living Together

Leveled Readers
- ☐ *Owl Life*
- ☐ *Polar Life*
- ☐ *Exoskeleton*

SCIENTIFIC INQUIRY

Core
- ☐ Camouflage Lab
- ☐ Make a Fossil Activity
- ☐ Constructing a Fossil Map Activity
- ☐ Small Change, Big Range Activity

Supplemental
- ☐ Fossilization Activity
- ☐ Compost Time Capsule Activity

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Ecosystem Dynamics, Functioning, and Resilience

3-LS4.C When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. Some kinds of plants and animals that once lived on Earth are no longer found anywhere.

Evidence of Common Ancestry and Diversity

3-LS4.A Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.

Natural Selection

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

Adaptation

3-LS4.C For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

Biodiversity and Humans

3-LS4.D For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

COMMON CORE STATE STANDARDS

Mathematics

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. Science examples: (1) Given a bar graph showing the number of flower species that were found in several different habitats, determine how many more flower species were found in grassy meadow than were found in dense forest. Would flower species be affected if a forest were to spread into its habitat?(2) Make a scaled bar graph to show the number of surviving individuals with and without an advantageous trait. How many more of the individuals with the advantageous trait survived?

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. Science example: Make a line plot to show the length of each fossil that is visible in a piece of shale. Do any of the fossils resemble modern organisms except for their size?

FOCUS AREAS

Knowledge

- Habitats include biotic and abiotic factors.
- Fossils indicate changes of environments on Earth.
- Adaptations help organisms survive.
- Environmental changes affect an organism's survival.

Skills

- Identify biotic and abiotic factors in the environment.
- Analyze and interpret data to understand what has lived on Earth over time.
- Identify and explain specific causes of environmental change; and the direct implications for species in that environment.
- Define a problem and propose solutions for an environmental issue.

Understandings

- Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
- 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.
- 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.
- 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.

NATURAL HAZARDS

What can humans do to help reduce the impact natural hazards will have?

NJCTL Unit 7 MP 4

BIG IDEAS

A VARIETY OF HAZARDS RESULT FROM NATURAL PROCESSES HUMANS CANNOT ELIMINATE HAZARDS BUT CAN REDUCE THEIR IMPACTS.

SUPPLEMENTAL RESOURCES

Scholastic Weather Watch: http://teacher.scholastic.com/activities/wwatch/severe.htm
FEMA for Kids: http://www.ready.gov/kids

SCIENTIFIC INQUIRY

Core

- Be Prepared Activity

Supplemental

- Making Lightening
- Analyzing Levees
- Fire Triangle Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Natural Hazards

3-ESS3.B A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

COMMON CORE STATE STANDARDS

Mathematics

3.MD.A.2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).17 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.18

3.MD.C.5. Recognize area as an attribute of plane figures and understand concepts of area measurement.

a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.

b. A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.

3.MD.C.6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

FOCUS AREAS

Knowledge

- A natural hazard is an extreme event that occurs from natural processes.
- Natural hazards cannot be prevented.
- The damage from natural hazards can be minimized.

Skills

- Describe different natural hazards.
- Analyze methods for reducing damage caused by natural hazards.

Understandings

- Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

INHERITANCE OF TRAITS

Why do organisms look similar and different among generations?
How does the environment affect genetic inheritance?

NJCTL Unit 3 MP 4

BIG IDEAS

DIFFERENT ORGANISMS VARY IN HOW THEY LOOK AND FUNCTION BECAUSE THEY HAVE DIFFERENT INHERITED INFORMATION; THE ENVIRONMENT ALSO AFFECTS THE TRAITS THAT AN ORGANISM DEVELOPS.

SCIENTIFIC INQUIRY

Core

- Mustard Seed Lab
- What Kind of Slythy Tove? Lab

Supplemental

- Virtual Field Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Inheritance of Traits

3-LS3.A Many characteristics of organisms are inherited from their parents.

3-LS3.A Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.

Variation of Traits

3-LS3.B Different organisms vary in how they look and function because they have different inherited information.

3-LS3.B The environment also affects the traits that an organism develops.

COMMON CORE STATE STANDARDS

Mathematics

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. Science examples: (1) Make a line plot to show the height of each of a number of plants grown from a single parent. Observe that not all of the offspring are the same size. Compare the sizes of the offspring to the size of the parent. (2) Make a similar plot for plants grown with insufficient water.

FOCUS AREAS

Knowledge

- Predatory defense, foraging, raising young and other tasks can be shared in a group to help the species survive.
- Solitary organisms have to collect resources and benefit particular organisms.
- Reproduction is necessary for all organisms.
- Variations in grouping affect the survival of organisms.

Skills

- Analyze an organism and determine how their social behavior helps their survival
- Ask questions about organisms and why they choose the social behavior they do.

Understandings

- 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.
- Use evidence to support the explanation that traits can be influenced by the environment.

FOURTH GRADE

PERFORMANCE EXPECTATIONS

In the fourth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

TOPICS/STANDARDS

4-PS3	Energy
4-PS4	Waves and their Applications in Technologies for Information Transfer
4-LS1	From Molecules to Organisms: Structures and Processes
4-ESS1	Earth's Place in the Universe
4-ESS2	Earth's Systems
4-ESS3	Earth and Human
3-5-ETS1	Engineering Design

CORE IDEAS

4-PS3-1.	Use evidence to construct an explanation relating the speed of an object to the energy of that object.
4-PS3-2.	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
4-PS3-3.	Ask questions and predict outcomes about the changes in energy that occur when objects collide.
4-PS3-4.	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.*
4-ESS3-1.	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
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. [
4-PS4-3.	Generate and compare multiple solutions that use patterns to transfer information.*
4-PS4-2.	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
4-LS1-1.	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

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.

4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over 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.

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.

4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*

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. lan 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.

CROSSCUTTING CONCEPTS

Patterns; cause and effect; energy and matter systems and system models; interdependence of science, engineering, and technology; an influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

EARTH'S CHANGING SURFACE

What are tectonic plates and what causes many of Earth's surface features? What is chemical weathering and erosion and how do they affect the environment?
How does rainfall affect the environment?

MP 1

BIG IDEAS

EARTH'S PHYSICAL FEATURES OCCUR IN PATTERNS, AS DO EARTHQUAKES AND VOLCANOES. MAPS CAN BE USED TO LOCATE FEATURES AND DETERMINE PATTERNS IN THOSE EVENTS. RAINFALL HELPS TO SHAPE THE LAND AND AFFECTS THE TYPES OF LIVING THINGS FOUND IN A REGION. WATER, ICE, WIND, ORGANISMS, AND GRAVITY BREAK ROCKS, SOILS, AND SEDIMENTS INTO SMALLER PIECES AND MOVE THEM AROUND.

PRIMARY RESOURCE

Pearson Interactive Science, 2016

- Chapter 6: Earth's Resources

SECONDARY RESOURCES

Pearson Leveled Readers

- *Earth's Resources*
- *Types of Rocks and Minerals*
- *Mining for Rocks and Minerals*

SCIENTIFIC INQUIRY

Core

- Mineral Lab
- Sediment Rate of Deposition Lab
- Rock Layers Lab
- Plate Tectonics Lab
- Chemical Weathering Lab
- Glacial Weathering and Erosion Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Plate Tectonics and Large-Scale System Interactions

4-ESS2.B 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 of Earth.

Earth Materials and Systems

4-ESS2.A 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.

FOCUS AREAS

Knowledge

- The layer of Earth that tells us the most about Earth's history is the crust.
- 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.
- Weathering is the break down or dissolving of rocks on Earth's surface.
- Chemical weathering is when chemicals change the materials that make up a rock.
- Erosion is the movement of broken down rocks.
- Rainfall impacts what an environment is like and what organisms live there.

Skills

- Create a model of sedimentary rock formation.

- Identify rock layers in a sedimentary rock model and use this information to determine the step-by-step process of rock formation.
- Collaborate to build a model of one type of plate boundary.
- Map earthquakes and plate boundary locations and determine the connections between their locations.
- Create a model of ice weathering a rock and relate it to weathering in nature.
- Create a model of water weathering a rock and relate it to weathering in nature.
- Create a model of erosion and relate it to erosion in nature.
- Create a model of weathering and erosion and relate it to weathering and erosion in nature.
- Identify chemical versus physical weathering.
- Distinguish between weathering and erosion.
- Identify the effects of weathering and erosion in the environment around their school.

Understanding

- Analyze and interpret data from maps to describe patterns of Earth's features.
- Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

NATURAL HAZARDS

How are natural hazards created and how can humans reduce their impact of creating natural hazards?

MP 1

BIG IDEAS

A VARIETY OF HAZARDS RESULT FROM NATURAL PROCESSES; HUMANS CANNOT ELIMINATE HAZARDS BUT CAN REDUCE THEIR IMPACTS.

PRIMARY RESOURCE

Pearson Interactive Science, 2016

- Chapter 6: Earth's Resources

SECONDARY RESOURCES

Pearson Leveled Readers

- *Earth's Resources*
- *Types of Rocks and Minerals*
- *Mining for Rocks and Minerals*

SUPPLEMENTAL RESOURCES

- Smithsonian Institute Global Volcanism Program: www.volcano.si.edu
- U.S. Volcanoes and Current Activity Alerts: volcanoes.usgs.gov

SCIENTIFIC INQUIRY

Core

- Volcano Lab
- Earthquake Epicenter Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Natural Hazards

4-ESS3.B 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.

Designing Solutions To Engineering Problems

4-ETS1.B Testing a solution involves investigating how well it performs under a range of likely conditions.

FOCUS AREAS

Knowledge

- Over time, people's needs and wants change, as do their demands for new and improved technologies.
- Cause and effect relationships are routinely identified and used to explain change.

Skills

- Obtain and combine information from books and other reliable media to explain phenomena.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

Understanding

- Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

THE HISTORY OF PLANET EARTH

What can rock formations teach us about the history of Earth?
What can fossils teach us about the history of Earth?
How can living things affect the physical characteristics of their regions?

MP 2

BIG IDEAS

CERTAIN FEATURES ON EARTH CAN BE USED TO ORDER EVENTS THAT HAVE OCCURRED IN A LANDSCAPE. SCIENTISTS ANALYZE AND INTERPRET DATA FROM FOSSILS TO LEARN ABOUT THE PAST. LIVING THINGS CAN AFFECT THE PHYSICAL CHARACTERISTICS OF THEIR ENVIRONMENTS.

PRIMARY RESOURCE

Pearson Interactive Science, 2016

- Chapter 5: Ecosystems

SECONDARY RESOURCES

Pearson Leveled Readers

- *Ecosystems*
- *Ecosystem Life*
- *Life in a Pond*

SCIENTIFIC INQUIRY

Core

- Relative Dating with Fossils Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

The History of Planet Earth

4-ESS1.C 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.

Biogeology

4-ESS2.E Living things affect the physical characteristics of their regions.

FOCUS AREAS

Knowledge

- Sedimentary rocks form in layers and fossils in these layers can help geologists determine how old the rocks are relative to one another.
- All living things affect the physical characteristics of their environment.

Skills

- Create a model of fossils in sedimentary rock layers.
- Determine what the youngest and oldest layer of a rock is based on the Law of Superposition.

Understanding

- Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

ENERGY & NATURAL RESOURCES

What is renewable energy and what is nonrenewable energy?
What is the difference between nonrenewable and renewable energy?
How does human energy impact the environment?

MP2

BIG IDEAS

ENERGY AND FUELS HUMANS USE ARE DERIVED FROM NATURAL SOURCES AND THEIR USE AFFECTS THE ENVIRONMENT. SOME RESOURCES ARE RENEWABLE OVER TIME, OTHERS ARE NOT. PLANTS CAPTURE ENERGY FROM SUNLIGHT, WHICH CAN LATER BE USED AS FUEL OR FOOD.

PRIMARY RESOURCE

Pearson Interactive Science, 2016

- Chapter 5: Ecosystems

SECONDARY RESOURCES

Pearson Leveled Readers

- *Ecosystems*
- *Ecosystem Life*
- *Life in a Pond*

SCIENTIFIC INQUIRY

Core

- Collecting the Sun's Energy

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Natural Resources

4-ESS3.A Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

Defining and Delimiting Engineering Problems

4-ETS1.A Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

FOCUS AREAS

Knowledge

- Humans use energy and fuels derived from natural sources.
- Devices must be designed, tested, and refined in order to convert energy.
- Renewable energy is energy that comes from a source that replenishes quickly and will not be used up before more is created.
- Non-renewable energy is energy that comes from a source that is very slow to replenish and can be used up.
- Human energy use has many impacts on the environment.

Skills

- Build a device that converts energy from one form to another by following instructions.
- Design and build a simple device that converts energy from one form to another.
- Define a simple engineering problem related to constraints due to materials, cost, or time.
- Explain one energy type in depth, including where the energy is found, what it is used for, and how it impacts the environment.
- Analyze a combination of information they have collected about one type of energy.

Understanding

- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

MOLECULES TO ORGANISMS

How do systems within organisms interact to fulfill life processes?
How do senses function to help animals survive?
How do internal and external structures function to support the survival of plants and animals?

MP 2

BIG IDEAS

ORGANISMS HAVE BOTH INTERNAL AND EXTERNAL MACROSCOPIC STRUCTURES THAT ALLOW FOR GROWTH, SURVIVAL, BEHAVIOR, AND REPRODUCTION. DIFFERENT SENSE RECEPTORS ARE SPECIALIZED FOR PARTICULAR KINDS OF INFORMATION; ANIMALS USE THEIR PERCEPTIONS AND MEMORIES TO GUIDE THEIR ACTIONS.

PRIMARY RESOURCE

Pearson Interactive Science, 2016

- Chapter 5: Ecosystems
- Chapter 4: Plants and Animals

SECONDARY RESOURCES

Pearson Leveled Readers

- *Ecosystems*
- *Ecosystem Life*
- *Life in a Pond*

- *Plants and Animals*
- *Animal and Plant Classification*
- *Strange Plants*

SCIENTIFIC INQUIRY

Core

- Permeability Lab
- Camouflage Frogs Hunt
- Frog Extinction Activity
- Video - The Last Frog
- Maze Test (Information Processing)
- Sensory Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Structure and Function

4-LS1.A Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

Information Processing

4-LS1.D 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.

FOCUS AREAS

Knowledge

- Systems interact to fulfill growth, development, and reproduction, responding to change and use energy.
- Examples of how plant and animal structures, both internally and externally, function to fulfill life processes.
- The difference between instincts and behavior with examples.
- How senses benefit animals in respect to how they respond to their environment.

Skills

- Analyze a plant or animal and explain how the internal and external features support their survival.
- Model how senses are used in respect to the brain in order to respond to their environment.
- Use a model to describe that animals receive different types of information through their senses, process the information in their brains, and respond to the information in different ways.

Understanding

- Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 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.

WAVES & LIGHT

What are waves, what are they caused by, and how do scientists describe waves?
How does light allow us to see and why do we see colors?
How do plane mirrors reflect light and how is light refracted?

MP 3

BIG IDEAS

WAVES ARE REGULAR PATTERNS OF MOTION, WHICH CAN BE MADE IN WATER BY DISTURBING THE SURFACE. WAVES OF THE SAME TYPE CAN DIFFER IN AMPLITUDE AND WAVELENGTH. WAVES CAN MAKE OBJECTS MOVE. OBJECT CAN BE SEEN WHEN LIGHT REFLECTED FROM THEIR SURFACE ENTERS OUR EYES.

PRIMARY RESOURCE

Pearson Interactive Science, 2016

- Chapter 1: Energy and Heat

SECONDARY RESOURCES

Pearson Leveled Readers

- *Energy and Heat*
- *What is Light?*
- *Electricity's Power*

SCIENTIFIC INQUIRY

Core

- Transverse and Longitudinal Waves Lab
- Reflection and Refraction Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Wave Properties

4-PS4.A 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.

4-PS4.A Waves of the same type can differ in amplitude (height of the wave) and wavelength (distance between wave crests).

Electromagnetic Radiation

4-PS4.B An object can be seen when light reflected from its surface enters the eyes.

FOCUS AREAS

Knowledge

- 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.
- 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.

Skills

- Create a wave and explain how to manipulate various characteristics of the wave (like amplitude or wavelength)
- Create a simple device to transfer sound waves and explain why it can do so.
- Relate amplitude and wavelength to volume and pitch.
- Model changes in amplitude and wavelength on a one-string guitar.
- Explain how mirrors reflect objects and light.
- Use patterns to create a code to transfer information.

Understanding

- Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
- Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

ENERGY & MOTION

What are the various forms of energy?
What is the difference between kinetic and potential energy and how does energy shift from kinetic to potential energy?
What is the law of conservation of energy and what is force? How do they relate?
How can energy be converted from one form to another?

MP 3-4

BIG IDEAS

MOVING OBJECTS CONTAIN ENERGY. THE FASTER THE OBJECT MOVES, THE MORE ENERGY IT HAS. ENERGY CAN BE MOVED FROM PLACE TO PLACE BY MOVING OBJECTS, OR THROUGH SOUND, LIGHT, OR ELECTRICAL CURRENTS. ENERGY CAN BE CONVERTED FROM ONE FORM TO ANOTHER FORM. ENERGY CAN BE “PRODUCED”, “USED,” OR “RELEASED” BY CONVERTING STORED ENERGY. WHEN OBJECTS COLLIDE, CONTACT FORCES TRANSFER ENERGY SO AS TO CHANGE THE OBJECT’S MOTION.

PRIMARY RESOURCE

Pearson Interactive Science, 2016

- Chapter 1: Energy and Heat

- Chapter 2: Motion

SECONDARY RESOURCES

Pearson Leveled Readers

- *Energy and Heat*
- *What is Light?*
- *Electricity's Power*
- *Objects in Motion*
- *Learning About Motion*
- *Isaac Newton and Gravity*

SCIENTIFIC INQUIRY

Core

- Pendulum Lab
- Potential and Kinetic Energy Lab
- Heat Transfer Lab

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Definitions of Energy

4-PS3.A The faster a given object is moving, the more energy it possesses.

4-PS3.A Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

Conservation of Energy and Energy Transfer

4-PS3.B Energy is present whenever there are moving objects, sound, light, or heat.

4-PS3.B 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; as a result, the air gets heated and sound is produced.

4-PS3.B Light also transfers energy from place to place.

4-PS3-2 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.

4-PS3-4 The currents may have been produced to begin with by transforming the energy of motion into electrical energy.

Relationship Between Energy and Forces

4-PS3.C When objects collide, the contact forces transfer energy so as to change the objects' motions.

Energy in Chemical Processes and Everyday Life

4-PS3.D The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use.

FOCUS AREAS

Knowledge

- Energy is an objects' ability to do work.
- Energy can be kinetic or potential, and has many different forms.
- 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.
- Producing energy refers to converting energy from one form to another so that it can be used for practical purposes.

Skills

- Predict how changes in speed affect an object's energy.
- Observe how energy can be transferred among its various forms and explain what is happening using scientific vocabulary.
- Predict changes in energy that will occur as a result of objects colliding.
- Test and refine devices that convert energy from one form to another.

Understanding

- Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- Ask questions and predict outcomes about the changes in energy that occur when objects collide.
- Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

TECHNOLOGY & DESIGN

How does technology affect your life? How can technology be used to solve problems? How can patterns encode, send, receive, and decode information? What are the steps in the design process, and how are they used?

MP 4

BIG IDEAS

TECHNOLOGY IS THE KNOWLEDGE, PROCESSES, AND PRODUCTS THAT SOLVE PROBLEMS AND MAKE WORK EASIER. TECHNOLOGY CAN BE USED TO SOLVE PROBLEMS. PATTERNS CAN ENCODE, SEND, RECEIVE AND DECODE INFORMATION. THE DESIGN PROCESS IS A SET OF STEPS FOR DEVELOPING PRODUCTS AND PROCESSES THAT SOLVE PROBLEMS.

PRIMARY RESOURCE

Pearson Interactive Science, 2016

- Skills Handbook Part 2: Technology and Design

SECONDARY RESOURCES

Pearson Leveled Readers

- *Technology and Design*
- *Technology and Design at Work*
- *Using Nature for Design*

SCIENTIFIC INQUIRY

Core

- Design Challenge

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Optimizing The Design Solution

4-PS4.C Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

Defining and Delimiting Engineering Problems

4-ETS1.A Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

Designing Solutions To Engineering Problems

4-ETS1.B Testing a solution involves investigating how well it performs under a range of likely conditions.

Information Technologies And Instrumentation

4-PS4.C 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.

FOCUS AREAS

Knowledge

- Technology solves problems and makes life easier.
- Different solutions need to be tested to see which best solves a given problem.
- Possible solutions to a problem are limited by available materials and resources.
- Digitized information can be transmitted over long distances (computers, cell phones, GPS).
-

Skills

- Analyze ways in which technology can be used to solve problems.
- Communicate and use the steps in the design process.
- Research and design ways to load cargo onto a cart.
- Decode a set of digitized information.
-

Understanding

- Generate and compare multiple solutions that use patterns to transfer information.
- Apply the steps in the design process to design, test, and refine a vehicle that will carry cargo best.

FIFTH GRADE

PERFORMANCE EXPECTATIONS

In the fifth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, engaging in argument from evidence, and obtaining, evaluating, and communicating information; and to use these practices to demonstrate understanding of the core ideas.

TOPICS/STANDARDS

5-PS1	Matter and Its Interactions
5-PS3	Energy
5-LS1	From Molecules to Organisms: Structures and Processes
5-LS2	Ecosystems: Interactions, Energy, and Dynamics
5-ESS1	Earth's Place in the Universe
5-ESS2	Earth's Systems
5-ESS3	Earth and Human Activity
5-PS2	Motion and Stability: Forces and Interactions
5-ESS1	Earth's Place in the Universe

CORE IDEAS

5-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 shows 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; the effects of air on larger particles or objects. (5-PS1-1)

The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)

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)

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)

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)

5-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)

5-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)

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)
5-LS1.C	Organization for Matter and Energy Flow in Organisms Plants acquire their material for growth chiefly from air and water. (5-LS1-1)
5-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)
5-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)
5-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)
5-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)
5-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)
5-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)
5-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)

5-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)

5-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 theo constraints. (3-5-ETS1-3)

CROSSCUTTING CONCEPTS

Cause and Effect

Cause and effect relationships are routinely identified, tested, and used to explain change.

Scale, Proportion, and Quantity

Natural objects exist from the very small to the immensely large.

Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Energy and Matter

Energy can be transferred in various ways and between objects.

Energy and Matter

Matter is transported into, out of, and within systems.

Patterns

Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.

Systems and System Models

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

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.

Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

Science assumes consistent patterns in natural systems.

Science Addresses Questions About the Natural and Material World.

Science findings are limited to questions that can be answered with empirical evidence.

STRUCTURE AND PROPERTIES OF MATTER

What are the properties of matter and what happens when matter changes state?
When two substances are mixed, what is formed and is it always something new?

MP 1

BIG IDEAS

BECAUSE MATTER EXISTS AS PARTICLES THAT ARE TOO SMALL TO SEE, MATTER IS ALWAYS CONSERVED EVEN IF IT SEEMS TO DISAPPEAR. MEASUREMENTS OF OBSERVABLE PROPERTIES CAN BE USED TO IDENTIFY PARTICULAR MATERIALS. CHEMICAL REACTIONS THAT OCCUR WHEN SUBSTANCES ARE MIXED CAN BE IDENTIFIED BY THE EMERGENCE OF SUBSTANCES WITH DIFFERENT PROPERTIES; THE TOTAL MASS REMAINS THE SAME.

RESOURCES

Scott Foresman Interactive Science, Pearson, 2016
Properties of Matter - Chapter 1
Leveled Readers

- *Matter and Its Properties*
- *Properties of Matter*
- *Pioneers of Physics*
- *Changes in Matter*
- *Baking Chemistry*

SCIENTIFIC INQUIRY

Core

- Properties of solids, liquids and gasses inquiry lab
- Conservation of matter and chemical reaction inquiry lab
- Particles in matter lab

Supplemental

- How are weight and volume affected when objects are combined? p.2
- What are some ways to separate a mixture? p. 40

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

Structure and Properties Of Matter

5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence 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 forms new substances.] [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 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Common Core State Standards Connections:

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. (5-PS1-1)

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. (5-PS1-2),(5-PS1-3),(5-PS1-4)

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2),(5-PS1-3),(5-PS1-4)

Mathematics

MP.2 Reason abstractly and quantitatively. (5-PS1-1),(5-PS1-2),(5-PS1-3)

MP.4 Model with mathematics. (5-PS1-1),(5-PS1-2),(5-PS1-3)

MP.5 Use appropriate tools strategically. (5-PS1-2),(5-PS1-3)

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-PS1-1)

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-PS1-1)

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-PS1-2)

5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)

5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, an i improvised units. (5-PS1-1)

FOCUS AREAS

Knowledge

- Matter is a term that applies to all of the stuff around us and it is made of particles that are too small to see.
- When substances are heated, cooled, or mixed the total weight before and after is always the same.
- Substances can be identified based on observable and measureable properties.
- Sometimes when two substances are mixed, each of the substances keeps its original properties and sometimes a new substance is formed.

Skills

- Give an example of what is matter.
- Describe how gases are made from matter particles that are too small to be seen. (Ex: an inflated balloon)
- Measure and graph the weights of matter before and after being heated, cooled, or mixed.
- Identify materials based on various observable properties.
- Determine whether the mixing of two substances always results in the formation of new substances or not and provide examples.
- Identify the differences between soluble and insoluble solutions.

Understandings

- Develop a model to describe that matter is made of particles too small to be seen.
- Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling.
- Make observations and measurements to identify materials based on their properties.
- Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

MATTER AND ENERGY IN ORGANISMS AND ECOSYSTEMS

From where do living things get their energy and what do they do with it? How does the sun (or the lack of sun) affect all living things? What is the affect on a food web when one member's role is changed or deleted? What are the different roles in an ecosystem and what factors allow a population to maintain or have its population threatened?

MP 2

BIG IDEAS

FOOD PROVIDES ANIMALS WITH THE MATERIALS AND ENERGY THEY NEED FOR BODY REPAIR, GROWTH, WARMTH, AND MOTION. PLANTS ACQUIRE MATERIAL FOR GROWTH CHIEFLY FROM AIR, WATER, AND PROCESS MATTER AND OBTAIN ENERGY FROM SUNLIGHT, WHICH IS USED TO MAINTAIN CONDITIONS NECESSARY FOR SURVIVAL. ENERGY CAN BE "PRODUCED," "USED," OR "RELEASED" BY CONVERTING STORED ENERGY. PLANTS CAPTURE ENERGY FROM SUNLIGHT, WHICH CAN LATER BE USED AS FUEL OR FOOD. THE FOOD OF ALMOST ANY 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, WHILE DECOMPOSERS RESTORE SOME MATERIALS BACK TO THE SOIL. MATTER CYCLES BETWEEN THE AIR AND SOIL AND AMONG ORGANISMS AS THEY LIVE AND DIE.

RESOURCES

Scott Foresman Interactive Science, Pearson, 2016
Chapter 4- Ecosytems: Lesson 1
Leveled Readers

- *Changing Forms of Energy*
- *How Energy Changes*

SCIENTIFIC INQUIRY

Core

- Where does food energy come from?
- What do plants need to grow?
- How does matter get reused in and ecosystem?

Supplemental

- What is a local ecosystem? p.144
- What do some molds need to grow? p.158
- Which materials break down fastest in the soil? p. 174

ENDURING UNDERSTANDINGS

NEXT GENERATION SCIENCE STANDARDS

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.]

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.]

COMMON CORE STATE STANDARDS
ELA/Literacy

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(5-LS1-1)*

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. *(5-PS3-1),(5-LS2-1)*

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-LS1-1)

W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-LS1-1)

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. *(5-PS3-1),(5-LS2-1)*

Mathematics

MP.2 Reason abstractly and quantitatively. *(5-LS1-1),(5-LS2-1)*

MP.4 Model with mathematics. *(5-LS1-1),(5-LS2-1)*

MP.5 Use appropriate tools strategically. *(5-LS1-1)*

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-LS1-1)*

FOCUS AREAS

Knowledge

- The sun is the primary source of energy for both plants and animals.
- Plants get the materials they need for growth from the air and water
- Food that animals consume provides energy for body growth, body repair, motion, and warmth.
- The process of photosynthesis is a chemical process that converts the energy of the sun into food for plants and animals
- All food webs rely on the sun for its energy source and producers to create their own food.
- Energy and mass are transferred from one organism to the next as it is eaten.
- Decomposers take dead material and recycle it back into usable material.
- Ecosystems are very fragile and require a perfect balance of predator and prey.

Skills

- Describe/chart the flow of energy from the sun, through plants, and animals.
- Explain that without the sun's energy animal growth and body repair would not be possible.
- Identify the properties of the sun and how they affect both plants and animals.
- Explain how plants convert energy from the sun into food for plants and animals.
- Create a food web.
- Explain the importance of producers, consumers and decomposers in an ecosystem.
- Observe and analyze factors that aid decomposition.
- Describe the flow of energy and mass through a food web.
- Make conclusions about an ecosystem's chances for survival based on factors such as overpopulation or overhunting.

Understanding

- 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.
- Support an argument that plants get the materials they need for growth chiefly from air and water.
- Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

EARTH'S SYSTEMS

Where is most of the Earth's water that is usable to humans?
What are the four major systems that make up the Earth and how do they interact?
What are the four layers of the Earth and what are the characteristics of each?
How do humans impact the Earth and how can we reduce it?
What is global change?

MP 3

BIG IDEAS

FOUR MAJOR EARTH SYSTEMS INTERACT. RAINFALL HELPS TO SHAPE THE LAND AND AFFECTS THE TYPES OF LIVING THINGS FOUND IN A REGION. WATER, ICE, WIND, ORGANISMS, AND GRAVITY BREAK ROCKS, SOILS, AND SEDIMENTS INTO SMALL PIECES AND MOVE THEM AROUND. MOST OF EARTH'S WATER IS IN THE OCEAN, IN GLACIERS OR UNDERGROUND.SOCIETAL ACTIVITIES HAVE HAD MAJOR EFFECTS ON THE LAND, OCEAN, ATMOSPHERE AND EVEN OUTER SPACE. SOCIETAL ACTIVITIES CAN
ALSO HELP PROTECT EARTH'S RESOURCES AND ENVIRONMENTS.

RESOURCES

Scott Foresman Interactice Science, Pearson, 2016

Chapter 4- Ecosystems, Lesson 4
Chapter 5- The Water Cycle and Weather, Lessons 5,6

Leveled Readers

- *Changing World*
- *Water on Earth*
- *Earth's Water*
- *Our Changing Earth*
- *Earth's Changing Surface*
- *Protecting Earth's Resources*
- *Earth's Natural Resources*
- *Green Gardening*

SCIENTIFIC INQUIRY

Core

- How do the spheres interact?
- Compare fresh water and salt water distribution.
- How can you protect Earth's resources and environment?

Supplemental

- How accurate is the weather forecast? p.216
- Does a cloud form? p.224

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

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 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.

COMMON CORE STATE STANDARDS

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. (4-ESS3-2)

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. (4-ESS2-2)

RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-ESS3-2)

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. (4-ESS1-1),(4-ESS2-2)

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. (4-ESS1-1),(4-ESS2-1)

W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. *(4-ESS1-1)*

Mathematics

MP.2 Reason abstractly and quantitatively. *(4-ESS1-1),*(4-ESS2-1),*(4- ESS3-2)*

MP.4 Model with mathematics. *(4-ESS1-1),*(4-ESS2-1)*(4-ESS3-2)*

MP.5 Use appropriate tools strategically. (4-ESS2-1)

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-ESS1-1),(4-ESS2-1)*

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-ESS2-*

1),(4-ESS2-2)

*4.*OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 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-ESS3-2)*

FOCUS AREAS

Knowledge

- Earth is a nonliving object that is made up of four major systems.
- The Earth's geosphere is composed of four distinct layers.
- Animals and plants rely on each other to create the gases needed for survival.
- The ozone layer protects us from the Earth's harmful UV rays.
- The vast majority of water on Earth is salt water and unusable. Most of the water that is usable is trapped in glaciers.
- Areas that are near water will have milder climate changes because the ocean will slowly absorb and release heat.
- How humans negatively impact Earth systems.
- How humans positively impact Earth systems.
- The impacts of human activities and consumption of natural resources

Skills

- Explain the four major systems of the Earth.
- Differentiate between the different layers of the Earth based on distinct characteristics.
- Explain the relationship between plants and animals when it comes to the production of oxygen and carbon dioxide.
- Describe how life on Earth would be different if the ozone layer continues to be depleted.
- Interpret and create graphs that represent the location of both salt and fresh water on Earth.
- Analyze lab results that suggest that areas near water will see milder temperature fluctuations than areas that are further inland.
- Describe humans' impact on Earth systems.
- Explain the impact that increasing human populations have on natural resources.
- Identify changes humans can make to lessen their impact on the Earth's systems.

Understanding

- Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- 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.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment

SPACE SYSTEMS: STARS AND THE SOLAR SYSTEM

What are some observable patterns on Earth throughout a day, month, and year? Why do some stars appear brighter than others and can only be seen during different times in a month or year? What changes can be made on two or more objects that can have an effect on the gravity between those objects?
What is the gravitational force of the Earth and what is its effect on objects of differing sizes and shapes?

MP 4

BIG IDEAS

STARS RANGE GREATLY IN SIZE AND DISTANCE FROM EARTH AND THIS CAN EXPLAIN THEIR RELATIVE BRIGHTNESS. THE EARTH'S ORBIT AND ROTATION, AND THE ORBIT OF THE MOON AROUND THE EARTH CAUSE OBSERVALBE PATTERNS.THE EFFECT OF UNBALANCED FORCES ON AN OBJECT RESULTS IN A CHANGE OF MOTION. PATTERNS OF MOTION CAN BE USED TO PREDICT FUTURE MOTION. SOME FORCES ACT THROUGH CONTACT, SOME FORECES ACT EVEN WHEN THE OBJECTS ARE NOT IN CONTACT. THE GRAVITATIONAL FORCE OF EARTH ACTING ON AN OBJECT TOWARD THE PLANET'S CENTER.

RESOURCES

Scott Foresman Interactive Science, 2016
- Chapter 6- Earth and Space
- Chapter 2 - Forces and Motion

Leveled Readers
- *Stars and Galaxies*
- *Exploring the Universe*
- *Telescopes*
- *Earth in Space*
- *The Earth and Its Neighbors*
- *Moon Landings*
- *Forces in Motion*
- *Objects on the Move*
- *Building Science*

SCIENTIFIC INQUIRY

Core
- Which direction does gravity pull?
- How does location affect a stars appearance?
- How do the stars change with the seasons?

Supplemental
- What does a spiral galaxy look like from different angles? p.258

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

5-PS2-1. 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.] [*Assessment Boundary: Assessment does not include causes of seasons.*]

COMMON CORE STATE STANDARDS

ELA/Literacy

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(5-PS2-1),(5-ESS1-1)*

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. *(5-ESS1-1)*

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). *(5-ESS1-1)*

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-PS2-1),(5-ESS1-1)

W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1),(5-ESS1-1)

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. *(5-ESS1-2)*

Mathematics

MP.2 Reason abstractly and quantitatively. *(5-ESS1-1)*,(5-ESS1-2)

MP.4 Model with mathematics. *(5-ESS1-1)*,(5-ESS1-2)

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-ESS1-1)*

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. (5-ESS1-2)

FOCUS AREAS

Knowledge

- That a star's distance from Earth affects how bright it appears to be.
- That the length of shadows decrease during the day until they reach a certain point, then the shadows gradual start to get larger.
- That the rotation of Earth causes night and day.
- That the path of the sun changes from month to month.
- Support an argument that the gravitational force exerted by Earth on objects is directed down.
- That the locations of constellations change due to the rotation and revolution of Earth.
- The history of our understanding of gravity. Where the center of mass of a sphere is.
- How mass and distance relate to the force of gravity.
- That an object's mass does not influence the force of Earth's gravity on it.

Skills

- Create an argument that relative brightness of the Sun compared to other stars is a function of the distance to those stars.
- Explain how day turns into night
- Explain why the sun casts different sized shadows.
- Explain that the location of constellation in the night sky appear in different locations due to the rotation and revolution of Earth.
- Show experimentally that things fall down because Earth's gravitational force is down.
- Explain the balance of the Sun's gravitational force on Earth, and the Earth's momentum cause the revolution of the Earth around the Sun.
- Show experimentally that objects fall at the same rate.

Understanding

- Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
- 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.
-

Engineering Design

What is science? How does technology affect our lives? What do you already know about the engineering design process? What do you already know about human impacts on Earth Systems?

MP 4

BIG IDEAS

Even though students have grown up surrounded by high-tech gadgets, the may not be aware of the connection between technology and science. Science is the study of the natural world to understand how it functions. Technology changes or modifies the natural world to meet human needs or solve problems. Advances in technology contribute to advances in science.

RESOURCES

- Designs and Function p. 361-386

SCIENTIFIC INQUIRY

Core

- How can you make a paper helicopter drop slowly? p. 54
- How much weight can a model arm support? p.398-403

ENDURING UNDERSTANDINGS

NEXT GENERATION STANDARDS

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

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

COMMON CORE STATE STANDARDS

ELA/Literacy

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS-2)

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. (3-5-ETS-2)

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS-2)

W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1),(3-5-ETS1-3)

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. (3-5-ETS1-1),(3-5-ETS1-3)

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1),(3-5-ETS1-3)

Mathematics

MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)

MP.4 Model with mathematics. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)

MP.5 Use appropriate tools strategically. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)

3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1),(3-5-ETS1-2)

FOCUS AREAS

Knowledge

- Students define a problem using criteria for success and constraints or limits of solutions.
- Students research and consider multiple possible solutions to a given problem.
- Generating and testing solutions also becomes more rigorous as the students learn to optimize solutions by revising them several times to obtain the best possible design.

Skills

- Plan and create an investigation
- Design a model
- Test model
- Develop a presentation
- Communicate findings

Understanding

- 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.
- 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.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.

Appendix A

Materials and Assessment

RESOURCES AND MATERIALS

Core

Progressive Science Initiative Units, New Jersey Center for Teaching and Learning, www.njctl.org

Supplemental

Scott Foresman Science, Pearson, 2008, Grades K-3
Interactive Science, Pearson, 2011, Grades 4-5

METHODS OF ASSESSMENT

Student assessment in science should include the following:

- Modeling
- Whole and small group activities
- Cooperative learning
- Vocabulary attack
- Discussion
- Independent practice
- Problem solving
- Controlled experiments
- Developmentally appropriate activities
- Projects (group and individual)
- Laboratory work
- Opportunities for student-directed inquiry in connection to unit standards

METHODS OF ASSESSMENT

Student assessment in science should include the following:

- Tests and Quizzes (standardized or teacher-made)
- Teacher observation of class work and homework
- HOT (higher order thinking) questions and answers including inferential thinking and critical thinking questions
- Participation in class and group work
- Portfolio assessment
- Journal entries
- Science notebook
- Projects (individual and group)
- Lab Reports

Appendix B

Science and Society

FIRST GRADE

Topic	Link to Science and Society
Biology	Sonia Ortega is the National Science Foundation program director and a marine biologist.
Geology	Dr. Winifred Goldring, eminent New York State geologist and the first person to do exhaustive work on stromatolites.
Engineering	Dr. Shamim Rahman is NASA's Chief Engineer for the Propulsion Test Directorate at Stennis Space Center.
Engineering	Felix Alberto Soto Toro is a NASA design engineer for hardware and software automated systems who reviews, designs, builds, tests and implements engineering designs used in the Space Shuttle and Payload Operations Development Laboratories
Atoms	Mike Wong's research in nanostructured materials is at the cutting edge of chemistry and is extending the traditional boundaries of both chemical engineering and materials science. He has used nanoparticles to develop innovative new catalysts for the chemical industry.

SECOND GRADE

Topic	Link to Science and Society
Plants	Mary Agnes Chase, studied and illustrated plants
Dinosaurs	Susan Hendrickson, paleontologist who has a Tyrannosaurus Rex named after her.
Animals	Alejandro Purgue, scientist who studies sounds animals make. Discovered that bullfrogs make most of their sound through their ears.

THIRD GRADE

Topic	Link to Science and Society
Dinosaurs	Paul Sereno, American palentologist responsible for the discovery of several new dinosaur species
Animals	Eric Stolen, wildlife biologist for NASA
Chemistry	Dr. John Pojman, Chemist of the Year 2006, specializing in polymer processing
Space	Dr. Elissa R. Levine, biospheric soil scientist for NASA
Astronomy	Galileo, played a major role in the scientific revolution and invented the telescope along with consequent astronomical observations

FOURTH GRADE

Topic	Link to Science and Society
Ecology	Rachel Carson, scientist and writer who learned that a chemical called DDT was destroying many ecosystems
Weather	Joanne Simpson, meteorologist/pilot who tested ideas about weather patterns by flying through weather systems
Plants and Space	Doug Ming, NASA scientist who studied soil and hope to grow plants in extreme conditions like Mars and the Moon
Electricity	William Gilbert, physician who developed and conducted experiments about electricity and magnetism
Astronomy	Nicolaus Copernicus, astronomer who studied the works of Ptolemy and other astronomers – developed a different theory of how to model the universe

FIFTH GRADE

Topic	Link to Science and Society
Engineering	Charles Babbage, originated the idea of a programmable computer
Engineering	Karl Benz, internal combustable engine for automobiles
Geology	Florence Bascom, first female geologist
Astronomy	Caroline Herschel, astronomer who discovered many comets
Astronomy	Isacc Newton, “Father of Science,” telescope
Astronomy	Galilei Galileo, “Father of Modern Science,” telescope
Chemistry	Charles Goodyear, process vulcanization
Biology	Alexander Fleming, discovered penicillin

Contributions of scientists listed above are suggested for discussion during related units.

Appendix C

Interdisciplinary and 21st Century Integration

CROSS-CURRICULAR INTEGRATION WITH SCIENCE: Standard 5 Grades K-5				
	Lang. Arts CCSS	**Math CCSS**	**Social Studies Standard 6**	**Technology Standard 8**
K	Use leveled readers to extend learning through fiction and nonfiction selections	Compare the rise and fall in daily and seasonal temperature	Identify and locate warmer and colder regions of the earth on a map and/or globe	Use a thermometer to read and record daily temperature
1	Use leveled readers to extend learning through fiction and nonfiction selections	Patterns and Algebra as related to Astronomy and Space	Discuss how our surroundings help meet our basic needs through a discussion local community	Select and use simple tools and materials to complete a task Make a plan in order to design a solution to a problem.
2	Use leveled readers to extend learning through fiction and nonfiction selections	Data Analysis and Probability as related to Earth Science	Associate various plants and animals with various parts of the world using a map and/or globe	Describe a toy or other familiar object as a system with parts that work together
3	Use leveled readers to extend learning through fiction and nonfiction selections	Geometry and Measurement as related to Technology	Locate bodies of water on a map and/or globe	Demonstrate how measuring instruments are used to gather information in order to design things that work properly Describe a product or device in terms of the problem it solves or the need it meets. Choose materials most suitable to make simple mechanical constructions. Use the design process to identify a problem, look for ideas, and develop and share solutions with others
4	Use leveled readers to extend learning through fiction and nonfiction selections	5.3.4 A Numerical Operations as related to Physics	Locate the San Andreas Fault and Grand Canyon on a map	Distinguish between things that occur in nature and those that have been designed to solve human problems
5	Watch the night sky and record daily observations in their Star Journal	Numerical Operations as related to Astronomy and Space	Discuss the impact that astronomy had on the early calendars (Egyptian, Roman and Julian) and compare/contrast to our modern calendar	Identify the basic components of a technological system: input, process, output, feedback

CROSS-CURRICULAR INTEGRATION WITH SCIENCE: Standard 5 Supplemental Content Areas			
Music and Art Standard 1	**World Language Standard 7**	**Physical Education Standard 2**	**Career Education Standard 9**
Grades K-3 Use painting, drawing and 3-D models to depict scientific phenomena	Grades K-3 Display and read cognate posters as vocabulary is connected to appropriate units	Grades K-3 Explore the impact of exercise on heart rate	Grades 1-8 Explore various scientific career options through discussions of scientists and their contributions
Grades 4-8 Investigate acoustics, timbre and pitch	Grades 4-8 Discuss how technical terms are derived from roots in foreign languages	Grades 4-8 Explore energy change, force and motion	

Appendix D

Modifications

ESL
Special Education
Gifted and Talented
At-Risk

ESL CURRICULUM MODIFICATIONS

Instruction

Tip: ESL students need modified instruction to learn both English and content.

Modifying instruction is critical to ESL students' success. However, modifying instruction doesn't mean creating a second lesson plan or curriculum; it just means changing some of the ways you do things. Most of your native English-speaking students can benefit from modifications as well.

Technique: Use various teaching styles and tricks of the trade.

- Teach to varied learning styles
- Encourage students to participate in class
- Have high expectations of your students
- Give students more wait time: at least 15-20 seconds
- Assign students a bilingual or English-speaking study buddy
- Use cooperative learning and put students in groups with English-speaking students
- Use lots of visuals, like graphic organizers and pictures
- Use physical activity: model, role-play, act out
- Repeat and rephrase often
- Emphasize the 5-8 most important vocabulary words of a lesson
- Focus on the 2-3 key concepts of a lesson
- Give students an outline of the lesson that highlights the key concepts
- Let ESL students copy your or someone else's notes
- Write in print unless specifically teaching the manuscript alphabet
- Give simple instructions
- Use concrete language and questions
- Simplify complex questions
- Use children's literature/lower grade level materials to teach content
- Incorporate the 4 skills of language acquisition: reading/writing/listening/speaking
- Check understanding using "show me" techniques

Class/Homework

Tip: ESL students experience greater success when class-work and homework is modified to fit their capabilities.

Modifying class-work or homework tasks to fit ESL students' capabilities doesn't mean expecting less from them. It means giving them realistic tasks to complete that increase their chances for success.

Technique: Allow for flexibility in the tasks you assign.

- Reduce assignments
- Simplify complex tasks
- Give ESL students extra time to do work or complete projects
- Adapt the task to the students' skill levels
- Ignore spelling or grammar errors except for when explicitly taught
- Allow students to take breaks when working: their brains tire quickly!

Assessment Modifications

Tip: Assess ESL students according to what they can do rather than what they cannot do.

Standardized tests or even teacher-created tests can't always measure ESL students' progress accurately or authentically. Instead, measure ESL students by what they can do at any point in time, keeping in mind what they could not do earlier. Have they shown progress? Have they sincerely made an effort to learn? Have they demonstrated their learning?

Technique: Modify the tests you give.

- Test key concepts or main ideas
- Avoid test questions asking for discrete information
- Make a simplified language version of the test
- Simplify instructions
- Provide word banks
- Give students extra time to complete tests
- Give students objective tests: matching, multiple choice, etc.
- Make all or part of the exam oral.

Technique: Use alternate assessment strategies for ESL students.

1. Non-Verbal
   - physical demonstration (point, gesture, act out, thumbs up/down, nod yes/no)
   - pictorial products (manipulate or create drawings, diagrams, dioramas, models, graphs, charts; label pictures; keep a picture journal
   - KWL Charts using pictures or native language

2. Oral and Written Strategies
   - interviews, oral reports, role plays using visuals cues, gestures or physicalactivity
   - describing, explaining, summarizing, retelling, paraphrasing
   - thinking and learning logs
   - reading response logs
   - writing assignments
   - dialogue journals
   - audio or video recordings of students
   - portfolios

Source: Harleys-ESL-Modifications

SPECIAL EDUCATION CURRICULUM MODIFICATIONS

The New Jersey Council on Developmental Disabilities has compiled the "Tools for Teachers" to provide basic information and guidance in demonstrated best practice strategies for including students with disabilities in general education settings. Developed by the Council's Subcommittee on Education the follow excerpt from Park 2 Curriculum Modifications and Adaptations provides guidance in meeting the needs of special education students in the general curriculum.

The New Jersey Council on Developmental Disabilities' Education Task Force has complied "Tools for Teachers" to provide basic information and guidance in demonstrated best practice strategies for including students with disabilities in general education settings.

CURRICULUM MODIFICATIONS & ADAPTATIONS

There is no recipe for adapting general education curriculum to meet each student's needs. Each teacher, each student, each classroom is unique and adaptations are specific to each situation. Keep in mind that curriculum does not always need to be modified. By providing multi-level instruction you will find that adapting a lesson may not always be necessary. Differentiating instruction and providing multiple ways assess allows more flexibility for students to meet the standards and requirements of the class. At other times, the curriculum can be made more accessible through accommodations. In addition, supports for one student may not necessarily be the same in all situations, e.g., a student who needs full time support from a paraprofessional for math may only need natural supports from peers for English, and no support for art. And, supports should not be determined by the disability label; instead supports should be used when the instructional or social activity warrants the need for assistance. (Fisher and Frey, 2001).

The forms and examples on the following pages provide information about curriculum and types of adaptations that could be considered in developing the appropriate strategy for a particular student.

A Curricular Adaptation and Decision-making Process

This decision-making flowchart can be used to conceptualize the process of selecting and implementing curricular adaptations. It should be used as a tool for a team in determining an individual student's needs.

Identify the student's individual educational goals and objectives to be emphasized during general education activities

Articulate the expectations for the student's performance in general education activities

Determine what to teach

As a team, determine the content of the general education activity, theme or unit study

Determine how to teach

As a team, determine if, without modification, the student can actively participate and achieve the same essential outcomes as non-disabled classmates. If the student cannot achieve the same outcomes...

Select of design appropriate adaptations

Select instructional arrangement	Select lesson format	Employ student-specific teaching strategies	Select curricular goals specific to the lesson	Engineer the physical and social classroom environment	Design modified materials	Select natural supports and supervision arrangements

If the above adaptation strategies are not effective, design an alternative activity

Evaluate effectiveness of adaptations

A Curricular Adaptation and Decision-making Model

Examine the Structure of the Instruction

1. Can the student actively participate in the lesson without modification? Will the same essential outcome he achieved?
2. Can the student's participation he increased by changing the instructional arrangement?

From traditional arrangements to:

- Cooperative groups
- Small groups
- Peer partners
- Peer or cross-age tutors

3. Can the student's participation be increased by changing the lesson format?
   - Interdisciplinary/thematic units
   - Activity-based lessons, games, simulations, role-plays
   - Group investigation or discovery learning
   - Experiential lessons
   - Community-referenced lessons
4. Can the Student's participation and understanding be increased by changing the delivery of instruction or teaching style?

Examine the Demands and Evaluation Criteria of the Task

5. Will the student need adapted curricular goals?
   - Adjust performance standards
   - Adjust pacing
   - Same content but less complex
   - Similar content with functional/direct applications
   - Adjust the evaluation criteria or system (grading)
   - Adjust management techniques

Examine the Learning Environment

6. Can the changes he made in the classroom environment or lesson location that will facilitate participation?
   - Environmental/physical arrangements
   - Social rules
   - Lesson location

Examine the Materials for Learning

7. Will different materials be needed to ensure participation?
   - Same content but variation in size, number, format
   - Additional or different materials/devices
   - Materials that allow a different mode of input
   - Materials that allow a different mode of output
   - Materials that reduce the level of abstraction of information

Examine the Support Structure

8. Will personal assistance be needed to ensure participation?
   - From peers or the general education instructor?
   - From the support facilitator'?
   - From therapists'?
   - From paraprofessionals?
   - From others?

Arrange Alternative Activities that Foster Participation and Interaction

9. Will a different activity need to be designed and offered for the student and a small group of peers?
   - In the classroom
   - In other general education environments
   - In community-based environments

Curriculum Adaptations

It is important to correlate adaptations with the IEP. In other words, we are not adapting for adaptations sake but, to meet the student's needs as identified on an IEP.

a. Curriculum as is. This is the type we forget most frequently. We need to constantly be looking at the general education curriculum and asking if the students on IEPs may gain benefit from participating in the curriculum as is. We need to keep in mind that incidental learning does occur. Curriculum as is supports outcomes as identified in standard curriculum.

Move in this direction only when necessary

b. Different objective within the same activity and curriculum. The student with an
IEP works with all the other students in the classroom participating in the activity when possible but, with a different learning objective from the other students. This is where the principle of partial participation fits. Examples include.

- A student with a short attention span staying on task for 5 minutes.
- Using a switch to activate a communication device to share during a class discussion.
- Expressing one's thoughts by drawing in a journal instead of writing.
- Holding a book during reading time.
- Understanding the effect World War II has on the present rather than knowing the
- names and dates of key battles.

c. Material or environmental adaptations. The material or environmental changes are utilized so that participation in the general education curriculum by the student with the IEP may occur. Examples include:

- 5 spelling words from the weekly list instead of the standard 20.
- Completing a cooking assignment by following picture directions rather than written
- directions
- Changing the grouping of the class from large group to small groups (possible with the
- additional support staff).
- Changing the instructional delivery from lecture to the cooperative learning format
- Using a computer to write an assignment instead of paper and pencil.
- Reading a test to a student.
- Highlighting the important concepts in a textbook.
- Having the student listen to a taped textbook.
- Using enlarged print
- Using an assistive technology device
- Using visual cues such as picture and/or word schedules for those who have difficulty staying on task.
- Using a note taking guide listing the key concepts during a lecture.

d. Providing Physical assistance. Assistance from another person may be needed for a student to participate in a classroom activity. If possible, it is better to use natural supports (peers) as these will be the people always present in the student' life. If the use of peers is not possible, then the support teacher, the paraprofessional, the classroom teacher, the classroom aide, or a parent volunteer

may provide the assistance. Most peers and staff will need training in the correct way of providing physical assistance. In addition, we need to keep in mind the principle of partial participations. Examples include: • Starting a computer for a student with an IEP to use. • Guiding a hand during handwriting. • Assisting in activating a switch. • Completing most of the steps of an activity and having a student with an IEP do the remainder • Pushing a student in a wheelchair to the next activity. **e. Alternative/substitute curriculum.** This is sometimes referred to as functional curriculum as it usually involves the acquisition of "life skills." The decision to use alternative/substitute curriculum is a major change and needs to be reflected on the IEP. This decision should be carefully made after weighing all of the pros and cons of using an alternative curriculum. The alternative curriculum may or may not take place in the general education classroom. Examples include: • Community-based instruction (which all students may benefit from!) • Learning job skills in the school cafeteria. • Learning how to use a communication device. • Doing laundry for the athletic department • Learning cooking/grooming skills at the home.	

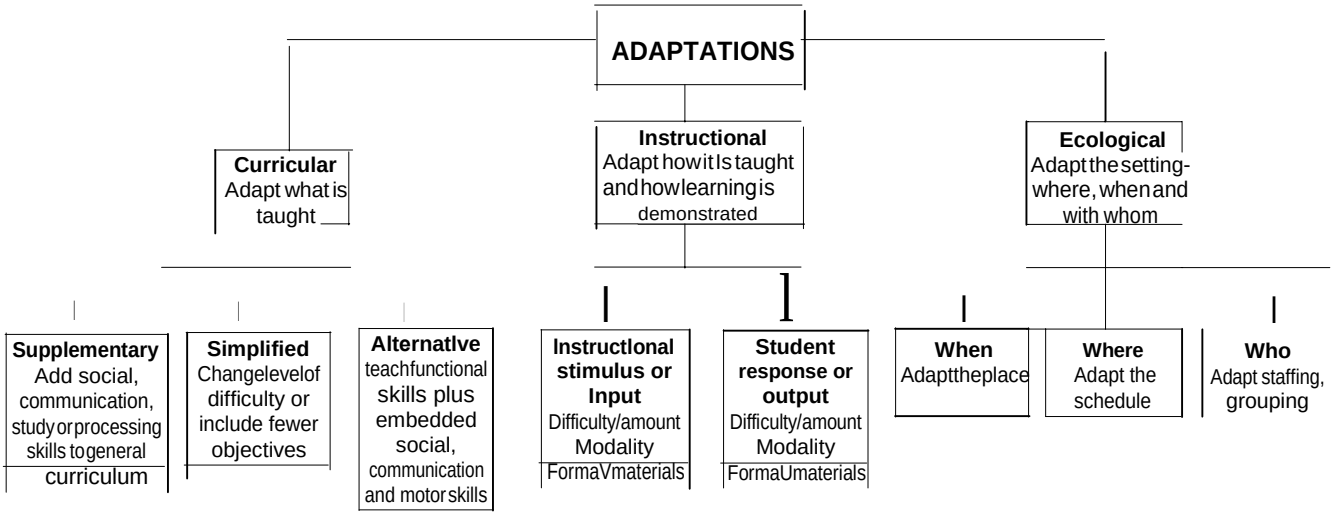
Overlap does occur among the five types of curriculum adaptations

Nine Types of Adaptations

Input Adapt the way instruction is delivered to the learner. *For example:* Use different visual aids; plan more concrete examples; provide hands-on activities; place students in cooperative groups	**Output** Adapt how the learner can respond to instruction *For example:* Allow a verbal vs. written response; use a communication book for students; allow students to show knowledge with hands-on materials.	**Time** Adapt the time allotted and allowed for learning, task completion or testing. *For example:* Individualize a timeline for completing a task; pace learning differently (increase or decrease) for some learners

Difficulty Adapt the skill level, problem type, or the rules on how the learner may approach the work. *For example:* Allow a calculator for math problems; simplify task directions; change rules to accommodate learner needs.	**Level of Support** Increase the amount of personal assistance with specific learner. *For example:* Assign peer buddies, teaching assistants, peer tutors or cross-age tutors	**Size** Adapt the number of items that the learner is expected to learn or compete. *For example:* Reduce the number of social studies terms a learner must learn at any one time.

Degree of Participation Adapt the extent to which a learner is actively involved in the task. *For example:* In geography, have a student hold the globe, while others point out the locations.	**Alternate Goals** Adapt the goals or outcome expectations while using the same materials. *For example:* In social studies, expect one student to be able to locate just the states while others learn to locate capitals as well.	**Substitute Curriculum** Provide the different instruction and materials to meet a learner's individual goals. *For example:* Individualize a timeline for completing a task; pace learning differently (increase or decrease) for some learners.



Stages of Adaptations

Stage 1
General Adaptations
Blueprints or formats for adapting predictable activities and routines

Stage 2
Specific Adaptations
Time-limited adaptations for a particular lesson, activity or unit

GIFTED AND TALENTED CURRICULUM MODIFICATIONS

Berger, S.
ERIC Digest
#E510

This article by Sandra L. Berger discusses how gifted students "need an appropriately differentiated curriculum designed to address their individual characteristics, needs, abilities, and interests. It is difficult to generalize about students who are gifted because their characteristics and needs are so personal and unique. However, as a group they comprehend complex ideas quickly, learn more rapidly and in greater depth than their age peers, and may exhibit interests that differ from those of their peers. They need time for in-depth exploration, they manipulate ideas and draw generalizations about seemingly unconnected concepts, and they ask provocative questions."

Developing An Effective Curriculum

An effective curriculum for students who are gifted is essentially a basic curriculum that has been modified to meet their needs. The unique characteristics of the students must serve as the basis for decisions on how the curriculum should be modified (Feldhusen, Hansen, & Kennedy, 1989; Maker 1982; TAG, 1989; VanTassel-Baska et al., 1988). It results from appropriate modification of content, process, environment, and product (Maker, 1982).

Modifying Content

Content consists of ideas, concepts, descriptive information, and facts. Content, as well as learning experiences, can be modified through acceleration, compacting, variety, reorganization, flexible pacing, and the use of more advanced or complex concepts, abstractions, and materials. When possible, students should be encouraged to move through content areas at their own pace. If they master a particular unit, they need to be provided with more advanced learning activities, not more of the same activity. Their learning characteristics are best served by thematic, broad-based, and integrative content, rather than just single-subject areas. An entire content area arranged and structured around a conceptual framework can be mastered in much less time than is traditionally allotted (VanTassel-Baska, 1989). In addition, such concept-based instruction expands opportunities to generalize and to integrate and apply ideas. (See Bruner, 1966, MAN: A COURSE OF STUDY MACOS for an example of a thematic, integrated curriculum.)

Middle and secondary schools are generally organized to meet student needs within content areas. Providing an interdisciplinary approach is another way of modifying curriculum . Jacobs and Borland (1986) found that gifted students benefit greatly from curriculum experiences that cross or go beyond traditional content areas, particularly when they are encouraged to acquire an integrated understanding of knowledge and the structure of the disciplines.

Modifying Process

To modify process, activities must be restructured to be more intellectually demanding. For example, students need to be challenged by questions that require a higher level of response or by open-ended questions that stimulate inquiry, active exploration, and discovery. Although instructional strategies depend on the age of the students and the nature of the disciplines involved, the goal is always to encourage students to think about subjects in more abstract and complex ways. Activity selection should be based on student interests, and activities should be used in ways that encourage self-directed learning. Bloom's TAXONOMY OF EDUCATIONAL OBJECTIVES (1956) offers the most common approach to process modification. His classification system moves from more basic levels of thought, such as memory or recall, to more complex levels of analysis, synthesis, and evaluation. Parnes (1966), Taba (1962), and others have provided additional models for structuring thinking skills. Every teacher should know a variety of ways to stimulate and encourage higher level thinking skills. Group interaction and

simulations, flexible pacing, and guided self-management are a few of the methods for managing class activities that support process modification.

Modifying Environment

Gifted students learn best in a receptive, nonjudgmental, student-centered environment that encourages inquiry and independence, includes a wide variety of materials, provides some physical movement, is generally complex, and connects the school experience with the greater world. Although all students might appreciate such an environment, for students who are gifted it is essential that the teacher establish a climate that encourages them to question, exercise independence, and use their creativity in order to be all that they can be.

Modifying Product Expectation and Student Response

Teachers can encourage students to demonstrate what they have learned in a wide variety of forms that reflect both knowledge and the ability to manipulate ideas. For example, instead of giving a written or oral book report, students might prefer to design a game around the theme and characters of a book. Products can be consistent with each student's preferred learning style. They should address real problems, concerns, and audiences; synthesize rather than summarize information; and include a self-evaluation process.

Assessing Curriculum Effectiveness

In their synthesis of curriculum effectiveness studies and effective practice, VanTassel-Baska et al. (1988) suggested that differentiated curriculum would respond to diverse characteristics of gifted learners in the following three ways:

- By accelerating the mastery of basic skills through testing-out procedures and reorganization of the curriculum according to higher level skills and concepts.
- By engaging students in active problem-finding and problem-solving activities and research.
- By providing students opportunities for making connections within and across systems of knowledge by focusing on issues, themes, and ideas.

Curriculum development is a dynamic, ongoing process. Special attention needs to be paid to articulation, scope, and sequence to avoid gaps and repetition through grade levels; ensure that the understandings and skills we expect children to develop fit together; and assure that children are provided with the knowledge and skills that will prepare them for the future. Periodic evaluations of curriculum effectiveness allow corrections to be made when needed, and they are essential if curriculum is to meet the long-term needs of gifted students for increasingly complex and challenging opportunities.

Conclusion

The curriculum committee of the Leadership Training Institute (Passow, 1982) developed seven guiding principles for curriculum differentiation that reflect the considerations described in this Digest.

- The content of curricula for gifted students should focus on and be organized to include more elaborate, complex, and in-depth study of major ideas, problems, and themes that integrate knowledge within and across systems of thought.
- Curricula for gifted students should allow for the development and application of productive thinking skills to enable students to reconceptualize existing knowledge and/or generate new knowledge.
- Curricula for gifted students should enable them to explore constantly changing knowledge and information and develop the attitude that knowledge is worth pursuing in an open world.
- Curricula for gifted students should encourage exposure to, selection, and use of appropriate and specialized resources.
- Curricula for gifted students should promote self-initiated and self-directed learning and growth.

- Curricula for gifted students should provide for the development of self-understanding and the understanding of one's relationship to persons, societal institutions, nature, and culture.
- Evaluations of curricula for gifted students should be conducted in accordance with the previously stated principles, stressing higher level thinking skills, creativity, and excellence in performance and products.
- Developing curriculum that is sufficiently rigorous, challenging, and coherent for students who are gifted is a challenging task. The result, however, is well worth the effort. Appropriately differentiated curriculum produces well-educated, knowledgeable students who have had to work very hard, have mastered a substantial body of knowledge, and can think clearly and critically about that knowledge. Achieving such results for one or for a classroom full of students who are gifted will produce high levels of satisfaction, not only for the students who are beneficiaries, but also for every teacher who is willing to undertake the task.

Credits

This publication was developed by Sandra L. Berger with funding from the Office of Educational Research and Improvement, U.S. Department of Education, under contract no. RI88062007. The opinions expressed in this report do not necessarily reflect the positions or policies of OERI or the Department of Education.

The Council for Exceptional Children, ERIC Clearinghouse on Handicapped and Gifted Children, Reston, Va.

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Permission Statement

Comments

Contributed by: DITD Team Member on 3/29/2005
This is a very good article for teachers and parents. It lists all of the positives of differentiating curriculum in schools. It is short and to the point.

At-Risk Accommodations for Classroom Interventions _____Tier 1 _____Tier 2 Name_____Teacher_____Begin Date_____

Evaluation Date (6 weeks): **Continue? Yes No (if No, move to next Tier)**

Pacing

_ Adjust time for completion of assignments
_ Allow frequent breaks, vary activities often
_ Modify assignments requiring copying in a timed situation
_Other:_____
_____
_____

Environment

Leave class for assistance
Preferential seating
Define limits(behavioral/physical)
Reduce/minimize distractions
visual_ auditory ___
Cooling off period
Provide consistent structure
Adjust lighting
Adjust room temperature
Other:._____
_____
_____

Presentation of Subject Matter

Emphasize teaching
_ auditory visual
tactile multi
Individual/small group instruction
Utilize specialized curriculum
Tape lectures forreplay
Present demonstration
Utilize manipulatives
Emphasize critical information/key concepts
Pre-teach vocabulary
Provide visual cues
Provide study guide or note cards or notes
Other:_____

Modification Legend:

5-Successful **U-Unsuccessful**

Assignments

_ Modify homework(Specify.),_____
Give directions in small units
_ Use written backup for oral directions
_ Lower reading level of assignment (RL=_)
_ Adjust length of assignment
_ Change format of assignment
_ Break assignment into a series of smaller assignments
Reduce paper and pencil tasks
Read directions/worksheets to student
Record or type assignments
Maintain assignment notebook
Avoid penalizing for spelling errors
Block off or mask sections of work
Use highlighted texts
Use taped texts
Use computer
Use calculator
Student planner
Other:._____

Reinforcement and Motivations

Use positive reinforcement
Use concrete reinforcers
Check often for understanding/review
Peer tutoring
Request parent-reinforcement Have student repeat directions Emphasize study/organizational skills Repeated review/drill
Use behavior modification techniques
Before or after school tutoring
Emphasize socialization skills
Other:_____

Testing Adaptations

Oral tests _ Bundling Taped tests
_ Modified format
Large print _ Content Mastery
Other:_____