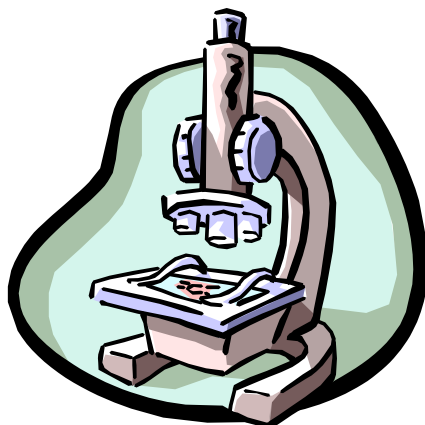


MSAD #53 Science Curriculum

PreK-8



Statement of Philosophy

The MSAD #53 Science curriculum is designed to encourage active student involvement in hands-on activities that are aligned with the MSAD #53 Mission, the Maine Learning Results, and National Science Standards. This curriculum supports the belief that, in such a dynamic world as the one in which we live and in which students will have to function as effective, innovative problem-solvers and citizens, students must learn to be independent, life-long learners who know where to go for the information they need, how to filter through sources to find and evaluate it, and how to apply it to the often complex life problems they might encounter.

The MSAD #53 Science curriculum acknowledges that science is a series of processes and discovery based on a solid knowledge base. As such, it seeks to tap students' natural curiosity. In addition, it attempts to afford all students exposure and opportunities to explore and utilize the tools of science, including important technological tools.

MSAD #53 Curriculum: Science PreK-2

Fundamental Knowledge & Skill – A Classifying Life Forms

Students will develop an understanding that there are similarities within the diversity of all living things.

FOCUS: PreK,K: Human Body

GR1: Animals

GR2: Plants

Indicator 1: Students will develop an ability to recognize the differences between living and nonliving things. (MLR – A1)

SWBAT...

- ...identify the human body and animals as living things, and rocks and other objects as nonliving things. (K)
- ...recite the five sense and match them with the organs responsible for them. (K)
- ...experience a variety of activities involving life cycles. (K)
- ...review the five senses through word study sorts (pictures). (GR1)
- ...apply the scientific method to the use of the five senses. (GR1)
- ...identify plants as living things. (GR2)

Indicator 2: Students will develop an ability to describe the characteristics of different living things. (MLR – A2)

SWBAT...

- ...experience a variety of animal life cycles (e.g., caterpillar to butterfly, tadpole to frog). (K)
- ...examine and record animal life cycles (e.g., cyclical diagrams). (GR1)
- ...list some external features of animals that help them adapt and do well in different kinds of places. (GR1)
- ...identify basic plant parts. (GR2)
- ...describe similarities and differences among individuals in the same species. (GR2)

Indicator 3: Students will develop an ability to explain, draw, or otherwise demonstrate the life cycle of an organism. (MLR – A3)

SWBAT...

- ...have experiences drawing diagrams of body parts, animals and plants. (K)
- ...identify and label various animals' parts. (GR1)
- ...make cyclical diagrams of animal life cycles. (GR1)
- ...identify the stages of plant development. (GR2)
- ...begin to identify the features of the fertilization process in plants. (GR2)

Indicator 4: Students will develop an ability to design and describe a classification system for objects. (MLR – A4)

SWBAT...

- ...begin to sort objects and give reasons for their sorting. (K) [Reference Math]
- ...design a sorting system for classifying animal characteristics. (GR1)
- ...use hand lenses to identify characteristics. (GR2)

Fundamental Knowledge & Skill – B Ecology

Students will develop an understanding of how living things depend on one another and on nonliving aspects of the environment.

Indicator 1: Students will develop an ability to identify ways that organisms depend on their environment. (MLR – B1)

SWBAT...

- ...examine ecological concepts related to the ways organisms depend on water, soil, and air. (K)
 - ...explain that most living things need water, food, and air to survive. (GR1,2)
 - ...describe the habitats of many kinds of animals. (GR1)
 - ...identify that animals sometimes use plants and animals for shelter and nesting. (GR1)
 - ...list some external features of animals that help them flourish in a variety of environments. (GR1)
- [Reference A2]
- ...examine how animals adapt to different seasons. (GR1)

Indicator 2: Students will develop an ability to describe how almost all animals' foods can be traced back to plants. (MLR – B2)

SWBAT...

- ...describe animals' needs for water, food, air, shelter. (GR1)
- ...explain that plants need water, food, air and light. (GR2)

Indicator 3: Students will develop an ability to give examples of how changes in a system affect other parts of the same system. (MLR – B3)

SWBAT...

- ...recognize and identify the changes that occur when living and/or nonliving materials are added to or taken away from a system. (GR2)

Indicator 4: Students will develop an ability to describe different ecological systems on Earth. (MLR – B4)

SWBAT...

- ...explore local ecosystems (streams, ponds, woods, fields). (K)

- ...record and diagram local ecosystems. (GR1)
- ...identify an ecological system. (GR2)
- ...list features of an ecological system. (GR2)
- ...compare and contrast two different ecological systems on earth (e.g., desert/tundra, rainforest/forest). (GR2)

Indicator 5: Students will develop an ability to describe a familiar local environment. (MLR – B5)
SWBAT...

- ...select a local environment (e.g., a farm, Manson Park, Sebasticook River, playground) and explain its living and nonliving features (K: human environment; GR1: animal environment; GR2: plant environment). (GR K,1,2)

Fundamental Knowledge & Skill – C Cells

Students will develop an understanding of cells as the basic units of life.

Indicator 1: Students will develop an ability to demonstrate that living things are made up of different parts. (MLR – C1)

SWBAT...

- ...examine different organisms (K: major human body parts; GR1: animal body parts; GR2: plant parts). (GR K,1,2)

Indicator 2: Students will develop an ability to demonstrate an understanding that plants and animals need food, water, and gases to survive. (MLR – C2)

SWBAT...

- ...list characteristics of good nutrition for a healthy body. (K)
- ...examine and list the different kinds of things animals need to survive. (GR1) [Reference B1]
- ...experiment with plants using food and water as variables. (GR2)

Indicator 3: Students will develop an ability to explore magnifying devices and how they allow one to see in more detail. (MLR – C3)

SWBAT...

- ...recognize and use a magnifying device as a way to look closer at the details of something. (GR1,2)
- ...use a magnifying device to examine the parts of plants. (GR2)

Fundamental Knowledge & Skill – D Continuity and Change

Students will develop an understanding of the basis for all life and that all living things change over time.

FOCUS: PreK,K: Classification of Objects
GR1: Materials & Physical Properties
GR2: Changes in Materials & Changes in Properties

Indicator 1: Students will develop an ability to explain how fossils show the existence of past life. (MLR – D1)

SWBAT...

- ...begin to identify the concept of extinction in relation to fossils. (GR1,2)
- ...identify and explain what a fossil is. (GR1,2)
- ...explain why a fossil animal is not alive now. (GR1)
- ...recognize plant features in rocks. (GR2)

Indicator 2: Students will develop an ability to identify characteristics that help organisms live in their environment. (MLR – D2)

SWBAT...

- ...identify ways in which characteristics of the human body (e.g., five senses) help them live in the environment. (K)
- ...identify some of the external characteristics of animals that allow them to live in their environments. (GR1)
- ...examine seasonal animal adaptations. (GR1)
- ...examine seasonal plant adaptations. (GR2)

Indicator 3: Students will develop an ability to draw or describe how an organism can change over its lifetimes, sometimes in predictable ways (e.g., butterfly, frog). (MLR – D3)

SWBAT...

- ...examine animal adaptations over a lifetime. (GR1)
- ...examine plant adaptations through stages. (GR2)

Indicator 4: Students will develop an ability to describe ways in which individuals of the same species are alike and different. (MLR – D4)

SWBAT...

- ...compare and contrast each other with different colored eyes, hair, height. (K)
- ...compare and contrast animal species (e.g., amphibians vs. mammals). (GR1)
- ...compare and contrast plant species needs. (GR2)
- ...compare and contrast human species to plant species in terms of needs. (GR2)

Fundamental Knowledge & Skill – E Structure of Matter

Students will develop an understanding of the structure of matter and the changes it can undergo.

Indicator 1: Students will develop an ability to show that large things are made up of smaller pieces.

(MLR – E1)

SWBAT...

...identify circles, triangles, squares and other shapes in things in the natural and man-made world.

(K) [Reference Math]

...recognize that rocks come in many shapes and sizes. **(K,GR1)**

...illustrate that parts can be combined in different ways to make a whole. **(GR2)**

Indicator 2: Students will develop an ability to describe some physical properties of objects. **(MLR – E2)**

SWBAT...

...describe and identify objects based on the materials of which they are made. **(K,GR1)**

...use magnets to move objects without touching the objects. **(K)**

...sort magnetic and nonmagnetic objects. **(K)**

...experience things which make sounds and the vibration that occurs, using a tuning fork. **(K)**

...observe and describe the changes water can go through. **(K)**

...distinguish and tell whether something is *heavier* or *lighter* using a balance scale. **(K)**

...demonstrate that some materials are more effective for making a certain thing than are others.

(GR1)

...begin to describe measurement (length, weight, volume). **(GR1)**

...illustrate how water left in an open container can disappear and water in a closed container does not.

(GR1)

...illustrate that water can be a liquid or solid or gas, and can change back and forth. **(GR1,2)**

...demonstrate that properties of things can change because of things that are done to them. **(GR2)**

...describe matter using scientific language and concepts (length, weight, volume, temperature).

(GR2)

...begin to demonstrate the concept of balance. **(GR2)**

...examine how solids, liquids and gases change. **(GR2)**

...identify and explain the physical characteristics of the sun. (color, size, composition) **(GR2)**

Indicator 3: Students will develop an ability to group objects based on observable characteristics (e.g., color, size, texture). **(MLR – E3)**

SWBAT...

...sort objects by stated characteristics (e.g., color, size, shape, etc). **(K)** [Reference Math]

...make linear patterns by combining different shapes or taking different shapes apart. **(GRK,1)**

[Reference Math]

...develop classification groups by using observable features to form the group(s). **(GR1,2)**

Fundamental Knowledge & Skill – F The Earth
Students will develop an understanding of the Earth and the processes that change it.

FOCUS: PreK,K: Everyday Life
GR1: Water
GR2: Sun & Stars

Indicator 1: Students will develop an ability to describe the way weather changes. (MLR – F1)
SWBAT...

- ...chart daily weather conditions. (K)
- ...list (orally or on paper) the seasons and describe the related weather changes. (K)
- ...participate in describing daily weather using a graph. (K)
- ...participate in morning meeting calendar and weather study. (GR1)
- ...use weather to show that change happens to many things. (K,GR1,2)
- ...identify and read temperature. (GR2)
- ...explain how the sun affects temperature. (GR2)

Indicator 2: Students will develop an ability to analyze the relationships between observable weather patterns and seasonal cycles. (MLR – F2)

SWBAT...

- ...compare monthly weather by charting weather on graphs. (K)
- ...identify and discuss daily weather and seasons and how it affects their lives. (K)
- ...give examples of repeating patterns in nature, weather and seasonal. (GR1)
- ...explain how different seasons affect animals in Maine. (GR1)
- ...explain how different seasons affect plants in Maine. (GR2)

Indicator 3: Students will develop an ability to observe changes that are caused by water, snow, wind, and ice. (MLR – F3)

SWBAT...

- ...chart daily weather conditions. (K)
- ...identify changes in their local environments caused by weather conditions (e.g., rain, snow, wind, ice). (GR1,2)

Fundamental Knowledge & Skill – G The Universe

Students will develop an understanding of the universe and how humans have learned about it, and the principles upon which it operates.

Indicator 1: Students will develop an ability to explain the cycles of the day and night and of seasons. (MLR – G1)

SWBAT...

- ...distinguish between what appears in the sky during the day and what appears in the sky during the night. (K)
- ...explore and identify the differences between day and night. (GR1)
- ...identify ROTATION as the reason for day and night. (GR2)

Indicator 2: Students will develop an ability to demonstrate that shadows of objects change based on where the light is coming from. (MLR – G2)

SWBAT...

- ...using Groundhog Day, identify what a shadow is. (K)
- ...explore the concepts of light sources as shadow-makers. (GR1)
- ...explore and demonstrate the interplay of light and shadows. (GR2)

Indicator 3: Students will develop an ability to demonstrate an understanding that the sun is one of many stars in the universe and is the closest star to earth. (MLR – G3)

SWBAT...

- ...identify the constellation known as the Big Dipper. (K)
- ...identify the Milky Way and the North Star. (GR1)
- ...identify the vastness of stars in the universe, as well as their uneven spread throughout the universe and their differences in brightness and color. (GR2)
- ...recognize that the sun is only seen during the day, while the moon can be seen at night and sometime during the day. (GR2)
- ...identify the apparent movement of the sun, moon, stars across the sky. (GR2)
- ...compare and contrast the sun to the Earth in terms of size, composition, color, etc. (GR2)
- ...identify objects in the sky (sun, moon, stars). (GR2)

Fundamental Knowledge & Skill – H Energy

Students will develop an understanding of energy.

Indicator 1: Students will develop an ability to demonstrate an understanding that the sun gives off light and heat energy. (MLR – H1)

SWBAT...

- ...recognize and tell how the sun helps the cycle of life. (K)
- ...recognize that the sun is a source of heat and light. (GR1,2)
- ...examine the ways that light affects the growth of plants. (GR2)

Indicator 2: Students will develop an ability to explain why living things need energy. (MLR – H2)

SWBAT...

- ...explain how plants use energy to grow. (GR2)
- ...explain how plants need food (seed) and energy (sun). (GR2)
- ...begin to identify photosynthesis as a process for providing energy to plants to grow. (GR2)

Fundamental Knowledge & Skill – I Motion

Students will develop an understanding of motion of objects and how forces can change that motion.

Indicator 1: Students will develop an ability to develop a variety of ways to describe the motion of an object. (MLR – I1)

SWBAT...

- ...demonstrate the ways that things can be made to move: along straight, curved, circular, back-and-forth, and jagged paths. (K,GR1) [Reference Physical Education]
- ...demonstrate the ways that different things move because of their physical properties. (GR1)
- ...show that things near the Earth fall to the ground unless something holds them up. (GR2)

Indicator 2: Students will develop an ability to demonstrate that the motion of an object can be changed. (MLR – I2)

SWBAT...

- ...demonstrate that a moving object can be changed by pushing or pulling it. (K,GR1)
- ...use Foss Kits to demonstrate how force or lack of it affects the motion of an object. (GR1)

Fundamental Knowledge & Skill – J Inquiry and Problem Solving

Students will develop an understanding of the application of inquiry and problem-solving approaches in science and technology.

Indicator 1: Students will develop an ability make accurate observations using appropriate tools and units of measure. (MLR – J1)

SWBAT...

- ...use hand lenses and balance scales appropriately to make observations. (K)
- ...use microscope, rulers, and balance scales appropriately to make observations. (GR1)

Indicator 2: Students will develop an ability to ask questions and propose strategies and materials to use in seeking answers to questions. (MLR – J2)

SWBAT...

...explain that scientists follow a routine to study things. (K)

...begin to use the scientific methods to develop a hypothesis and then test it. (GR1,2)

Indicator 3: Students will develop an ability to use results in a purposeful way, which includes making predictions based on patterns they have observed. (MLR – J3)

SWBAT...

...experience keeping a scientific log. (K)

...use the scientific method to track results. (GR1)

Indicator 4: Students will develop an ability to identify products which were invented to solve a problem. (MLR – J1)

SWBAT...

...brainstorm lists of products developed to solve problems. (GR1)

...identify inventions and tell how they helped to solve problems. (GR2)

Fundamental Knowledge & Skill – K Scientific Reasoning

Students will develop an understanding of how to formulate and justify ideas to make informed decisions.

Indicator 1: Students will develop an ability to examine the strengths and weaknesses of simple arguments. (MLR – K1)

SWBAT...

...practice using the scientific method to test and justify hypotheses when doing experiments. (GR1)

...predict how plants will grow best, providing valid reasons for why. (GR2)

Indicator 2: Students will develop an ability to distinguish between important and unimportant information in simple arguments. (MLR – K2)

SWBAT...

...identify the difference between opinion and fact. (K)

...use the scientific method. (GR1)

...discuss to defend or justify their hypothesis as well as their results. (GR1)

...distinguish between important and unimportant information. (GR1) [Reference math]

...give examples of fact and opinion. (GR2)

...determine which information is important in deciding which products to take from the rainforest. (GR2)

Indicator 3: Students will develop an ability to make scientific observations. (MLR – K3)
SWBAT...

- ...observe the life cycle of a plant. (K)
- ...review the five senses as a way of internalizing information. (GR1)
- ...record information. (GR1)
- ...form and test a hypothesis in plant study. (GR2)

Indicator 4: Students will develop an ability to participate in brainstorming activities. (MLR – K4)
SWBAT...

- ...given a topic, provide category options. (K)
- ...make lists, verbally or with paper/pencil, as a class, small group or individually on various topics. (GR1)
- ...use Know, Want to know, and Learn (KWL) and schema to define already known facts and determine what they want to know about any given science topic. (GR2)

Indicator 5: Students will develop an ability to use various forms of simple logic. (MLR – K5)
SWBAT...

- ...play games related to logic. (GR1) [Reference math]
- ...identify cause/effect relationships in their study of plants. (GR2)

Indicator 6: Students will develop an ability to discover relationships and patterns. (MLR – K6)
SWBAT...

- ...combine different shapes to make linear patterns. (K) [Reference E3]
- ...explore and discuss patterns in nature and life cycles. (GR1)
- ...describe the relationship of certain stars (e.g. sun) to the earth. (GR2)
- ...describe patterns (e.g. seasons) determined by the relationship between stars (e.g. sun) and the earth. (GR2)

Fundamental Knowledge & Skill – L Communication

Students will develop an understanding of how to communicate effectively in the application of science and technology.

Indicator 1: Students will develop an ability to describe and compare things in terms of number, shape, texture, size, weight, color, and behavior. (MLR – L1)

SWBAT...

- ...use at least one attribute to describe a group of objects. (K)
- ...sort and classify various objects related to science. (GR1) [Reference math]
- ...describe and compare different plants by their defining features. (GR2)

Indicator 2: Students will develop an ability read and write instructions to be followed or instructions which explain procedures. (MLR – L2)

SWBAT...

- ...explain the process for a simple three-step sequential activity (e.g., riding a bicycle). (K)
- ...read and follow two-three step verbal and written instructions. (GR1)
- ...participate in whole group writing of instructions. (GR1)
- ...follow instructions for a hands-on experiment. (GR2)

Indicator 3: Students will develop an ability to ask clarifying questions. (MLR – L3)

SWBAT...

- ...ask a topic-related question. (K)
- ...participate at an introductory level in questioning activities (i.e., mystery box). (GR1)
- ...pose specific questions (who, what, when, where, why) when developing a hypothesis. (GR2)

Indicator 4: Students will develop an ability to explain problem-solving processes using verbal, pictorial, and written methods. (MLR – L4)

SWBAT...

- ...draw pictures to solve equation problems. (K) [Reference Math]
- ...model problem-solving processes at an introductory level. (GR1)
- ...demonstrate in a method of choice why/how they arrived at a certain conclusion. (GR2)

Indicator 5: Students will develop an ability to make and use simple graphs. (MLR – L5)

SWBAT...

- ...examine simple graphs and provide a comparative statement. (K)
- ...make and use graphs from various survey questions. (GR1)
- ...chart/graph plant growth, ice melting, or similar scientific processes (GR2)

Indicator 6: Students will develop an ability to use objects and pictures to represent scientific and technological ideas. (MLR – L6)

SWBAT...

- ...demonstrate in method of choice why/how they arrived at a certain conclusion. (GR2)

Fundamental Knowledge & Skill – M Implications of Science and Technology
Students will develop an understanding of the historical, social, economic, environmental, and ethical implications of science and technology.

Indicator 1: Students will develop an ability to describe how legends, stories, and scientific explanations are different ways in which people attempt to explain the world. (MLR – M1)

SWBAT...

- ...experience a variety of legends/tales to explore different explanations for our world. **(GR1)**
[reference Language Arts]
- ...distinguish among different types of writing. **(GR2)**

Indicator 2: Students will develop an ability to describe at least two inventions and tell what they do, how they work, and how they have made our life easier. **(MLR – M2)**

SWBAT...

- ...participate in the identification of inventions. **(K)**
- ...provide reasons for inventions. **(GR1)**
- ...describe how certain inventions make life easier. **(GR2)**

Indicator 3: Students will develop an ability to identify commonly used resources, their sources, and where waste products go. **(MLR – M3)**

SWBAT...

- ...tell where food comes from. **(K)**
- ...identify at an introductory level products that can be recycled. **(GR1)**
- ...identify resources in rainforest. **(GR2)**
- ...identify products that come from the rainforest. **(GR2)**

Indicator 4: Students will develop an ability to demonstrate some practices for recycling and care of resources. **(MLR – M4)**

SWBAT...

- ...participate in classroom recycling projects. **(K)**
- ...recycle classroom materials. **(GR1)**
- ...recycle paper, bottles, packaging from snacks, and other activities. **(GR2)**

Indicator 5: Students will develop an ability to explain how their lives would be different without specific inventions or scientific knowledge. **(MLR – M5)**

SWBAT...

- ...given examples of specific inventions or facts, describe how their life would be different without them. **(GR1)**
- ... identify ways science is important in their lives. **(GR2)**

MSAD #53 Curriculum: Science GR 3-4

Fundamental Knowledge & Skill – A Classifying Life Forms

Students will develop an understanding that there are similarities within the diversity of all living things.

FOCUS:

GR3: Animals

GR4: Human Body Systems

Indicator 1: Students will develop an ability to group the same organisms in different ways using different characteristics. (MLR – A1)

SWBAT...

...explain that the features used to group living things depend on the purpose of the grouping. (GR3)

Indicator 2: Students will develop an ability to design and describe a classification system for organisms. (MLR – A2)

SWBAT...

...use features to sort living things into various groups. (GR3)

Indicator 3: Students will develop an ability to describe the different living things within a given habitat. (MLR – A3)

SWBAT...

...explain how certain living things (e.g., penguins in Antarctica) co-exist within a given habitat. (GR3)

Indicator 4: Students will develop an ability to compare and contrast the life cycles, behavior, and structure of different organisms. (MLR – A4)

SWBAT...

- ...classify living and nonliving things. (GR3)
- ...classify vertebrates and invertebrates. (GR3)
- ...classify types of vertebrates. (GR3)
- ...begin to classify invertebrates. (GR3)

Fundamental Knowledge & Skill – B Ecology

Students will develop an understanding of how living things depend on one another and on nonliving aspects of the environment.

Indicator 1: Students will develop an ability to describe a food web and the relationships within a given ecosystem. (MLR – B1)

SWBAT...

...describe how animals interact in various ways as predators and prey. (GR3)

Indicator 2: Students will develop an ability to explain the difference between producers (e.g., green plants), consumers (e.g., those that eat green plants), and identify examples of each. (MLR – B2)

SWBAT...

...demonstrate that most animals' food can be traced back to plants. (GR3)

Indicator 3: Students will develop an ability to compare and contrast physical and living components of different biomes – i.e., regions characterized by their climate and plant life – (e.g., tundra, rain forest, ocean, desert). (MLR – B3)

SWBAT...

...describe animal characteristics and their habitats. (GR3)

Indicator 4: Students will develop an ability to investigate the connection between major living and nonliving components of a local ecosystem. (MLR – B4)

SWBAT...

...explain that although weathered rock is the basic component of soil, the composition and texture of soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, bacteria, fungi, worms, insects, rodents, and other organisms. (GR4)

...define FERTILITY, RESISTANCE, DEBRIS, BACTERIA, FUNGI. (GR4)

Fundamental Knowledge & Skill – C Cells

Students will develop an understanding of cells as the basic units of life.

Indicator 1: Students will develop an ability to demonstrate an understanding that a cell is a basic unit of living organisms. (MLR – C1)

SWBAT...

...define a cell as a basic unit of living organisms. (GR4)

Indicator 2: Students will develop an ability to describe how single-celled organisms exist. (MLR – C2)

SWBAT...

...identify basic cell structure. (GR4)

Indicator 3: Students will develop an ability to investigate how the use of a microscope allows one to see cells in a variety of organisms. (MLR – C3)

SWBAT...

...identify the useful features of microscopes. (GR3)

...use microscopes to verify that living things are made mostly of cells. (GR4)

...use microscopes and hand lens to investigate and observe pores, hair, onion skin, and carrot. (GR4)

Indicator 4: Students will develop an ability to describe the functions of the major human organ system. (MLR – C4)

SWBAT...

...select one human body system and describe the function of the component organs. (GR4)

...begin to identify the structure and functions of the main systems of the human body [(skeletal/muscular, digestive/excretory, circulatory/respiratory, nervous, skin (integumentary)]. (GR4)

...explain that organisms need food, water, air, and a way to dispose of waste. (GR4)

...describe that by breathing, people take in oxygen they need to live. (GR4)

...identify skin as the body's protection from harmful substances, other organisms, and from drying out. (GR4)

...indicate that the brain sends and receives messages. (GR4)

...express that germs, once inside the body, prevent it from working properly. (The body has defense mechanisms such as tears, saliva, skin, some blood cells, and stomach secretions. A healthy body can fight more germs that do get inside, but there are some germs that interfere with the body's defenses.) (GR4)

Fundamental Knowledge & Skill – D Continuity and Change

Students will develop an understanding of the basis for all life, and that all living things change over time.

Indicator 1: Students will develop an ability to identify present day organisms that have not always existed, and past life forms that have become extinct. (MLR – D1)

SWBAT...

...identify that organisms are made of a collection of similar cooperating cells. (GR4)

Indicator 2: Students will develop an ability to describe how fossils form. (MLR – D2)

SWBAT...

...explain how fossils form in sedimentary rock. (GR4)

...describe the process of sediments layering. (GR4)

Indicator 3: Students will develop an ability to explain how adaptations, in response to change over time, may increase a species' chances of survival. (MLR – D3)

SWBAT...

...give examples of how in particular environments, some animals will survive well, some less well, and some not at all. (GR3)

...give examples of some changes in various organisms' habitats that can be beneficial or harmful. (GR3)

...begin to classify vertebrates and invertebrates and their adaptations. (GR3)

...compare offspring and their parents giving reasons for changes over time. (GR3)

Indicator 4: Students will develop an ability to describe ways in which organisms may be similar to and different from their parents and explore the possible reasons for this. (MLR – D4)

SWBAT...

...compare their physical characteristics (e.g. height, eye color, hair color, freckles) to those of their family tree members. (GR4)

Fundamental Knowledge & Skill – E Structure of Matter

Students will develop an understanding of the structure of matter and the changes it can undergo.

FOCUS:

GR3: Motion

GR4: Energy, Light and Physical

Indicator 1: Students will develop an ability to describe how the physical properties of objects sometimes change when one object chemically combines with another. (MLR – E1)

SWBAT...

...define SEDIMENTARY ROCK. (GR4)

...explain that sedimentary rock buried deep enough may be reformed by pressure and heat, perhaps melting and recrystallizing into different kinds of rock, and may be forced up again to become land surface and even mountains. (GR4)

...describe that some materials conduct heat much better than others. (or conductors can reduce heat loss.) (GR4)

...demonstrate that when a new material is made by combining two or more materials, it has properties that are different from the original materials. (For that reason, a lot of different materials can be made from a small number of basic kinds of material.) (GR4)

Indicator 2: Students will develop an ability to explain how matter changes in both chemical and physical ways. (MLR – E2)

SWBAT...

- ...recognize temperature as a physical property. (GR3)
- ...acknowledge states of matter (solid, liquid, gas). (GR4)
- ...demonstrate that heating and cooling cause changes in the properties of materials. (Many kinds of changes occur faster under hotter conditions.) (GR4)
- ...illustrate that when warmer things are put with cooler ones, the warm ones lose heat and the cool ones gain it until they all are at the same temperature. (GR4)
- ...discover that no matter how parts of an object are assembled, the weight of the whole object made is always the same as the sum of the parts; and when a thing is broken into parts, the parts have the same total weight as the original thing. (GR4)

Fundamental Knowledge & Skill – F The Earth

Students will develop an understanding of the Earth and the processes that change it.

FOCUS:**GR3: Weather & Our Solar System****GR4: Rocks, Minerals, and Soils**

Indicator 1: Students will develop an ability to describe the change in position of the continents over time. (MLR – F1)

SWBAT...

- ...define EARTHQUAKE, GLACIER, VOLCANO, PLATE TECTONICS. (GR3)
- ...relate the above to the three types of rock, sedimentary, igneous, and metamorphic. (GR4)

Indicator 2 Students will develop an ability to understand that many things about the earth (e.g., climate) occur in cycles that vary in length and frequency. (MLR – F2)

SWBAT...

- ...list and describe some events in nature that have repeating patterns. (The weather changes some from day to day, but things such as temperature and rain/snow tend to be high, low, or medium in the same months each year.) (GR3)

Indicator 3 Students will develop an ability to describe differences among minerals, rocks, and soils. (MLR – F3)

SWBAT...

- ...identify the earth's layers. (GR3,4)
- ...identify major features of rocks, of minerals, of soils. (GR4)
- ...describe and demonstrate that rock bears evidence of the minerals, temperatures and forces that create it. (GR4)
- ...identify rock as being composed of different combinations of minerals. (GR4)
- ...recognize that smaller rocks come from the breakage and weathering of bedrock and larger rocks. (GR4)

...explain that solid rock is reformed from sediments of sand and smaller particles (sometimes the remains of organisms) which are gradually buried and then are cemented together by dissolved minerals. (GR4)

...state that reformed rock erodes. (GR4)

...compare different kinds of soil. (GR4)

...explain that thousands of layers of sedimentary rock confirm the long history of the changing surface of the earth and the changing life forms whose remains are found in successive layers. (The youngest layers are not always found on top because of folding, breaking, and uplift of layers.) (GR4)

Indicator 4 Students will develop an ability to illustrate how water and other substances go through a cyclic process of change in the environment. (MLR – F4)

SWBAT...

...demonstrate that water can be a liquid or a solid and can go back and forth from one form to another. (If water is turned into ice and the ice is allowed to melt, the amount of water is the same as it was before freezing.) (GR3)

...show through experimentation that water left in an open container disappears, but water left in a closed container does not disappear. (GR3)

...explain that when liquid water disappears, it turns into a gas (vapor) in the air and can reappear as a liquid when cooled, or as a solid if cooled below the freezing point of water. (GR3)

...recognize that clouds and fog are made of tiny droplets of water. (GR3)

...begin to explain the water cycle. (GR3)

Fundamental Knowledge & Skill – G The Universe

Students will develop an understanding of the universe and how humans have learned about it, and the principles upon which it operates.

Indicator 1: Students will develop an ability to illustrate the relative positions of the sun, moon, and planets. (MLR – G1)

SWBAT...

...recognize the variations in the daily appearance of the moon and observe that it looks the same again approximately every four weeks. (GR3)

...recognize and identify the characteristics of the moon (orbits, phases, tides, revolution and rotation). (GR3)

...review and name objects in the solar system. (GR3)

...indicate that the planets change their position against the background of the stars. (GR3)

...describe that stars are like the sun, some being larger and some being smaller, so far away that they look like points of light. (GR3)

Indicator 2: Students will develop an ability to trace the sources of earth's heat and light energy to the sun. (MLR – G2)

SWBAT...

...report that the sun warms the land, air, and water. (GR3)

Indicator 3: Students will develop an ability to describe earth’s rotation on its axis and its revolution around the sun. (MLR – G3)

SWBAT...

...explain that, like all planets and stars, the earth is spherical in shape, (GR3)

...describe the rotation of the earth on its axis every 24 hours, producing the day and night cycle. (To people on earth, this turning of the planet makes it seem as though the sun, moon, planets and stars are orbiting the earth once a day. (GR3)

...identify the earth as one of several planets that orbit the sun. (GR3)

... express that the moon orbits around the earth. (GR3)

Indicator 4: Students will develop an ability to investigate the relationship between the earth and its moon. (MLR – G4)

SWBAT...

...compare various phases of the moon with the calendar. (GR4)

Fundamental Knowledge & Skill – H Energy
Students will develop an understanding of energy.

Indicator 1: Students will develop an ability to identify different forms of energy (e.g., light, sound, heat). (MLR – H1)

SWBAT...

...show that moving air and water can be used to run machines. (GR4)

...demonstrate that things that make sound vibrate. (GR4)

...investigate various forms of energy, focusing on light, sound (vibration), and heat. (GR4)

Indicator 2: Students will develop an ability to explain ways different forms of energy can be produced. (MLR – H2)

SWBAT...

...demonstrate that a warmer object can warm a cooler one by contact or from a distance. (GR4)
[reference E2]

...explain that energy from the sun, and the wind and water energy derived from it, is available indefinitely. (Because the flow of energy is weak and variable, very large collection systems are needed. Other sources don’t renew, or renew very slowly.) (GR4)

Fundamental Knowledge & Skill – I Motion
Students will develop an understanding of the motion of objects and how forces can change that motion.

Indicator 1: Students will develop an ability to describe the effects of different types of forces (e.g., mechanical, electrical, magnetic) on motion. **(MLR – I1)**

SWBAT...

...identify kinds of simple machines and their uses (lever and fulcrum, wheel and axle, screw and inclined plane). **(GR3)**

...work with various simple machines. **(GR3)**

...demonstrate that the earth's gravity pulls any object toward it without touching it. **(GR3)**

...illustrate that the ways in which fast things move differs greatly. (some things are so slow that their journey takes a long time; others move too fast for people to even see them.) **(GR3)**

Indicator 2: Students will develop an ability to draw conclusions about how the amount of force affects the motion of more massive and less massive objects. **(MLR – I2)**

SWBAT...

...demonstrate that changes in speed or direction of motion are caused by forces. (The greater the force, the greater the change in motion. The more massive an object is the less effect a given force will have.) **(GR3)**

Indicator 3: Students will develop an ability to generate examples illustrating that when something is pushed or pulled, it exerts a reaction force. **(MLR – I3)**

SWBAT...

...illustrate that the way to change how something is moving is to give it a push or a pull. **(GR3)**

Fundamental Knowledge & Skill – J Inquiry and Problem Solving
Students will develop an understanding of the application of inquiry and problem-solving approaches in science and technology.

Indicator 1: Students will develop an ability to use appropriate tools and units of measure to make accurate observations. **(MLR – J1)**

SWBAT...

...identify and use weather tools (i.e., thermometer, rain gauge, weathervane) for purposes for which they were designed. **(GR3)**

Indicator 2: Students will develop an ability to conduct scientific investigations: make observations, collect and analyze data, and do experiments. **(MLR – J2)**

SWBAT...

...investigate and record air and wind direction. **(GR3)**

...recognize the effects of temperature on weather. **(GR3)**

Indicator 3: Students will develop an ability to use results in a purposeful way: to design fair tests, to make predictions based on observed patterns, and to interpret data to make further predictions. (MLR – J3)

SWBAT...

...compare predictions (hypotheses) to data collected during an experiment. (GR4)

Indicator 4: Students will develop an ability to design and build an invention. (MLR – J4)

SWBAT...

...design and build a simple machine. (GR3) [Reference Social Studies]

Indicator 5: Students will develop an ability to explain how differences in time, place, or experimenter can lead to different data. (MLR – J5)

SWBAT...

...compare the results of the same experiment for variations due to time, place, or experimenter. (GR4)

Indicator 6: Students will develop an ability to explain how different conclusions can be derived from the same data. (MLR – J6)

SWBAT...

...compare and contrast each other's conclusions using the same data. (GR4)

...identify factors that make a test "fair" (e.g., control group, variables, control sample). (GR4)

Fundamental Knowledge & Skill – K Scientific Reasoning

Students will develop an understanding of how to formulate and justify ideas and to make informed decisions.

Indicator 1: Students will develop an ability to provide alternative explanations for observed phenomena. (MLR – K1)

SWBAT...

...brainstorm explanations of observations made during an experiment. (GR4)

Indicator 2: Students will develop an ability to describe how feelings can distort reasoning. (MLR – K2)

SWBAT...

...define what it means to be OBJECTIVE when studying scientific phenomena. (GR3)

...give examples of what could happen to results if objectivity is not observed. (GR3)

Indicator 3: Students will develop an ability to draw conclusions about observations. (MLR – K3)

SWBAT...

...use specific experiments to make conclusions from the data their experiments yielded. (GR3)

Indicator 4: Students will develop an ability to use various types of evidence (e.g., logical, quantitative) to support a claim. (MLR – K4)

SWBAT...

...distinguish among various types of evidence: logical, quantitative, qualitative. (GR4)

Indicator 5: Students will develop an ability to demonstrate an understanding that ideas are more believable when supported by good reasons. (MLR – K5)

SWBAT...

...compare and contrast ideas supported by good reasons and those with not good reasons. (GR3)

Indicator 6: Students will develop an ability to practice and apply simple logic, intuitive thinking, and brainstorming. (MLR – K6)

SWBAT...

...brainstorm possible outcomes of experiments prior to conducting the experiment. (GR3)

Fundamental Knowledge & Skill – L Communication

Students will develop an understanding of how to communicate effectively in the application of science and technology.

Indicator 1: Students will develop an ability to record results of experiments (e.g., interviews, discussions, field work) and summarize and communicate what they have learned. (MLR – L1)

SWBAT...

...use interviews, discussions, and field work as part of their collection of data. (GR3)

...evaluate interviews, discussions, and field work as ways to gather and record data. (GR4)

Indicator 2: Students will develop an ability to ask clarifying and extending questions. (MLR – L2)

SWBAT...

...develop clarifying and extending questions and differentiate between them. (GR3)

...apply clarifying and extending questions to an actual science/technology problem. (GR4)

Indicator 3: Students will develop an ability to reflect on work in science and technology using such activities as discussions, journals, and self-assessment. (MLR – L3)

SWBAT...

...keep a log/journal of their work on a science project. (GR3,4)

...demonstrate the use of discussion and self-assessment to reflect on science/technology work. (GR4)

Indicator 4: Students will develop an ability to make and/or use sketches, tables, graphs, physical representations, and manipulatives to explain procedures and ideas. (MLR – L4)

SWBAT...

...explain with increasing detail (label, such as title, data, ect.) their ideas for and their procedures in practical science/technology experiments and problem-solving task through sketches, tables, graphs, or other visual/hands-on means. (GR3,4)

Indicator 5: Students will develop an ability to gather and effectively present information, using a variety of media including computers (e.g., spreadsheets, word processing, programming, graphics, modeling). (MLR – L5)

SWBAT...

...use spreadsheets and other technology with increasing complexity to process and then present scientific information. (GR3,4)

Indicator 6: Students will develop an ability to cite examples of bias in information sources and question the validity of information from varied sources. (MLR – L6)

SWBAT...

...define BIAS. (GR3)

...give examples of bias in information sources. (GR3)

...demonstrate the appropriate ways to question the validity of information from varied sources. (GR4)

Indicator 7: Students will develop an ability to function effectively in groups within various assigned roles (e.g., reader, recorder). (MLR – L7)

SWBAT...

...work in cooperative groups to complete tasks related to science/technology. (GR3,4)

Fundamental Knowledge & Skill – M Implications of Science and Technology
Students will develop an understanding of the historical, economic, environmental, and ethical implications of science and technology.

Indicator 1: Students will develop an ability to determine how cultures have found different technological solutions to deal with similar needs or problems (e.g., construction, clothing, agricultural tools, and methods). (MLR – M1)

SWBAT...

...give examples from at least three cultures, ancient and modern, of ways these cultures have used varying technological solutions to meet the same or similar needs or solve similar problems. (GR3,4)
 [Reference Social Studies]

Indicator 2: Students will develop an ability to investigate and describe the role of scientists and inventors. (MLR – M2)

SWBAT...

...explain what scientists and inventors do and tell why this work is important. (GR3)

Indicator 3: Students will develop an ability to explain how technology (e.g., transportation, irrigation) has altered human settlement. (MLR – M3)

SWBAT...

...give examples from places in the world of how technology has affected settlement. (GR3)

[Reference Social Studies]

...give examples from Maine of the impact of technology has (e.g., shoemaking, lumber, ship building, etc.) on settlement. (GR4) [Reference Social Studies]

Indicator 4: Students will develop an ability to explain practices for conservation in daily life, based on a recognition that renewable and non-renewable resources have limits. (MLR – M4)

SWBAT...

...define CONSERVATION. (GR3)

...give examples of conservation in daily life practices. (GR3)

...define RENEWABLE and NONRENEWABLE resources. (GR4)

...explain by giving examples why nonrenewable resources have limits. (GR4)

MSAD #53 Curriculum: Science GR 5-8¹

Fundamental Knowledge & Skill – A Classifying Life Forms

Students will develop an understanding that there are similarities within the diversity of all living things.

Indicator 1: Students will develop an ability to compare systems of classifying organisms including systems used by scientists. (MLR – A1)

SWBAT...

...recognize that biologists consider details of internal and external structures to be more important than behavior or general appearance when classifying organisms. (GR7,8)

...recognize that a great variety of living things can be sorted into groups in many ways using various features to decide which things belong to which groups. (GR7,8)

...describe that relatedness can be inferred by similarities in internal anatomical features. (GR7,8)

Indicator 2: Students will develop an ability to decipher the system for assigning a scientific name to every living thing.

SWBAT...

...identify features of grouping and explain why they depend on the purpose of the group. (GR5,6)

...demonstrate that living things, plant and animal, can be sorted into various groups using features. (GR7,8)

Indicator 3: Students will develop an ability to describe some structural and behavioral adaptations that allow organisms to survive in a changing environment. (MLR – A3)

SWBAT...

...define and identify VERTEBRATE and distinguish among them: mammals, reptiles, amphibians, birds and fishes. (GR5,6)

...give examples of the great variety of internal and external structures of plants that contribute to their being able to make food and reproduce. (GR7,8)

Fundamental Knowledge & Skill – B Ecology

Students will develop an understanding of how living things depend on one another and on non-living aspects of the environment.

Indicator 1: Students will develop an ability to describe in general terms the chemical processes of photosynthesis and respiration. (MLR – B1)

SWBAT...

...define PHOTOSYNTHESIS, RESPIRATION. (GR5,6)

¹ All SWBATs are indicated for GR 5-6 and GR7-8 multiage classes. Teachers of single year classes will cooperatively determine on a year-to-year basis which SWBATs will be for the single year classes.

...describe how plants use sunlight to make their food. (GR7,8)
 ...define TRANSPIRATION. (GR7,8)

Indicator 2: Students will develop an ability to analyze how the finite resources in an ecosystem limit the types and populations of organisms within it. (MLR – B2)

SWBAT...

...describe the environmental needs of living organisms (food, water, air, and a way to dispose of waste). (GR5,6)

...define INVERTEBRATE, ARTHROPODS, CNIDARIANS, ECHINODERMS, MOLLUSKS, SPONGES. (GR5,6)

...define BIOME. (GR5,6)

...identify the characteristics of various biomes: freshwater, marine, forest, desert, grassland, mountain, tundra, taiga, rainforest, temperate forest, chaparral. (GR5,6)

...compare and contrast how organisms with similar need compete for resources in all biomes. (GR5,6)

...explain why cleaning up polluted air, water, or soil or restoring depleted soil, forests, or fishing grounds can be difficult and very costly. (GR5,6)

...identify and explain how human activities have changed the earth's land and atmosphere. (GR5,6)

...recognize that all organisms are part of and depend on two main interconnected global food webs (microscopic ocean plants and land plants). (GR7,8)

...conduct a field study for the purpose of identification of local woodland, field, and wetland organisms. (GR7,8)

Indicator 3: Students will develop an ability to describe succession and other ways that ecosystems can change over time. (MLR – B3)

SWBAT...

...compare and contrast plants of specific biomes. (GR5,6)

...describe local invertebrates and their adaptations. (GR5,6)

...describe local vertebrates and their adaptations. (GR5,6)

Indicator 4: Students will develop an ability to generate examples of the variety of ways that organisms interact (e.g., competition, predator/prey, parasitism/mutualism). (MLR – B4)

SWBAT...

...define PREDATOR, PREY, PRODUCER, CONSUMER, PARASITE, HOST. (GR5,6)

...recognize that all organisms are part of two main food webs (land and ocean) and interact in various ways: predator/prey, producer/consumer, parasite/host. (GR5,6)

Indicator 5: Students will develop an ability to describe various mechanisms found in the natural world for transporting living and nonliving matter and the results of such movements. (MLR – B5)

SWBAT...

...identify new varieties of cultivated plants that have resulted from selective breeding for particular traits. (GR7,8)

- ...begin to describe the cycles of water, oxygen, and carbon dioxide. (GR7,8)
- ...explain that food provides molecules that serve as fuel and building materials for all organisms. (GR7,8)
- ...explain that plants use the energy in light to make sugars out of carbon dioxide and water, which can be used immediately or stored for later use. (GR7,8)
- ...describe how organisms that eat plants break down the plant structures to produce the materials and energy they need to survive. (GR7,8)
- ...describe and give an example of how energy is capable of changing from one form to another in living things. (GR7,8)

Fundamental Knowledge & Skill – C Cells
Students will develop an understanding of cells as the basic unit of life.

Indicator 1: Students will develop an ability to compare and contrast human organ systems with those of other species. (MLR – C1)

SWBAT...

- ...compare and contrast animals to highlight the great variety of body plans and internal structures that contribute to their being able to find food and reproduce. (GR5,6)
- ...define: SPECIES of sexually reproducing organisms as all organisms that can mate with one another to produce fertile offspring. (GR7,8)
- ...identify that, like other animals, human beings have body systems for obtaining and providing energy, defense, reproduction, and the coordination of body functions. (GR7,8)

Indicator 2: Students will develop an ability to prepare and examine microscope slides of major organs in human systems. (MLR – C2)

SWBAT...

- ...use microscopes and slides to differentiate between animal and plant cells. (GR5,6)
- ...compare and contrast the functions of systems of the human body to those of another organism of choice. (GR6,8)
- ...examine the structure of plant cells using a microscope. (GR7,8)
- ...list the function of plant cells. (GR7,8)
- ...recognize that some kinds of organisms, many of them microscopic, cannot be neatly classified. (GR7,8)
- ...explain that all living things are composed of cells which are specific to their structure and function. (GR7,8)

Indicator 3: Students will develop an ability to describe the structure and function of major organs in human systems. (MLR – B3)

SWBAT...

- ...define and explain: ADAPTATIONS, GENETICS, REPRODUCTION – SEXUAL and ASEXUAL, SCIENTIFIC NOMENCLATURE. (GR7,8)

- ...relate that about two-thirds of the weight of cells is accounted for by water, which gives cells many of their properties. (GR7,8)
- ...identify and describe the lungs as the major body organ that take in oxygen for the combustion of food and the elimination of the carbon dioxide produced, noting the ways in which other body systems are connected to this process. (GR7,8)
- ...identify the role of specialized cells and the molecules they produce as the identification and destructions of microbes that get inside the body. (GR7,8)
- ...identify levels of organization : cell tissues, organ, organ systems. (GR7,8)
- ...explain the functions of the major body systems and describe how they are interdependent. (GR7,8)
- ...compare and contrast human body systems to that other species. (GR7,8)

Indicator 4: Students will develop an ability to identify the causes and effects of diseases, explain their transmission, and identify prevention strategies. (MLR – B4)

SWBAT...

- ...examine and describe water borne diseases. (GR7,8)
- ...recognize the difference between bacterial and viral diseases. (GR7,8)
- ...determine that if germs are able to get inside one's body, they may keep it from working properly. (GR8)
- ...investigate and begin to describe genetic disorders. (GR7,8)
- ...differentiate between diseases that human beings can catch only once and others that through vaccination can prevent people from catching even once. (GR7,8)
- ...define VIRUS, BACTERIA, FUNGI, PARASITES and explain how they might infect the human body and interfere with normal body functions. (GR7,8)
- ...identify the role of white blood cells as one in which they engulf invaders or produce antibodies that attack them or mark them for killing by other white cells. (GR7,8)
- ...recognize that antibodies produced by white blood cells remain and can fight off subsequent invaders of the same kind. (GR7,8)

Indicator 5: Students will develop an ability to describe how body systems work together. (MLR – B5)

SWBAT...

- ...define and give examples of VERTEBRATES. (GR5,6)
- ...using vertebrates, give examples of how animals consume energy-rich foods for growth and repair of body parts. (GR5,6)
- ...explain that vertebrates get energy from oxidizing their food and release some of its energy as heat. (GR5,6)
- ...identify various systems of the body and explain their function (cells -oxygen must be supplied to the cells and carbon dioxide removed; lungs – take in oxygen for the combustion of food and they eliminate carbon dioxide produced; urinary system – disposes of dissolved waste molecules; intestinal tract – removes solid wastes; skin and lungs – rid the body of heat energy; circulatory system – moves all these substances to or from cells where they are needed or produced, responding to changing demands). (GR7,8)
- ...illustrate the water cycle and the nitrogen cycle. (GR7,8)
- ...identify that cells divide to make more cells for growth and repair. (GR7,8)

- ...describe that organells of cells perform basic functions. (GR7,8)
- ...explain the process through which thebody can use food for energy and building materials: food digestion to molecules which are absorbed and trasnported to the cells. (GR7,8)
- ...identify hormones as chemicals from glands that affect other body parts which are involved in helping the body respond to danger and inregulating human growth and development, and reproduction. (GR7,8)
- ...distinguish the human body's production of tears, saliva, skin, some blood cells and stomach secretions as defense mechanisms against germs. (GR7,8)
- ...explain that the interactions among the senses, nerves, and brain make it possible the learning that enable human beings to cope with changes in their environment. (GR7,8)

Fundamental Knowledge & Skill – D Continuity and Change

Students will develop an understanding of the basis for all life and that all living things change over time.

Indicator 1: Students will develop an ability to describe how fossils can be used by scientists to trace the history of a species. (MLR – D1)

SWBAT...

- ...demonstrate that fossil evidence is consistent with the idea that human beings evolved from earlier species. (GR6,8)

Indicator 2: Students will develop an ability to explain how scientists use fossils to prove that life forms, climate, environment, and geologic features in a certain location are not the same now as they were in the past. (MLR – D2)

SWBAT...

- ...recognize that climates have sometimes changed abruptly in the past as a result of impacts of rocks from space. (GR5,6)

Indicator 3: Students will develop an ability to provide examples of the concept of natural and artificial selection and its role in species changes over time. (MLR – D3)

SWBAT...

- ...recognize that an individual's characteristics may give it an advantage or disadvantage in surviving and reproducing. (GR5,6)
- ...explain that some differences between parents and offspring can accumulate (through selective breeding) in successive generations so that descendants are very different from their ancestors. (GR7,8)
- ...recognize that individual organisms with certain traits are more likely than others to survive and have offspring. (GR7,8)
- ...identify changes in the environment that can affect the survival of individual organisms and entire species. (GR7,8)

Indicator 4: Students will develop an ability to compare how sexually and asexually reproducing species transfer genetic information to offspring. (MLR – D4)

SWBAT...

...identify some likenesses between offspring and parents that are inherited and others that are learned. (GR6,8)

...explain that roles of non-human species are often genetically programmed so that behavior is affected by both inheritance and experience. (GR6,8)

...describe that following fertilization, cell division produces a small cluster of cells that then differentiate by appearance and function to form the basic tissues of an embryo. (GR7,8)

...differentiate among animal species that are limited to a repertoire of genetically determined behaviors and those which have more complex brains and can learn a wide variety of behaviors. (GR7,8)

...recognize that all behavior is affected by both inheritance and experience. (GR7,8)

Fundamental Knowledge & Skill – E Structure of Matter

Students will develop an understanding of the structure of matter and the changes it can undergo.

Indicator 1: Students will develop an ability to predict and test whether objects will float or sink based on a qualitative and quantitative understanding of the concepts of density and buoyancy. (MLR – E1)

SWBAT...

...define and identify: BERNOULLI'S PRINCIPLE, ARCHIMEDE'S PRINCIPLE. (GR7,8)

...build models to illustrate Bernoulli's Principle, Archimede's Principle. (GR7,8)

...recognize that equal volumes of different substances usually have different weights. (GR7,8)

Indicator 2: Students will develop an ability to describe the evidence that all matter consists of particles called atoms that are made up of certain smaller particles. (MLR – E2)

SWBAT...

...explain that all matter is made up of atoms which are far too small to see directly through a microscope. (GR7,8)

...construct a model of an atom. (GR7,8)

...identify the parts of an atom. (GR7,8)

Indicator 3: Students will develop an ability to use the Periodic table to group elements based on their characteristics. (MLR – E3)

SWBAT...

...identify the Greeks, generally and specifically, as the originators of scientific ideas about elements (that they believed everything was made from four basic elements: air, water, earth, and fire; that it was the combination of these elements in different proportions that gave other substances their observable properties). (GR8)

...use the Periodic Table to structure and organize elements. (GR8)

...recognize that the Greeks were wrong about the four elements, though over 100 different elements have been identified out of which everything is made. (GR7,8)

...recognize why few elements are found in their pure form. (GR7,8)

...identify groups of elements that have similar properties, including highly reactive metals, less reactive metals, highly reactive nonmetals such as chlorine, fluorine, and oxygen and some almost completely nonreactive gases such as helium and neon. (GR7,8)

...recognize that some elements do not fit into any categories, among them are carbon and hydrogen, essential elements of living matter. (GR7,8)

Indicator 4: Students will develop an ability to describe how a substance can combine with different substances in different ways, depending on the conditions and properties of each substance. (MLR – E4)

SWBAT...

...explain how temperature and acidity of a solution influence reactive rates. (GR7,8)

...recognize that when a new material is made from a combination of two or more materials, its properties are different from the original material. (GR7,8)

...explain how a lot of different materials can be made from a small number of basic kinds of materials. (GR7,8)

...recognize that an especially important kind of reaction between substances involves combinations of oxygen with something else – as in burning or rusting. (GR7,8)

Indicator 5: Students will develop an ability to describe how the motion of the particles of matter determines the state of that matter (e.g., solid, liquid, gas, plasma) and vice versa. (MLR – E5)

SWBAT...

...identify and explain the three states in which water can exist: solid (ice), liquid (water), and gas (vapor). (GR5,6)

...describe clouds and fog as being comprised of tiny droplets of water. (GR5,6)

...demonstrate that air is a substance that surrounds us, takes up space, and whose movement we feel as wind. (GR5,6)

...recognize that atoms and molecules are perpetually in motion. (GR7,8)

...explain that increased temperature means greater average energy of motion, so most substances expand when heated. (GR7,8)

...demonstrate that in solids, atoms are closely locked in position and can only vibrate. (GR7,8)

...demonstrate that in liquids, the atoms or molecules have higher energy, are more loosely connected, and can slide past one another. (GR7,8)

...demonstrate that in gases, the atoms or molecules have still more energy and are free of one another except during occasional collisions. (GR7,8)

...define ATOM, MOLECULE. (GR7,8)

Indicator 6: Students will develop an ability to explain how the relatively small number of naturally occurring elements can result in the large variety of substances found in the world. (MLR – E6)

SWBAT...

...illustrate that different arrangements of atoms into groups compose all substances. (GR7,8)

...explain that atoms may stick together in well-defined molecules or may be packed together in large arrays. (GR7,8)

Indicator 7: Students will develop an ability to investigate the similarities and differences between elements, compounds, and mixtures. (MLR – E7)

SWBAT...

...identify that atoms of any element are alike but are different from atoms of other elements. (GR7,8)

Indicator 8: Students will develop an ability to demonstrate the law of the conservation of matter.

(MLR – E8)

SWBAT...

...demonstrate that no matter how substances within a closed system interact with one another or how they combine or break apart, the total weight of the system remains the same. (GR7,8)

...explain the law of the conservation of matter. (GR7,8)

Fundamental Knowledge & Skill – F The Earth

Students will develop an understanding of the earth and the processes that change it.

Indicator 1: Students will develop an ability to demonstrate how the earth's tilt on its axis results in the seasons. (MLR – F1)

SWBAT...

...identify meteorological concepts such as LAYER OF THE ATMOSPHERE, AIR MASSES, FRONTS, WEATHER PREDICTION. (GR5,6)

Indicator 2: Students will develop an ability to describe how soils are formed and why soils differ from one place to another. (MLR – F2)

SWBAT...

...identify the composition of the earth as mostly rock. (GR5,6)

...explain that three-fourths of the earth's surface is covered by a relatively thin layer of water (some of it frozen) and a relatively thin blanket of air surrounds the entire planet. (GR5,6)

...identify weathered rock as the basic component of soil. (GR5,6)

...relate plant and animal material to the composition and texture of soil and its fertility and resistance to erosion. (GR5,6)

Indicator 3: Students will develop an ability to explain the evidence scientists use when they give the age of the earth. (MLR – F3)

SWBAT...

...define and begin to explain the concept of PANGEA. (GR5,6)

Indicator 4: Students will develop an ability to describe factors that can cause short-term and long-term changes to the earth. (MLR – F4)

SWBAT...

- ...cite changes in the earth's crust, such as volcanic eruptions, as a reason why climates have sometimes changed abruptly in the past. (GR5,6)
- ...explain that waves, wind, water, and ice shape and reshape the earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in seasonal layers. (GR5,6)
- ...determine that heat flow and movement of material within the earth cause earthquakes and volcanic eruptions, creating mountains and ocean basins. (GR5,6)
- ...determine through example (e.g., Mt St. Helens) that gas and dust from large volcanoes can change the atmosphere. (GR5,6)
- ...demonstrate that some changes in the earth's surface are abrupt while others happen slowly. (GR5,6)
- ...recognize the long history of the changing surface of the earth and the changing life forms whose remains are found in successive layers by noting the existence of thousands of layers of sedimentary rock. (GR5,6)
- ...analyze the earth's turning on an axis that whose tilt is relative to the plane of the earth's annual orbit around the sun to discover that sunlight falls more intensely on different parts of the earth throughout the year. (GR5,6)
- ...determine that the difference in heating of the earth surface produces seasons and weather patterns. (GR5,6)
- ...describe that even relatively small changes in atmospheric or ocean content can have widespread effects on climate if the change lasts long enough. (GR5,6)
- ...identify human activities that have changed the earth's oceans. (GR5,6)

Indicator 5: Students will develop an ability to classify and identify rocks and minerals based on their physical and chemical properties, their composition, and the processes which formed them. (MLR – F5)

SWBAT...

- ...conclude that some minerals are very rare and some exist in great quantities. (GR5,6)

Indicator 6: Students will develop an ability to describe the many products used by humans that are derived from materials in the earth's crust. (MLR – F6)

SWBAT...

- ...name uses of materials found in the earth's crust. (GR5,6)

Indicator 7: Students will develop an ability to demonstrate factors affecting the flow of groundwater. (MLR – F7)

SWBAT...

- ...associate the cycling of water in and out of the atmosphere plays an important role in determining climatic patterns. (GR5,6)

...explain what happens to water falling on land: collects in rivers and lakes, soil, porous layers of rock, and much of it flows back into the ocean. (GR5,6)

...explain what is meant by water quality. (GR5,6)

Fundamental Knowledge & Skill – G The Universe

Students will develop an understanding of the universe and how humans have learned about it, and about the principles upon which it operates.

Indicator 1: Students will develop an ability to compare past and present knowledge about characteristics of stars (e.g., composition, location, life-cycles) and explain how people have learned about them. (MLR – G1)

SWBAT...

...identify the characteristics of stars. (GR5,6)

...describe stars as being like the sun, some smaller, some larger, but so far away that they look like points of light. (GR5,6)

Indicator 2: Students will develop an ability to describe the concept of galaxies, including size and number of stars. (MLR – G2)

SWBAT...

...classify the earth as a relatively small planet when compared to the others. (GR5,6)

...identify earth as being located third from the sun in a system of planets. (GR5,6)

...illustrate that the patterns of stars in the sky stay the same although they appear to move across the sky nightly. (GR5,6)

...acknowledge different stars during different seasons. (GR5,6)

...identify the sun as a medium-sized star located on the edge of a disk-shaped galaxy (the Milky Way) of stars. (GR5,6)

...state that the universe contains many billions of galaxies consisting of many billions of stars. (GR5,6)

Indicator 3: Students will develop an ability to compare and contrast distances and the time required to travel those distances on earth, in the solar system, in the galaxy, and between galaxies. (MLR – G3)

SWBAT...

...observe that the sun is many thousands of times closer to the earth than any other star. (GR5,6)

...explain that light from the sun takes a few minutes to reach the earth but light from the next nearest star takes a few years to arrive. (GR5,6)

...acknowledge that since some distant galaxies' light takes several billion years to reach earth, we on earth see them as they were long ago in the past. (GR5,6)

Indicator 4: Students will develop an ability to describe scientists' exploration and the objects they have found (e.g., comets, asteroids, pulsars). (MLR – G4)

SWBAT...

...report that the earth is the only body in the solar system that appears able to support life. (GR5,6)

...indicate that other planets have compositions and conditions very different from that of the earth. (GR5,6)

...recognize that large numbers of chunks of rock orbit the sun. (GR5,6)

Indicator 5: Students will develop an ability to describe the motions of moons, planets, stars, solar systems, and galaxies. (MLR – G5)

SWBAT...

...define ROTATION, REVOLUTION as applied to the movement of objects in the solar system.

(GR6)

...identify and explain characteristics of the solar system: sun planets, meteors, comets. (GR5,6)

...explain that the sun's gravitational pull holds the earth and other planets in their orbits just as the planets' gravitational pull keeps their moons in orbit around them. (GR5,6)

...recognize that planets change their position against the background of stars. (GR5,6)

...contrast that the earth is one of several planets that orbits around the sun while the moon orbits around the earth. (GR5,6)

...indicate that the earth is orbited by one moon, many artificial satellites, and debris. (GR5,6)

...explain that there are planets of very different sizes, compositions, and surface features that move around the sun in nearly circular orbits. (GR5,6)

...identify planets that have a variety of moons and rings of rock and ice orbiting around them. (GR5,6)

...indicate that some planets and moons show evidence of geological activity. (GR5,6)

...describe the earth, like all planets and stars, as approximately spherical in shape. (GR5,6)

...give reasons for night and day (rotation of earth on its axis every 24 hours). (GR5,6)

...describe the phases of the moon. (GR5,6)

Fundamental Knowledge & Skill – H Energy

Students will develop an understanding of the concepts of energy.

Indicator 1: Students will develop an ability to analyze the benefits and drawbacks of energy conservation (e.g., in electricity generation). (MLR – H1)

SWBAT...

...identify energy in the form of heat as almost always one of the products of an energy transformation.

(GR7,8)

Indicator 2: Students will develop an ability to demonstrate that energy cannot be created or destroyed but only changed from one form to another. (MLR – H2)

SWBAT...

...describe how it is possible that something can be “seen” when light waves emitted or reflected by it enter the eye, just as something can be “heard” when sound waves from it enter the ear. (GR5,6)

...illustrate that energy appears in different forms. (GR7,8)

...give examples of the various forms in which energy can appear: heat energy, chemical energy, mechanical energy, and gravitational energy. (GR7,8)

...explain that energy cannot be created or destroyed, but only changed from one form to another. (GR7,8)

...explain that what goes on in the universe, from exploding stars and geological growth to the operation of machines and the motion of people, involves some form of energy being transformed into another. (GR7,8)

Indicator 3: Students will develop an ability to compare and contrast the ways energy travels (e.g. waves, conduction, convection, radiation). (MLR – H3)

SWBAT...

...demonstrate that some materials conduct heat much better than others. (GR5,6)

...explain why poor conductors can reduce heat loss. (GR5,6)

...show that electric currents and magnets can exert a force on each other. (GR5,6)

Indicator 4: Students will develop an ability to describe the characteristics of static and current electricity. (MLR – H4)

SWBAT...

...define and investigate CIRCUIT, STATIC ELECTRICITY, ELECTROMAGNETS, MAGNETISM. (GR5,6)

...illustrate that, without touching them, material that has been electricity-charged pulls on all other materials and may either push or pull other charged materials. (GR5,6)

Indicator 5: Students will develop an ability to categorize energy sources as renewable or nonrenewable and compare how these sources are used by humans. (MLR – H5)

SWBAT...

...list the benefits of the earth's resources, such as fresh water, air, soil, and trees. (GR5,6)

...assess that the benefit of the earth's resources can be reduced by using them wastefully or by deliberately or inadvertently destroying them. (GR5,6)

Indicator 6: Students will develop an ability to describe how energy put into or taken out of a system can cause changes in the motion of particles in matter. (MLR – H6)

SWBAT...

...give examples of vibrations in materials that set up wave-like disturbances that spread away from the source (e.g., sound, earthquake). (GR5,6)

...identify that sound and earthquake waves as well as other waves move at different speeds in different materials. (GR5,6)

Fundamental Knowledge & Skill – I Motion

Students will develop an understanding of the motion of objects and how forces can change that motion.

Indicator 1: Students will develop an ability to describe the motion of objects using knowledge of Newton’s Laws. (MLR – I1)

SWBAT...

- ...define GRAVITY and describe how it affects the motion of objects. (GR7,8)
- ...demonstrate that things on or near the earth are pulled toward it by the earth’s gravity. (GR7,8)
- ...define and describe GRAVITATIONAL FORCE, MASS. (GR7,8)
- ...explain that gravitational force depends on how much mass objects have and how far apart they are. (GR7,8)
- ...describe how an unbalanced force on an object changes its speed or direction of motion or both. (GR7,8)
- ...explain that if a force acts toward a single center, the object’s path may curve into an orbit around the center. (GR7,8)

Indicator 2: Students will develop an ability to use mathematics to describe the motion of objects (e.g., speed, distance, time, acceleration). (MLR – I2)

SWBAT...

- ...demonstrate that changes in speed and/or direction of motion are caused by forces (e.g., the greater the force the greater the change in motion; the more mass an object has, the less of an effect the force will have). (GR7,8)
- ...illustrate that the movement of fast things differs greatly. (GR7,8)

Indicator 3: Students will develop an ability to describe and quantify the ways machines can provide mechanical advantages in producing motion. (MLR – I3)

SWBAT...

- ...identify and explain Newton’s Laws of Motion. (GR7,8)
- ...explain the operation of simple machines. (GR7,8)

Fundamental Knowledge & Skill – J Inquiry and Problem Solving

Students will develop an understanding of the application of inquiry and problem-solving approaches in science and technology.

Indicator 1: Students will develop an ability to make accurate observations using appropriate tools and units of measure. (MLR – J1)

SWBAT...

- ...use graphs and charts to illustrate observations they have made. (GR5-8)
- ...use metric tools. (GR 5-8)
- ...identify and use weather tools for measuring and making weather-related observations. (GR5,6)

...use stopwatches, and probes (motion). (**GR 7,8**)

Indicator 2: Students will develop an ability to design and conduct scientific investigations which include controlled experiments and systematic observations. (**MLR – J2**)

SWBAT...

...design and conduct experiments to support content. (**GR7,8**)

...identify variables and controlling factors in scientific investigations. (**GR7,8**)

Indicator 3: Students will develop an ability to verify and evaluate scientific investigations and use the results in a purposeful way. (**MLR – J3**)

SWBAT...

...apply the results of scientific investigations to real and relevant situations. (**GR7,8**)

Indicator 4: Students will develop an ability to compare and contrast the processes of scientific inquiry and the technological method. (**MLR – J4**)

SWBAT...

...distinguish between the scientific inquiry process (obtaining information about the natural world or what exists) and the technological method (obtaining artifacts and solutions to problems). (**GR7,8**)

Indicator 5: Students will develop an ability to explain how personal bias can affect observations. (**MLR – J5**)

SWBAT...

...explain how famous people’s biases have affected their conclusions in scientific investigations. (**GR7,8**)

...determine ways in which bias can alter presentation of information. (**GR7,8**)

Indicator 6: Students will develop an ability to design, construct, and test a device (invention) that solves a special problem. (**MLR – J6**)

SWBAT...

...build weather instruments. (**GR5,6**)

...build three-dimensional buildings that demonstrate the power of earthquakes. (**GR5,6**)

...build Rube Goldberg’s inventions to demonstrate the use of simple machines. (**GR7,8**)

Fundamental Knowledge & Skill – K Scientific Reasoning

Students will develop an understanding of how to formulate and justify ideas and make informed decisions.

Indicator 1: Students will develop an ability to examine the way people make generalizations. (**MLR – K1**)

SWBAT...

...identify generalizations in published materials. (GR5-8)

Indicator 2: Students will develop an ability to identify exceptions to proposed generalizations.

(MLR – K2)

SWBAT...

...in published materials, identify exceptions to generalizations (i.e., extinction of dinosaurs). (GR 5-8)

Indicator 3: Students will develop an ability to identify basic informal fallacies in arguments. (MLR – K3)

SWBAT...

...examine data with a questioning attitude (i.e., What was the size of the sample? Was it a biased sample?) (GR7,8)

Indicator 4: Students will develop an ability to analyze means of slanting information. (MLR – K4)

SWBAT...

...define PROPAGANDA. (GR7,8)

...demonstrate how propaganda is used in science. (GR7,8)

Indicator 5: Students will develop an ability to identify stereotypes. (MLR – K5)

SWBAT...

...define STEREOTYPE. (GR7,8)

...give examples of stereotypes in scientific arguments. (GR7,8)

Indicator 6: Students will develop an ability to support reasoning by using a variety of evidence.

(MLR – K6)

SWBAT...

...form conclusions after scientific investigations or making observations. (GR5-8)

Indicator 7: Students will develop an ability to show that proving a hypothesis false is easier than proving it is true, and explain why. (MLR – K7)

SWBAT...

...demonstrate that more than one trial is needed to support a hypothesis. (GR5-8)

Indicator 8: Students will develop an ability to construct logical arguments. (MLR – K8)

SWBAT...

...defend and rationalize arguments based on evidence. (GR5-8)

Indicator 9: Students will develop an ability to apply analogous reasoning. (MLR – K9)

SWBAT...

- ...explain what analogy is. (GR5-8)
- ...give examples of analogies in the field of science. (GR5-8)
- ...use an analogy to explain a scientific phenomenon. (GR5-8)

Fundamental Knowledge & Skill – L Communication

Students will develop an understanding of how to communicate effectively in the application of science and technology.

Indicator 1: Students will develop an ability to discuss scientific and technological ideas and make conjectures and convincing arguments. (MLR – L1)

SWBAT...

- ...develop hypotheses based on scientific and technological ideas. (GR5-8)

Indicator 2: Students will develop an ability to defend problem-solving strategies and solutions. (MLR – L2)

SWBAT...

- ...explain the steps of increasingly complex scientific procedures they have used to solve problems. (GR 5-8)

Indicator 3: Students will develop an ability to evaluate individual and group communication for clarity, and work to improve communication. (MLR – L3)

SWBAT...

- ...reflect on and evaluate past work. (GR5-8)

Indicator 4: Students will develop an ability to make and use scale drawings, maps, and three-dimensional models to represent real objects, find locations and describe relationships. (MLR – L4)

SWBAT...

- ...make and explain maps (i.e., topographical maps). (GR5,6)
- ...make and explain models of atoms. (GR7,8)

Indicator 5: Students will develop an ability to access information at remote sites using telecommunications. (MLR – L5)

SWBAT...

- ...access remote sites to support research topics, investigations, and content using the Internet. (GR5-8)

Indicator 6: Students will develop an ability to identify and perform roles necessary to accomplish group tasks. (MLR – L6)

SWBAT...

...participate in cooperative learning groups to investigate and solve scientific questions and problems. (GR 5-8)

...work in pairs to accomplish tasks. (GR 5-8)

Fundamental Knowledge & Skill – M Implications of Science and Technology
Students will develop an understanding of the historical, social, economic, environmental, and ethical implications of science and technology.

Indicator 1: Students will develop an ability to research and evaluate the social and environmental impacts of scientific and technological developments. (MLR – M1)

SWBAT...

...clarify what is meant by social, environmental impacts of science and technological developments. (GR5-8)

...review and evaluate current events and their impact on scientific and technological developments. (GR5-8)

Indicator 2: Students will develop an ability to describe the historical and cultural conditions at the time of an invention or discovery, and analyze the societal impacts of that invention. (MLR – M2)

SWBAT...

...determine how certain events have contributed to various discoveries or inventions. (GR5-8)

...describe ways in which certain inventions and discoveries have impacted history and culture. (GR5-8)

Indicator 3: Students will develop an ability to discuss the ethical issues surrounding a specific scientific or technological development. (MLR – M3)

SWBAT...

...define and explain “ethical” issues. (GR5-8)

choose at least one scientific or technological development and explain the ethical issues surrounding it. (GR 5-8)

Indicator 4: Students will develop an ability to describe an individual’s biological and other impacts on an environmental system. (MLR – M4)

SWBAT...

...identify how various organisms affect the environment by giving specific examples. (GR 5-8)

Indicator 5: Students will develop an ability to identify factors that have caused some countries to become leaders in science and technology. (MLR – M5)

SWBAT...

...identify the scientific and technological factors and give specific examples of the factors that help civilizations advance. **(GR5-8)**

Indicator 6: Students will develop an ability to give examples of actions which may have expected to unexpected consequences that may be positive, negative, or both. **(MLR – M6)**

SWBAT...

...select an action and give positive and negative consequences and implications of that action (i.e., certain federal and/or state legislation, vaccines). **(GR5-8)**

Indicator 7: Students will develop an ability to explain the connections between industry, natural resources, population, and economic development. **(MLR – M7)**

SWBAT...

...illustrate relationships between progress and resources. **(GR5-8)**

Indicator 8: Students will develop an ability to recognize scientific and technological contributions of diverse people including women, different ethnic groups, races, and physically disabled. **(MLR – M8)**

SWBAT...

...highlight scientific and technological careers of famous people in diverse groups. **(GR5-8)**