

Swift River School

Science and Technology Curriculum Alignment Document

2005

Introduction to Swift River School's Science Curriculum Alignment Document

The Massachusetts Department of Education has developed Curriculum Frameworks for subject areas taught in the public schools. The Science and Technology/Engineering Curriculum Framework is one of seven documents created to advance educational reform in Massachusetts. It reflects the work of K-12 educators and consultants throughout the state in collaboration with staff from the Massachusetts Department of Education.

The following document demonstrates how the Swift River School Science and Technology/Engineering Curriculum aligns with the Massachusetts Science and Technology/Engineering Curriculum Framework, which is available on the internet at <http://www.doe.mass.edu>.

The learning standards describe the knowledge that children are expected to acquire at each grade level. This document shows how Swift River School's curriculum covers content, concepts and inquiry skills in Earth and Space Science, Life Science (Biology), Physical Sciences (Chemistry and Physics) and Technology/Engineering. It reflects the use of Full Option Science System (F.O.S.S.) as a primary resource for teaching these standards and skills. Additional units and activities are also included. The FOSS investigations cited below for Grades 6-8 are from FOSS modules developed for grades 5-6. We have noted in which grade the material is covered. Because the Learning Standards are written for Grades 6-8, Swift River School covers only a portion of them. We've listed the activities for areas we address, and left the remaining portion blank.

The inquiry sections include essential scientific skills such as observing, measuring, replicating experiments, manipulating equipment, and collecting and reporting data. In the early grades, investigations center on student questions, observations, and communication about what they observe. In later elementary years, students plan and carry out investigations as a class, in small groups, or independently. Students communicate their findings through oral and written responses.

It is our hope that this document will be of use to parents, teachers and administrators at the Swift River School.

Science and Technology/Engineering Curriculum Alignment Committee

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Strand 1: Earth and Space Science

Grades PreK-2 Learning Standards

Earth's Materials

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
1. Recognize that water, rocks, soil, and living organisms are found on the earth's surface. (PK Learning Guidelines #5)	K: Trees, Investigation 1, Part 1 <i>Trees FOSS Science Stories Pages 3-13</i> 1st-2nd: Pebbles, Sand and Silt, Investigation 4, Part 2 <i>Pebbles, Sand and Silt FOSS Science Stories Pages 20-22</i>	PK: Sand and Water Table, Shovelful of Earth unit, Walks on Nature Trail and Playground K: Teacher-created Ocean Life unit
2. Understand that air is a mixture of gases that is all around us and that wind is moving air. (PK Learning Guidelines #6)	1st-2nd: Air and Weather, Investigation 1, Parts 1-6 Investigation 3, Parts 1-5 <i>Air and Weather FOSS Science Stories Pages 3-6</i>	PK: Wind Experiments, Sink and Float Boat Making, Art Projects

Weather

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
3. Describe the weather changes from day to day and over the seasons. (PK Learning Guidelines #7)	1st-2nd: Air and Weather, Investigation 2, Parts 1-4 Investigation 4, Part 1-2	PK-2nd: Everyday Mathematics

The Sun as a Source of Light and Heat

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
4. Recognize that the sun supplies heat and light to the Earth and is necessary for life. (PK Learning Guidelines #8)	K: Trees Investigation 1, Parts 2, 8 1st-2nd: Air and Weather, Investigation 4, Part 2	PK: Changes in Light, Shadow Explorations, Day vs. Night

Periodic Phenomena

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
5. Identify some events around us that have repeating patterns, including the seasons of the year, day and night. (PK Learning Guidelines #9)	1st-2nd: Air and Weather, Investigation 4, Parts 1-3 <i>Air and Weather FOSS Science Stories Pages 18-23</i>	PK-2nd: Everyday Mathematics PK: Days of the Week and Seasons, Festival of Lights, Pajama Day activities

Earth and Space Sciences

Grades 3-5 Learning Standards

Rocks and Their Properties

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
1. Give a simple explanation of what a mineral is and some examples, e.g., quartz, mica.	3rd-4th: Earth Materials, Investigation 1, Parts 2-3 Investigation 2, Parts 1-2 Investigation 3, Parts 1-2 <i>Earth Materials FOSS Science Stories Pages 12-15</i>	
2. Identify the physical properties of minerals (hardness, color, luster, cleavage, and streak), and explain how minerals can be tested for these different physical properties.	3rd-4th: Earth Materials Investigation 2, Parts 1-2 Investigation 3, Parts 1-2 <i>Earth Materials FOSS Science Stories Pages 12-15, 30-33</i>	
3. Identify the three categories of rocks (metamorphic, igneous, and sedimentary) based on how they are formed, and explain the natural and physical processes that create these rocks.	3rd-4th: Earth Materials, Investigation 4, Parts 1-2 <i>Earth Materials FOSS Science Stories Pages 1-4, 5-7, 34</i>	

Soil

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
4. Explain and give examples of the ways in which soil is formed (the weathering of rock by water and wind and from the decomposition of plant and animal remains).	3rd-4th: Water, Investigation 4, Part 1 <i>Note: this standard is also addressed in the FOSS Grades 1-2 module Pebbles, Sand and Silt.</i>	3rd-4th: Material reviewed.
5. Recognize and discuss the different properties of soil, including color, texture (size of particles), the ability to retain water, and the ability to support the growth of plants.	3rd-4th: Water, Investigation 4, Part 1 <i>Note: this standard is also addressed in the FOSS Grades 1-2 module Pebbles, Sand and Silt.</i>	3rd-4th: Material reviewed.

Weather

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
6. Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time.	3rd-4th: <i>Water FOSS Science Stories Pages 8-9, 12, 14-16</i> <i>Note: this standard is addressed very thoroughly in the FOSS Grades 1-2 module Air and Weather and also in the FOSS Middle School Module Weather and Water.</i>	5 th : Material reviewed. How Weather Occurs www.fossweb.com
7. Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time.	3rd-4th: <i>Water FOSS Science Stories Pages 1-2, 12</i> <i>Note: this standard is addressed very thoroughly in the FOSS Grades 1-2 module Air and Weather.</i>	5 th : Material reviewed with teacher-created materials.
8. Describe how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation.	5 th : <i>Solar Energy FOSS Science Stories Pages 2, 22-25</i>	5 th : Teacher-created materials
9. Differentiate between weather and climate.	5 th : <i>Solar Energy FOSS Science Stories Pages 16-17</i>	5 th : Teacher-created materials

The Water Cycle

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
10. Describe how water on earth cycles in different forms and in different locations, including underground and in the atmosphere.	3rd-4th: <i>Water, Investigation 3, Parts 1-4 Investigation 4, Part 1 Water FOSS Science Stories Pages 1-2, 4-9, 12-17</i> 5 th : <i>Solar Energy FOSS Science Stories Pages 22-25</i>	
11. Give examples of how the cycling of water, both in and out of the atmosphere, has an effect on climate.	3rd-4th: <i>Water FOSS Science Stories Pages 12-16, 22</i> 5 th : <i>Solar Energy FOSS Science Stories Pages 22-28</i> <i>Note: this standard is addressed very thoroughly in the FOSS Grades 1-2 module Air and Weather and also in the FOSS Middle School Module Weather and Water.</i>	

Earth's History

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
12. Give examples of how the surface of the earth changes due to slow processes such as erosion and weathering, and rapid processes such as landslides, volcanic eruptions, and earthquakes.	<i>3rd-4th: Water FOSS Science Stories Pages 22-23</i> <i>5th: Landforms FOSS Science Stories Pages 13-32</i>	

The Earth in the Solar System

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
13. Recognize that the earth is part of a system called the "solar system" that includes the sun (a star), planets, and many moons. The earth is the third planet from the sun in our solar system.	<i>5th: Models and Designs FOSS Science Stories Pages 5-9</i> <i>Solar Energy FOSS Science Stories Pages 40-44</i>	<i>5th: Physical Models Kids Discover, The Sun</i> Teacher-created materials
14. Recognize that the earth revolves around (orbits) the sun in a year's time and that the earth rotates on its axis once approximately every 24 hours. Make connections between the rotation of the earth and day/night, and the apparent movement of the sun, moon and stars across the sky.	<i>5th: Models and Designs FOSS Science Stories Pages 5-10</i> <i>Solar Energy FOSS Science Stories Pages 1-5, 40-44</i> <i>Note: this standard is addressed thoroughly in the FOSS Middle School module Planetary Science.</i>	<i>5th: Physical Models Kids Discover, The Sun</i>
15. Describe the changes that occur in the observable shape of the moon over the course of a month.	<i>Note: this standard is addressed in the FOSS Grades 1-2 Module Air and Weather and in more detail in the FOSS Middle School Module Planetary Science.</i>	<i>5th: Teacher-created materials</i> Student Projects

Earth and Space Sciences

Grades 6-8 Learning Standards

Mapping the Earth

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
1. Recognize, interpret, and be able to create models of the earth's common physical features in various mapping representations, including contour maps.	6 th : Landforms, Investigation 1, Parts 1-3 Investigation 2, Parts 1-2 Investigation 4, Parts 1-3 <i>Landforms FOSS Science Stories Pages 33-36</i>	

Earth's Structure

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
2. Describe the layers of the solid earth, including the lithosphere, the hot convecting mantle, and the dense metallic core.	6 th : <i>Landforms FOSS Science Stories Pages 27-39</i>	

Heat Transfer in the Earth System

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
3. Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through the earth's system.	5 th : Solar Energy Investigation 2, Parts 1-2 Investigation 4, Parts 1-3 WWW.FOSSWEB.com Solar Energy	5 th : Movie Clips, How Weather Occurs
4. Explain the relationship among the energy provided by the sun, the global patterns of atmospheric movement, and the temperature differences among water, land, and atmosphere.	5 th : Solar Energy Investigation 2, Parts 1-2 Investigation 3, Parts 1-2 <i>Solar Energy FOSS Science Stories Pages 1-3, 16-17, 22-25</i>	

Earth's History

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
5. Describe how movement of the earth's crustal plates causes both slow changes in the earth's surface (e.g. formation of mountains and ocean basins), and rapid ones (e.g. volcanic eruptions and earthquakes).	6 th : <i>Landforms FOSS Science Stories Pages 22-25, 30-32</i>	

6. Describe and give examples of ways in which the earth's surface is built up and torn down by natural processes, including deposition of sediments, rock formation, erosion, and weathering.	6 th : Landforms, Investigation 2, Parts 1-2 <i>Landforms FOSS Science Stories Pages 15-21,28-29</i>	
7. Explain and give examples of how physical evidence, such as fossils and surface features of glaciation, supports theories that earth has evolved over geologic time.		

Earth and Space

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
8. Recognize that gravity is a force that pulls all things on and near the earth toward the center of the earth. Not covered in grade 6: Gravity plays a major role in the formation of planets, stars and solar system and in determining their motions.	5 th : <i>Models and Designs FOSS Science Stories Pages 5-10</i> <i>Solar Energy FOSS Science Stories Pages 40-44</i>	
9. Describe lunar and solar eclipses, the observed moon phases, and tides. Relate them to the relative positions of the earth, moon, and sun.	5 th : <i>Solar Energy FOSS Science Stories Page 14</i>	
10. Compare and contrast properties and conditions of objects in the solar system (i.e., sun, planets, and moons) to those on Earth (i.e., gravitational force, distance from the sun, speed, movement, temperature, and atmospheric conditions).	5 th : <i>Solar Energy FOSS Science Stories Pages 1-5, 40-44</i>	
11. Explain how the tilt of the earth and its revolution around the sun result in an uneven heating of the earth, which in turn causes the seasons.		
12. Recognize that the universe contains many billions of galaxies, and that each galaxy contains many billions of stars.		

Strand 2: Life Science (Biology)

Life Science Grades PreK-2 Learning Standards

Characteristics of Living Things

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
1. Recognize that animals (including humans) and plants are living things that grow, reproduce, and need food, air, and water. (PK Learning Guidelines #10)	K: Trees, Investigation 1, Part 2 1st-2nd: Insects, Investigation 1, Part 1 New Plants, Investigation 3, Parts 1-3 <i>New Plants FOSS Science Stories Pages 3-7</i>	PK: Plants, Seasonal Changes, Fall Colors, Animals in Winter, Life Cycles: Butterflies, Frog, Chick Hatch, Gems Peaches - Tree Homes
2. Differentiate between living and nonliving things. Group both living things and nonliving things according to the characteristics that they share. (PK Learning Guidelines #11)	K: Trees, Investigation 2, Parts 1-6 1st-2nd: New Plants, Investigation 2, Parts 1-2 Insects, Investigation 6, Parts 1-3 <i>Insects FOSS Science Stories Pages 12-15</i>	PK: Life Cycles, Seasonal Animals, Insects, Everyday Mathematics categorization activities

Life Cycles

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
3. Recognize that plants and animals have life cycles, and that life cycles vary for different living things. (PK Learning Guidelines #12)	1st-2nd: New Plants, Investigation 1, Parts 1-3 Insects – ALL investigations <i>Insects FOSS Science Stories Pages 16-21</i>	PK: Life Cycles K: Teacher-created Ocean Life unit

Heredity

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
4. Describe ways in which many plants and animals closely resemble their parents in observed appearance. (PK Learning Guidelines #13)	1st-2nd: New Plants, Investigation 1, Parts 1-3 Insects, Investigation 3, Parts 1-3 <i>Insects FOSS Science Stories Pages 16-33</i>	PK: Life Cycles, About Me and My Family

Evolution and Biodiversity

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
5. Recognize that fossils provide us with information about living things that inhabited the earth years ago. (PK Learning Guidelines #14)	<i>This standard is addressed in readings from the Grades 5-6 module Models and Designs and in investigations and readings from the FOSS Middle School module Earth History.</i>	K: <i>Fossils Tells Us About Long Ago</i> 1st-2nd: <i>Fossils</i> Becky Olien, <i>Dinosaurs, Magic Tree House Research Guide #1</i> Osborne and Osborne pages 21-28, <i>The Best Book of Fossi's, Rocks and Minerals</i> Chris Pellant, <i>Wild and Woolly Mammoths</i> Aliko

Living Things and Their Environment

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
6. Recognize that people and other animals interact with the environment through their senses of sight, hearing, touch, smell and taste. (PK Learning Guidelines #15)	K: Fabric, Investigation 1, Parts 1-2 Paper, Investigation 3, Parts 1-4 1st-2nd: Insects, Investigation 6, Parts 1-3	PK: Five Senses unit K: Teacher-created Ocean Life unit
7. Recognize changes in appearance that animals and plants go through as the seasons change. (PK Learning Guidelines #16)	K: Trees, Investigation 3, Parts 1-9 1st-2nd: <i>Air and Weather FOSS Science Stories Pages 18-23</i>	PK-K: Everyday Mathematics PK: Apples and Pumpkins, Weather, Seasonal Changes, Animals in Winter, Tree Homes, Plants, About Me K: Teacher-created Ocean Life unit
8. Identify ways in which an organism's habitat provides for its basic needs (plants require air, water, nutrients, and light; animals require food, water, air and shelter). (PK Learning Guidelines #17)	K: Trees, Part 1 1st-2nd: New Plants, Investigation 1, Parts 1-3 <i>New Plants FOSS Science Stories Pages 3-7, 22-30</i> Insects, Investigation 3, Parts 1-3 <i>Insects FOSS Science Stories Pages 8-11, 16-21</i>	PK: Apples and Pumpkins, Everyday Mathematics Weather, Seasonal Changes, Animals in Winter, Tree Homes, Plants, About Me K: Teacher-created Ocean Life unit

Life Science

Grades 3-5 Learning Standards

Characteristics of Plants and Animals

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
1. Classify plants and animals according to the physical characteristics that they share.	<p><i>3rd-4th:</i> Structures of Life, Investigation 4, Part 2 <i>Structures of Life FOSS Science Stories</i> Pages 14-19 Human Body Investigation 1, Part 3 Investigation 2, Part 4</p> <p><i>5th:</i> Environments, Investigation 1, Parts 1-2 Investigation 2, Parts 1-3 <i>Environments FOSS Science Stories</i> Pages 18-22</p>	<p><i>5th:</i> Teacher-created materials</p>

Plant and Animal Structures and Functions

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
2. Identify the structures in plants (leaves, roots, flowers, stem, bark, wood) that are responsible for food production, support, water transport, reproduction, growth, and protection.	<p><i>3rd-4th:</i> Structures of Life, Investigation 1, Part 3 Investigation 2, Parts 1-3 <i>Structures of Life FOSS Science Stories</i> Pages 1-3, 10-11, 22-34</p> <p><i>5th:</i> Environments, Investigation 3, Parts 1-3 Investigation 6, Parts 1-3 <i>Note: bark and wood are addressed in the Trees module, designed for Kindergarten.</i></p>	<p><i>3rd-4th:</i> Teacher-created materials</p>
3. Recognize that plants and animals go through predictable life cycles that include birth, growth, development, reproduction, and death.	<p><i>3rd-4th:</i> Structures of Life, Investigation 2, Part 3 <i>Structures of Life FOSS Science Stories</i> Pages 2, 20-21, 40</p> <p><i>5th:</i> Environments, Investigation 5, Parts 1-3 <i>Environments FOSS Science Stories</i> Pages 18-19, 21, 22</p>	

4. Describe the major stages that characterize the life cycle of the frog and butterfly as they go through metamorphosis.	<i>This standard is addressed for butterflies in the Grades 1-2 module Insects.</i>	5 th : Teacher-created materials
5. Differentiate between observed characteristics of plants and animals that are fully inherited (e.g., color of flower, shape of leaves, color of eyes, number of appendages) and characteristics that are affected by the climate or environment (e.g., browning of leaves due to too much sun, language spoken).	3rd-4th: Structures of Life, Investigation 1, Part 1 <i>Structures of Life FOSS Science Stories Pages 6-9, 10-11</i> Ideas and Inventions, Investigation 2, Parts 1-2 <i>Ideas and Inventions FOSS Science Stories Pages 15-16</i> Human Body, Investigation 4, Parts 1-3 <i>Human Body FOSS Science Stories Pages 25-27</i> 5 th : Environments, Investigation 1, Parts 1-2 Investigation 3, Parts 1-3 Investigation 5, Parts 1-3 <i>Environments FOSS Science Stories Pages 23-26, 49-52</i>	5 th : Teacher-created materials

Adaptations of Living Things

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
6. Give examples of how inherited characteristics may change over time as adaptations to changes in the environment that enable organisms to survive, e.g., shape of beak or feet, placement of eyes on head, length of neck, shape of teeth, color.	5 th : Environments, Investigation 5, Parts 1-3 <i>Environments FOSS Science Stories Pages 22-35, 42</i> <i>Note: this standard is addressed very thoroughly in the FOSS Middle School module Populations and Ecosystems inv. 8 and 9.</i>	5 th : Teacher-created materials
7. Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration).	5 th : Environments, Investigation 3, Parts 1-3 <i>Environments FOSS Science Stories Pages 42, 43-45, 49-52</i>	

<p>8. Describe how organisms meet some of their needs in an environment by using behaviors (patterns of activities) in response to information (stimuli) received from the environment. (3rd-4th)</p> <p>Recognize that some animal behaviors are instinctive (e.g., turtles burying their eggs), and others are learned (e.g. humans building fires for warmth, chimpanzees learning how to use tools). (5th)</p>	<p>3rd/4th Human Body Investigation 4, Parts 1-2</p> <p>5th: Environments, Investigation 2, Parts 2-4 <i>Environments FOSS Science Stories Pages 1-17</i></p>	
<p>9. Recognize plant behaviors, such as the way seedlings' stems grow toward light and their roots grow downward in response to gravity. Recognize that many plants and animals can survive harsh environments because of seasonal behaviors e.g., in winter, some trees shed leaves, some animals hibernate, others migrate.</p>	<p>3rd/4th: Structures of Life Investigation 2, Parts 1-3 <i>Structures of Life FOSS Science Stories Page 22-34</i></p> <p>5th: Environments, Investigation 5, Parts 1-3 <i>Environments FOSS Science Stories Pages 1-17</i></p>	
<p>10. Give examples of how organisms can cause changes in their environment to ensure survival. Explain how some of these changes may affect the ecosystem.</p>	<p>3rd-4th: <i>Structures of Life FOSS Science Stories Pages 35-36</i></p> <p>5th: <i>Environments FOSS Science Stories Pages 27-44</i></p>	

Energy and Living Things

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
<p>11. Describe how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within a food chain from producers (plants) to consumers and decomposers.</p>	<p>3rd-4th: Structures of Life, Investigation 2, Parts 1-3 <i>Structures of Life FOSS Science Stories Pages 4-5, 12-16, 43</i></p> <p>5th: Environments, Investigation 2, Part 4 <i>Environments FOSS Science Stories Pages 18-22, 27-35, 38-41</i> <i>Food and Nutrition FOSS Science Stories Pages 41-43</i></p>	<p>3rd-5th: Teacher-created materials to emphasize vocabulary</p>

Life Sciences

Grades 6-8 Learning Standards

Classification of Organisms

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
1. Classify organisms into the currently recognized kingdoms according to characteristics that they share. Be familiar with organisms from each kingdom.		

Cells and Systems

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
2. Recognize that all organisms are composed of cells, and that many organisms are single-celled (unicellular), e.g., bacteria, yeast. In these single-celled organisms, one cell must carry out all the basic functions of life.	6 th : <i>Food and Nutrition FOSS Science Stories Pages 41-43</i>	
3. Compare and contrast plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, cytoplasm, chloroplasts, mitochondria, vacuoles).		
4. Recognize that within cells, many of the basic functions of organisms (e.g., extracting energy from food and getting rid of waste) are carried out. The way in which cells function is similar in all living organisms.	6 th : <i>Food and Nutrition FOSS Science Stories Pages 41-43</i>	

Systems in Living Things

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
5. Describe the hierarchical organization of multicellular organisms from cells to tissues to organs to systems to organisms.		

6. Identify the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, excretion, protection from disease, and movement, control and coordination) and describe ways that these systems interact with each other.	6 th : <i>Food and Nutrition FOSS Science Stories Pages 6-9, 15-20, 44-5</i> <i>Note: skeletal and muscular systems are addressed thoroughly in the FOSS Grade 3-4 module Human Body.</i>	
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Reproduction and Heredity

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
7. Recognize that every organism requires a set of instructions that specifies its traits. These instructions are stored in the organism's chromosomes. Heredity is the passage of these instructions from one generation to another.	5 th : <i>Models and Designs FOSS Science Stories Page 4</i>	
8. Recognize that hereditary information is contained in genes located in the chromosomes of each cell. A human cell contains about 30,000 different genes on 23 different chromosomes.		
9. Compare sexual reproduction (offspring inherit half of their genes from each parent) with asexual reproduction (offspring is an identical copy of the parent's cell).		

Evolution and Biodiversity

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
10. Give examples of ways in which genetic variation and environmental factors are causes of evolution and the diversity of organisms.	5 th : <i>Environments FOSS Science Stories Pages 9-17, 49-52</i>	
11. Recognize that evidence drawn from geology, fossils, and comparative anatomy provide the basis for the theory of evolution.	5 th : <i>Models and Designs FOSS Science Stories Pages 11-16</i>	
12. Relate the extinction of species to a mismatch of adaptation and the environment.		

Living Things and Their Environment

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
13. Give examples of ways in which organisms interact and have different functions within an ecosystem that enable the ecosystem to survive.	5 th : Environments Investigation 2, Part 4, Investigation 4, Parts 1-3 <i>Environments FOSS Science Stories Pages 1-8,9-17,27-35,38-45, 53-55</i>	

Energy and Living Things

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
14. Explain the roles and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.	5 th : Environments, Investigation 4, Part 3 <i>Environments FOSS Science Stories Diversity of Life Pages 6,28,39-41,43-44</i>	
15. Explain how dead plants and animals are broken down by other living organisms and how this process contributes to the system as a whole.	5 th : <i>Environments FOSS Science Stories Pages 38-41</i>	
16. Recognize that producers (plants that contain chlorophyll) use the energy from sunlight to make sugars from carbon dioxide and water through a process called photosynthesis. This food can be used immediately, stored for later use, or used by other organisms.	5 th : Environments Investigation 4, Part 3 <i>Environments FOSS Science Stories Pages 39-41</i> <i>Solar Energy FOSS Science Stories Page 1</i> 6 th : <i>Food and Nutrition FOSS Science Stories Pages 41-43</i>	

Changes in Ecosystems over Time

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
17. Identify ways in which ecosystems have changed throughout geologic time in response to physical conditions, interactions among organisms, and the actions of humans. Describe how changes may be catastrophes such as volcanic eruptions or ice storms. 5 th :	5 th : Environments, Investigation 3, Parts 1-3 Investigation 5, Parts 1-3	<i>Environments FOSS Science Stories Pages 39-42, 43-45, 49-52</i>
18. Recognize that biological evolution accounts for the diversity of species developed through gradual processes over many generations.		

Strand 3: Physical Sciences (Chemistry and Physics)

Grades PreK-2 Learning Standards

Observable Properties of Objects

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
1.Sort objects by observable properties such as size, shape, color, weight, and texture. (PK Learning Guidelines #18)	K: Trees Part 2 Wood and Paper Investigation 1, Parts 1-2 Investigation 3, Parts 1-3 1st-2nd: Solids and Liquids, Investigation 1, Parts 1-2 Investigation 2, Parts 1-3 Investigation 3, Parts 1-4 <i>Solids and Liquids FOSS Science Stories Pages 8-13</i>	PK-2 nd . Everyday Mathematics PK: Fall Leaves, Cooking, Art Projects

States of Matter

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
2.Identify objects and materials as solid, liquid, or gas. Recognize that solids have a definite shape and that liquids and gases take the shape of their container. (PK Learning Guidelines #19)	K: Wood and Paper Investigation 1, Parts 3-5 1st-2nd: Solids and Liquids, Investigation 1, Part 1st-2nd Investigation 2, Parts 1-3 <i>Solids and Liquids FOSS Science Stories Pages 3-13</i> Air and Weather Investigation 1, Parts 1-6 <i>Air and Weather FOSS Science Stories Pages 3-6</i>	PK: Weather - Seasonal Changes Winter - Water, Ice, Snow Cooking - Apples, Maple Syrup, Pops Sink and Float

Position and Motion of Objects

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
3. Describe the various ways that things can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow. (PK Learning Guidelines #20)	1st-2nd: Balance and Motion, Investigation 2, Parts 1-3 Investigation 3, Parts 1-3 <i>Balance and Motion FOSS Science Stories Pages 21-32</i> Solids and Liquids, Investigation 2, Parts 1-3	P-K: All About Me - Body Awareness, Block Area, Music, Dance, Gross Motor Activities

<p>4. Demonstrate that the way to change the motion of an object is to apply a force (give it a push or pull). The greater the force, the greater the change in the motion of the object</p> <p>(PK Learning Guidelines #21)</p>	<p>1st-2nd: Air and Weather Investigation 1, Parts 4-6 Balance and Motion, Investigation 2, Parts 1-2 <i>Balance and Motion FOSS Science Stories Pages 10-17</i></p>	<p>PK: Blocks, Small Manipulatives, Large Motor Activities</p>
<p>5. Recognize that under some conditions, objects can be balanced.</p> <p>(PK Learning Guidelines #22)</p>	<p>1st-2nd: Balance and Motion, Investigation 1, Parts 1-4 <i>Balance and Motion FOSS Science Stories Pages 3-9</i></p>	<p>PK: Everyday Mathematics, Blocks, Yoga, Large Motor Activities</p>

Physical Sciences

Grades 3-5 Learning Standards

Properties of Objects and Materials

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
1. Differentiate between properties of objects (e.g., size, shape, weight) and properties of materials (e.g., color, texture, hardness).	<p>3rd-4th: Structures of Life, Investigation 1, Part 1 Earth Materials, Investigation 1, Parts 1-3 Investigation 2, Parts 1-2 Investigation 3, Parts 1-2 Investigation 4, Part 1 Ideas and Inventions, Investigation 3, Parts 1-3 <i>Ideas and Inventions FOSS Science Stories Pages 19-20</i> Magnetism and Electricity Investigation 1 Parts 1-2 Investigation 2, Part 3</p> <p>5th: Mixtures and Solutions Investigation 1 Part 1 <i>Mixtures and Solutions FOSS Science Stories Pages 1-6</i> Solar Energy Investigation 3 Parts 1-2 Investigation 4 Parts 1-4</p>	

States of Matter

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
2. Compare and contrast solids, liquids, and gases based on the basic properties of each of these states of matter.	<p>3rd-4th: Earth Materials, Investigation 1, Parts 1-3 Water, Investigation 2, Parts 1-3 Investigation 3, Parts 1-4</p> <p><i>Note: because this is such a focus of Solids and Liquids (a Grade 1st-2nd FOSS module), FOSS investigations in Grades 3-5 modules reinforce rather than introduce this standard.</i></p>	
3. Describe how water can be changed from one state to another by adding or taking away heat.	<p>3rd-4th: Water, Investigation 3, Parts 1-4</p>	

Forms of Energy

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
4. Identify the basic forms of energy (light, sound, heat, electrical, and magnetic). <i>Recognize that energy is the ability to cause motion or create change.</i>	3 rd -4 th : Ideas and Inventions, Investigation 4, Parts 1-3 <i>Ideas and Inventions FOSS Science Stories Pages 23-25</i> Physics of Sound, (entire module) ex. Investigation 3, Parts 1-2 <i>Physics of Sound FOSS Science Stories Pages 6-14, 17-21</i> Magnetism and Electricity, Investigation 1, Parts 1-4 Investigation 2, Parts 1-2 <i>Magnetism and Electricity FOSS Science Stories Pages 20-25</i> 5 th : Solar Energy Investigation 2, Parts 1-2 Investigation 3, Parts 1-2 <i>Solar Energy FOSS Science Stories Pages 1-5,12-13,16- 17,22-32</i>	Emphasize italicized phrase.
5. Give examples of how energy can be transferred from one form to another.	3 rd -4 th : Magnetism and Electricity, Investigation 5, Parts 1-2 Physics of Sound, (entire module) ex. Investigation 3, Parts 1-2 <i>Physics of Sound FOSS Science Stories Pages 7-14,17- 20</i> Water, Investigation 4, Part 2 <i>Water FOSS Science Stories Pages 22-23</i> 5 th : Solar Energy, Investigation 3, Parts 1-2	

Electrical Energy

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
6. Recognize that electricity in circuits requires a complete loop through which an electrical current can pass, and that electricity can produce light, heat and sound.	3 rd -4 th : Magnetism and Electricity Investigation 2, Parts 1-2 Investigation 3, Parts 1-3 Investigation 4, Parts 1-2 Investigation 5, Parts 1-2 <i>Magnetism and Electricity FOSS Science Stories Pages 10-30</i>	5 th : Review with teacher-created material

7. Identify and classify objects and materials that conduct electricity and objects and materials that are insulators of electricity.	3 rd -4 th : Magnetism and Electricity Investigation 2, Part 3 <i>Magnetism and Electricity FOSS Science Stories Pages 12-16</i>	5 th : Review with teacher-created material
8. Explain how electromagnets can be made, and give examples of how they can be used.	3 rd -4 th : Magnetism and Electricity, Investigation 4, Parts 1-3 Investigation 5, Parts 1-2 <i>Magnetism and Electricity FOSS Science Stories Pages 20-23, 26-29</i>	

Magnetic Energy

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
9. Recognize that magnets have poles that repel and attract each other.	3 rd -4 th : Magnetism and Electricity, Investigation 1, Parts 1-4 <i>Magnetism and Electricity FOSS Science Stories Pages 5- 6</i>	3 rd -4 th : Teacher-created activity using bar magnets with marked poles
10. Identify and classify objects and materials that a magnet will attract and objects and materials that a magnet will not attract.	3 rd -4 th : Magnetism and Electricity, Investigation 1, Parts 1-4 <i>Magnetism and Electricity FOSS Science Stories Pages 1- 4, 5-6</i>	

Sound Energy

11. Recognize that sound is produced by vibrating objects and requires a medium through which to travel. Relate the rate of vibration to the pitch of the sound.	3 rd -4 th : Physics of Sound, Investigation 1, Part 3 Investigation 2, Parts 1-3 Investigation 3, Parts 1-2 <i>Physics of Sound FOSS Science Stories Pages 9-20,30</i>	
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Light Energy

12. Recognize that light travels in a straight line until it strikes an object or travels from one medium to another, and that light can be reflected, refracted, and absorbed.	3 rd -4 th : Ideas and Inventions, Investigation 4, Parts 1-3 <i>Ideas and Inventions FOSS Science Stories Pages 23-27</i>	
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Physical Sciences

Grades 6-8 Learning Standards

Properties of Matter

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
1. Differentiate between weight and mass, recognizing that weight is the amount of gravitational pull on an object.	5 th : Levers and Pulleys Investigation 1, Parts 1-3 6 th : Mixtures and Solutions Investigation 2, Parts 1-4	
2. Differentiate between volume and mass. Define density.	6 th : Mixtures and Solutions, Investigation 1, Part 2 Investigation 2, Parts 1-4 Food and Nutrition, Investigation 2, Parts 1-3	
3. Recognize that the measurement of volume and mass requires understanding of the sensitivity of measurement tools (e.g. rulers, graduated cylinders, balances) and knowledge and appropriate use of digits.	6 th : Mixtures and Solutions, Investigation 2, Parts 1-4 Variables Investigation 2, Parts 1-3 <i>Variables FOSS Science Stories Pages 10-14</i> Food and Nutrition, Investigation 1, Part 1 Investigation 2, Parts 1-3	
4. Explain and give examples of how mass is conserved in a closed system.	6 th : Mixtures and Solutions Investigation 2, Parts 1-3	

Elements, Compounds, and Mixtures

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
5. Recognize that there are more than 100 elements that combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.	6 th : <i>Mixtures and Solutions FOSS Science Stories, Pages 3-6, 23-24, 32-42</i>	
6. Differentiate between an atom (the smallest unit of an element that maintains the characteristics of that element) and a molecule (the smallest unit of a compound that maintains the characteristics of that compound).	6 th : Mixtures and Solutions Investigation 1, Parts 1-4 <i>Mixtures and Solutions FOSS Science Stories Pages 25-28</i>	

7. Give basic examples of elements and compounds.	6 th : Mixtures and Solutions Investigation 2, Parts 1-4	<i>Mixtures and Solutions FOSS Science Stories Pages 3-6, 7-8, 11-12, 25-28</i>
8. Differentiate between mixtures and pure substances.	6 th : Mixtures and Solutions Investigation 1, Parts 1-4 (Note: the investigations and readings from the entire module reinforce the concept.)	
9. Recognize that a substance (element or compound) has a melting point and a boiling point, both of which are independent of the amount of the sample.		
10. Differentiate between physical changes and chemical changes.	6 th : Mixtures and Solutions Investigation 1, Parts 1-4 Investigation 4, Parts 1-3 <i>Mixtures and Solutions FOSS Science Stories Pages 1-4, 23-28</i> Food and Nutrition Investigation 2, Parts 1-3	

Motion

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
11. Explain and give examples of how the motion of an object can be described by its position, direction of motion, and speed. 5 th :	5 th : Levers and Pulleys, Investigation 3, Part 1st-2nd	Models and Designs Investigation 3, Parts 1-3 and Math Extensions
12. Graph and interpret distance vs. time graphs for constant speed.	5 th : Levers and Pulleys, Investigation 1, Part 2 Models and Designs Investigation 3, Parts 1-3 6 th : Variables Investigation 3, Part 4	5 th -6 th : Everyday Mathematics

Forms of Energy

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
13. Differentiate between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.		

Heat Energy

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
14. Recognize that heat is a form of energy and that temperature change results from adding or taking away heat from a system.	5 th : Solar Energy, Investigation 2, Parts 1-2 Investigation 3, Parts 1-2 <i>Solar Energy FOSS Science Stories, Pages 1-5, 16-34</i>	
15. Explain the effect of heat on particle motion through a description of what happens to particles during a change of phase.		
16. Give examples of how heat moves in predictable ways, moving from warmer objects to cooler ones until they reach equilibrium.	5 th : Solar Energy, Investigation 2, Parts 1-2 Investigation 4, Parts 1-3.	

Strand 4: Technology and Engineering

Grades PreK-2 Learning Standards

1. Materials and Tools

LEARNING STANDARDS <i>Grades PreK-2:</i>	FOSS INVESTIGATION/ ACTIVITY	OTHER
<p>1.1 Identify and describe characteristics of natural materials (e.g., wood, cotton, fur, wool) and human-made materials (e.g., plastic, Styrofoam)</p> <p>(PK Learning Guidelines #23)</p>	<p>K: Wood and Paper Investigation 1, Parts 1-5 Investigation 2, Parts 3-4 Fabric Investigation 1 Parts 1-6 <i>Fabric FOSS Science Stories Pages 3-13</i></p> <p>1st-2nd: Solids and Liquids, Investigation 1 Parts 1-2 Investigation 3, Parts 2,4 <i>Solids and Liquids FOSS Science Stories Pages 6-10</i> Balance and Motion, Investigation 2, Parts 1-3 Pebbles, Sand, and Silt Investigation 3, Parts 1-5 Insects Investigation 3 Part 2</p>	<p>PK: Art activities, Blocks, Sand and Water Table</p>
<p>1.2 Identify and explain some possible uses for natural materials (e.g. wood, cotton, fur, wool) and human-made materials (e.g., plastic, Styrofoam).</p> <p>(PK Learning Guidelines #23)</p>	<p>K: Wood and Paper Investigation 1 Parts 3-4 Investigation 2, Parts 3-4 <i>Wood and Paper FOSS Science Stories Pages 3-8, 13-18</i> Fabric, Activity 2, Part 4 <i>Fabric FOSS Science Stories Pages 16-24</i></p> <p>1st-2nd: Solids and Liquids Investigation 1, Part 3 Investigation 3, Parts 2,4 <i>Solids and Liquids FOSS Science Stories Pages 6-10</i> Balance and Motion, Investigation 3, Parts 1-2 Pebbles, Sand, and Silt, Investigation 3, Parts 1-5 <i>Pebbles, Sand, and Silt FOSS Science Stories Pages 16-19</i></p>	<p>PK: Art activities, Blocks, Sand and Water Table</p>

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
<p>1.3 Identify and describe the safe and proper use of tools and materials (e.g., glue, scissors, tape, ruler, paper, toothpicks, straws, spools) to construct simple structures.</p> <p>(PK Learning Guidelines #24)</p>	<p><i>Note: safety guidelines are provided in the Teacher Manual for ALL FOSS Investigations. Students construct structures in many FOSS modules. See for example:</i></p> <p>K: Wood and Paper Investigation 5, Parts 1-3 Fabric Investigation 1, Parts 5-6</p> <p>1st-2nd: Solids and Liquids, Investigation 1, Part 3 Extensions Balance and Motion, Investigation 3, Part 3 Air and Weather Investigation 2, Part 4 Pebbles, Sand, and Silt Investigation 3, Part 3-5 Insects Investigation 6, Part 1st-2nd</p>	<p>PK: Art and Carpentry projects, Everyday Mathematics - magnifying glass, eye dropper, balance scales, rulers</p>

2. Engineering Design

LEARNING STANDARDS Grades PreK-2:	FOSS INVESTIGATION/ ACTIVITY	OTHER
<p>2.1 Identify tools and simple machines used for a specific purpose e.g., ramp, wheel, pulley, lever.</p> <p>(PK Learning Guidelines #25)</p>	<p>K: Wood Investigation 2, Part 2 Investigation 4, Part 2 Fabric Investigation 1, Parts 5-6 <i>Fabric FOSS Science Stories Pages 14-15</i></p> <p>1st-2nd: Balance and Motion, Investigation 3, Parts 1-3 <i>Balance and Motion FOSS Science Stories Pages 14-17</i> Air and Weather Investigation 2, Part 4 Pebbles, Sand, and Silt, Investigation 2, Parts 1-2</p> <p><i>Note: levers and pulleys are addressed in the FOSS Grades 5-6 module Levers and Pulleys.</i></p>	<p>PK: Blocks, Cooking, Sand Table, Mechanical Toys</p>
<p>2.2 Describe how human beings use parts of the body as tools (e.g., teeth for cutting, hands for grasping and catching), and compare their use with the ways in which animals use those parts of their bodies.</p> <p>(PK Learning Guidelines #26)</p>	<p>1st-2nd. <i>New Plants FOSS Science Stories Pages 40-43</i></p> <p><i>This standard is addressed in the FOSS Grades 3-4 module Human Body.</i></p>	<p>PK: Bird Watching, All About Me Our Bodies Community Helpers Animals in Winter</p>

Technology and Engineering Grades 3-5 Learning Standards

1. Materials and Tools

LEARNING STANDARDS Grades 3-5:	FOSS INVESTIGATION/ ACTIVITY	OTHER
<p>1.1 Identify materials used to accomplish a design task based on a specific property, i.e., weight, strength, hardness, and flexibility.</p>	<p><i>Note: all of the FOSS Grades 3-6 modules conclude with a project entitled "Choose Your Own Investigation", many of which involve design and construction of objects related to the area of study. See also:</i></p> <p><i>3rd-4th:</i> Magnetism and Electricity Investigation 4, Parts 1-3 Ideas and Inventions, Investigation 4, Parts 1-3 Human Body, Investigation 3 Parts 1-3 Physics of Sound, Investigation 4, Parts 1-2 Water, Investigation 4, Part 2</p> <p><i>5th:</i> Models and Designs Investigation 2, Parts 1-3 Solar Energy, Investigation 4, Parts 1-4</p>	
<p>1.2 Identify and explain the appropriate materials and tools (e.g., hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) to construct a given prototype safely.</p>	<p><i>Note: safety guidelines are provided in the Teacher Manual for ALL FOSS Investigations and also in Safety Posters included in each kit. Students construct structures in many FOSS modules. See for example:</i></p> <p><i>3rd-4th:</i> Magnetism and Electricity Investigation 4, Parts 1-3 Human Body, Investigation 3 Parts 1-3 Ideas and Inventions, Investigation 4, Parts 1-3 Water Investigation 4, Part 2</p> <p><i>5th:</i> Models and Designs Investigation 2, Parts 1-3 Solar Energy, Investigation 4, Parts 1-4</p>	<p><i>3rd-5th:</i> Skills are also taught and reinforced in Art class</p>

<p>1.3 Identify and explain the difference between simple and complex machines, e.g., hand can opener that includes multiple gears, wheel, wedge gear, and lever.</p>	<p>3rd-4th: Water Investigation 4, Part 2</p> <p>5th: Levers and Pulleys Investigation 2, Parts 1-4 <i>Levers and Pulleys FOSS Science Stories Pages 1-32</i> Models and Designs Investigation 2, Parts 1-3 <i>Models and Designs FOSS Science Stories Pages 21-24</i> <i>Variables FOSS Science Stories Pages 8-9, 32-33</i></p>	
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2. Engineering Design

LEARNING STANDARDS Grades 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
<p>2.1. Identify a problem that reflects the need for shelter, storage, or convenience.</p>	<p>3rd-4th: Ideas and Inventions, Investigation 4, Parts 1-3 <i>Ideas and Inventions FOSS Science Stories Pages 1-30</i> Magnetism and Electricity Investigation 5, Parts 1-3 Water Investigation 4, Part 2</p> <p>5th: Models and Designs, Investigations 3 and 4 <i>Models and Designs FOSS Science Stories Pages 17-40</i> Solar Energy, Investigation 4, Parts 1-4 <i>Solar Energy FOSS Science Stories Pages 16-34</i></p>	
<p>2.2. Describe different ways in which a problem can be represented, e.g., sketches, diagrams, graphic organizers, and lists.</p>	<p>5th: Levers and Pulleys Investigation 2, Parts 1-4 Models and Designs, Investigation 2, Parts 1-2 Investigation 3, Parts 1-3 <i>Models and Designs FOSS Science Stories Pages 17-40</i> Solar Energy, Investigation 4, Parts 1-4 Variables Investigation 1, Parts 1-3</p>	<p>3rd-5th: Everyday Mathematics</p>
<p>2.3. Identify relevant design features (e.g., size, shape, weight) for building a prototype of a solution to a given problem.</p>	<p>3rd-4th: Ideas and Inventions, Investigation 4, Parts 1-3</p> <p>5th: Models and Designs, Investigation 2, Parts 1-2 Investigation 3, Parts 1-3 Solar Energy, Investigation 4, Parts 1-4</p>	

<p>2.4. Compare natural systems with mechanical systems that are designed to serve similar purposes, e.g., a bird's wings as compared to an airplane's wings.</p>	<p><i>3rd-4th:</i> <i>Ideas and Inventions FOSS</i> <i>Science Stories Pages 9, 26</i></p> <p><i>5th:</i> <i>Models and Designs FOSS</i> <i>Science Stories Pages 35-36</i></p>	
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Technology and Engineering Grades 6-8 Learning Standards

1. Materials, Tools, and Machines

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based upon specific properties and characteristics (e.g., weight, strength, hardness, and flexibility).	5 th : Models and Designs Investigation 4, Parts 1-2 <i>Models and Designs FOSS Science Stories Pages 23-28, 44-47, 52-55</i> Solar Energy Investigation 4, Parts 1-4 <i>Solar Energy FOSS Science Stories Pages 16-17, 29-39</i>	
1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use.	5 th : <i>Levers and Pulleys FOSS Science Stories Pages 1-27</i> 6 th : Mixtures and Solutions Investigation 1, Parts 1-4 Investigation 3, Parts 2-3 Variables, Investigation 2, Parts 1-3 Investigation 4, Parts 1-3	
1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sander, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design.	<i>Note: safety guidelines are provided in the Teacher Manual for ALL FOSS Investigations and also in Safety Posters included in each kit. Students construct structures in many FOSS modules. See for example:</i> 5 th : Models and Designs Investigation 4, Parts 1-2 6 th : Variables, Investigation 2, Parts 1-3 Investigation 4, Parts 1-3	Covered in Art class.

2. Engineering Design

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
2.1 Identify and explain the steps of the engineering design process, i.e., identify the need or the problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign.	5 th : Models and Designs Investigation 2, Parts 1-2 Investigation 3, Parts 1-3 Investigation 4, Parts 1-3 Solar Energy Investigation 4, Parts 1-4	

2.2 Demonstrate methods of representing solutions to a design problem, e.g., sketches, orthographic projections, multiview drawings.	5 th : Environments Investigation 1, Part 1 Models and Designs Investigation 2, Parts 1-2 Investigation 4, Parts 1-3 6 th : Landforms Investigation 3, Part 3 Solar Energy Investigation 4, Parts 1-4 <i>Variables FOSS Science Stories Pages 18-20, 32-33</i>	
2.3 Describe and explain the purpose of a given prototype.	5 th : <i>Models and Designs FOSS Science Stories Page 28</i> <i>Note: this standard is not addressed in these specific terms, but students document their design process in lab notebooks and presentations both in classroom design experiences (such as the humdinger) and in end of module projects suggested for every Grade 5-6 FOSS Module.</i>	
2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design.	5 th : Models and Designs Investigation 2, Parts 1-2 Investigation 4, Parts 1-3	Solar Energy Investigation 4, Parts 1-4
2.5 Explain how such design features as size, weight, shape, function, and cost limitations would affect the construction of a given prototype.	5 th : Models and Designs Investigation 4, Parts 1-3 Solar Energy Investigation 4, Parts 1-4	
2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback.	5 th : <i>Models and Designs FOSS Science Stories Pages 1-10 (discusses engineering and technology and even models and systems, but not the "universal system model")</i>	

3. Communication Technologies

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
3.1 Identify and explain the components of a communication system, i.e. source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.		

3.2 Identify and explain the appropriate tools, machines, and electronic devices (e.g. drawing tools, computer-aided design, and cameras) used to produce and/or reproduce design solutions (e.g., engineering drawings, prototypes, and reports).		
3.3 Identify and compare communication technologies and systems, i.e. audio, visual, printed, and mass communication.		
3.4 Identify and explain how symbols and icons (e.g., international symbols and graphics) are used to communicate a message.	6 th : <i>Mixtures and Solutions FOSS Science Stories Pages 6. 32-37</i>	5 th -6 th : Everyday Mathematics

4. Manufacturing Technologies

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
4.1 Describe and explain the manufacturing systems of custom and mass production.		5 th : <i>Models and Designs FOSS Science Stories Pages 25-36</i>
4.2 Explain and give examples of the impacts of interchangeable parts, components of mass-produced products, and the use of automation, e.g., robotics.	5 th : <i>Models and Designs FOSS Science Stories Pages 25-36</i>	
4.3 Describe a manufacturing organization, e.g., corporate structure, research and development, production, marketing, quality control, distribution.		
4.4 Explain basic processes in manufacturing systems, e.g., cutting, shaping, assembling, joining, finishing, quality control, and safety.	5 th : <i>Models and Designs FOSS Science Stories Pages 23-24</i>	

5. Construction Technologies

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
5.1 Describe and explain parts of a structure, e.g., foundation, flooring, decking, call, roofing systems.	5 th : Solar Energy Investigation 4, Parts 1-4	

5.2 Identify and describe three major types of bridges (e.g., arch, beam, and suspension) and their appropriate uses (e.g., site, span, resources, load).		
5.3 Explain how the forces of tension, compression, torsion, bending, and shear affect the performance of bridges.		
5.4 Describe and explain the effects of loads and structural shapes on bridges.		

6. Transportation Technologies

LEARNING STANDARDS	FOSS INVESTIGATION/	OTHER
Grades 6-8	ACTIVITY	
6.1 Identify and compare examples of transportation systems and devices that operate on each of the following: land, air, water, and space.	5 th : Models and Designs Investigation 3, Parts 1-3 <i>Models and Designs FOSS Science Stories Pages 17-40, 44-47</i>	6 th : Variables, Investigation 3, Parts 1-3 <i>Variables FOSS Science Stories Pages 15-33</i> 5 th : <i>Levers and Pulleys FOSS Science Stories Pages 9, 23-25</i>
6.2 Given a transportation problem, explain a possible solution using the universal systems model.	5 th : <i>Models and Designs FOSS Science Stories, Pages 17-19, 25-40</i>	
6.3 Identify and describe three subsystems of a transportation vehicle or device, i.e. structural, propulsion, guidance, suspension, control, and support.	5 th : <i>Models and Designs FOSS Science Stories , Pages 25-28, 44-47</i> 6 th : Variables, Investigation 3, Parts 1-4	
6.4 Identify and explain lift, drag, friction, thrust, and gravity in a vehicle or device, e.g., cars, boats, airplanes, rockets.	6 th : <i>Variables FOSS Science Stories Pages 15-33,38</i>	

7. Bioengineering Technologies

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
7.1 Explain examples of adaptive or assistive devices, e.g., prosthetic devices, wheelchairs, eyeglasses, grab bars, hearing aids, lifts, braces.	<i>Note: Hearing aids are discussed in the Grades 3-4 module Physics of Sound.</i>	
7.2 Describe and explain adaptive and assistive bioengineered products, e.g., food, bio-fuels, irradiation, integrated pest management.		

Appendix A: Inquiry

The following section contains a correlation of the FOSS units to the Skills of Inquiry listed in the Science and Engineering/Technology Curriculum Framework.

Inquiry skills are used throughout the F.O.S.S. and teacher-created units. The following includes representative examples of investigations and activities which address the inquiry skills.

Inquiry: Grades PreK-2

<i>Skills of Inquiry Grades PreK-2:</i>	<i>FOSS INVESTIGATION/ ACTIVITY</i>	<i>OTHER</i>
<p>Ask questions about objects, organisms, and events in the environment.</p> <p>Name and use simple equipment and tools (e.g. rulers, meter sticks, thermometers, hand lenses, and balance) to gather data and extend the senses.</p>	<p>K: Wood Investigation 1, Parts 1-2 Trees Investigation 2, Parts 1-4</p> <p>1st-2nd: Air and Weather Investigations 2, Part 1-4 Pebbles, Sand and Silt, Investigation 1, Parts 1-3 Solids and Liquids Investigation 1, Parts 1-2 Insects, Investigation 2, Parts 1-3</p>	<p>PK: Teacher-created Five Senses unit</p> <p>K: Teacher-created Ocean Life unit</p>
<p>Make predictions based on observed patterns.</p> <p>Record observations and data with pictures, numbers, or written statements.</p> <p>Discuss observations with others.</p> <p>(PK Learning Guidelines #2)</p>	<p>K: Fabric Activity 2, Part 4</p> <p>1st-2nd: Air and Weather, Investigation 4, Parts 1-3 Balance and Motion Investigation 1, Part 2 Insects, Investigation 5, Parts 1-3 Solids and Liquids Investigation 3, Part 3</p>	<p>PK: Sink and Float</p> <p>K: Teacher-created Ocean Life unit</p>
<p>Tell about why and what would happen if.</p>	<p>K: Fabric Investigation 2, Part 2 Wood Investigation 1, Parts 3-5</p> <p>1st-2nd: Balance and Motion Investigation 1, Parts 1-3 New Plants, Investigation 2, Parts 1-2 Pebbles, Sand and Silt, Investigation 4, Parts 1-3 Solids and Liquids Investigation 1, Parts 1-3 Air and Weather Investigation 1, Parts 1-6</p>	

Inquiry: Grades 3-5

LEARNING STANDARDS GRADES 3-5	FOSS INVESTIGATION/ ACTIVITY	OTHER
Ask questions and make predictions that can be tested.	3 rd -4 th : Human Body Investigation 4, Parts 1-4 Magnetism and Electricity Investigation 2, Parts 3-4 Water Investigation 3, Parts 1-4 5 th : Environments Investigation 2, Parts 1-4 Solar Energy Investigation 4, Parts 1-4	
Conduct multiple trials to test a prediction. Compare the result of an investigation or experiment with the prediction. 3 rd -4 th : Physics of Sound Investigation 4, Part 1 Ideas and Inventions, Investigation 2, Parts 1- 3 Earth Materials Investigation 3, Part 2	Magnetism and Electricity Investigation 4, Part 3 Water Investigation 1, Part 2 Structures of Life Investigation 3, Parts 3-4 Human Body Investigation 4, Parts 1-4	5 th : Environments Investigation 6, Parts 1-2 Levers and Pulleys Investigation 3, Parts 1-3 Solar Energy Investigation 4, Part 3
Select and use appropriate tools and technology (e.g. calculators, computers, balances, scales, meter sticks, graduated cylinders) in order to extend observations. 3 rd -4 th	Magnetism and Electricity Investigation 1, Part 3 Water Investigation 2, Parts 1-3	Earth Materials Investigation 1, Parts 1-3
Recognize simple patterns in data and use data to create a reasonable explanation for the results of an investigation or experiment. Record data and communicate findings to others using graphs, charts, maps, models, and oral and written reports. 3 rd -4 th :	Water, Investigation 4, Part 1 Magnetism and Electricity, Investigation 4, Parts 1-3	5 th : Environments Investigation 5, Parts 1-3 Levers and Pulleys Investigation 1, Parts 1-3 Solar Energy Investigation 3, Parts 1-2
Keep accurate records while conducting simple investigations or experiments.	3 rd -4 th : Structures of Life, Investigation 2, Parts 1-3 5 th : Environments, Investigation 5, Parts 1-3 <i>This standard is also addressed in the end-of module projects suggested in every FOSS module from Grades 3-6. See for example: Ideas and Inventions Investigation 4, Part 4</i>	

Inquiry: Grades 6-8

LEARNING STANDARDS Grades 6-8	FOSS INVESTIGATION/ ACTIVITY	OTHER
<p>Formulate a testable hypothesis.</p> <p>Design and conduct an experiment specifying variables to be changed, controlled, and measured</p>	<p>5th: Environments Investigation 6, Part 1 Levers and Pulleys Investigation 4, Parts 1-2</p> <p>6th: Mixtures and Solutions Investigation 1, Part 4 Variables Investigation 4, Parts 1-3</p>	
<p>Select appropriate tools, technology (e.g., calculators, computers, thermometers, meter sticks, balances, graduated cylinders, and microscopes), and make quantitative observations.</p>	<p>5th: Levers and Pulleys Investigation 1, Parts 1-3</p> <p>6th: Food and Nutrition Investigation 2, Parts 1-3 Mixtures and Solutions Investigation 1, Parts 1-4 Variables Investigation 3, Part 2</p>	
<p>Present and explain data and findings using multiple representations, including tables, graphs, mathematical and physical models, and demonstrations.</p>	<p>5th: Models and Designs Investigation 2, Parts 1-2</p>	<p>6th: Variables Investigation 1, Parts 1-3 Landforms Investigation 4, Parts 1-3</p>
<p>Communicate procedures and results using appropriate science and technology terminology.</p>	<p><i>Note: Every FOSS Grades 5-6 module involves an end-of-unit project with a presentation to the class. See for example:</i></p> <p>5th: Solar Energy Investigation 4, Part 4 Environments Investigation 6, Part 3</p> <p><i>Mid-module example:</i> Models and Designs, Investigation 3, Parts 1-2</p>	
<p>Draw conclusions based on data or evidence presented in tables or graphs, and make inferences based on patterns or trends in the data.</p> <p>Offer explanations of procedures, and critique and revise them.</p>	<p>5th: Models and Designs Investigation 2, Parts 1-2 Environments, Investigation 1, Parts 1-2</p> <p>6th: Variables, Investigation 3, Part 3</p>	

Appendix B: Units of Study by Grade

Preschool:

Life Cycle

Seasonal Changes

Animals in Winter

Our Bodies

Five Senses

Other inquiry and exploration activities are integrated throughout the preschool year.

Kindergarten:

Ocean Life

Trees

Wood

Fabric

Grade 1 and 2:

(Taught in a two year cycle)

Year A

Insects

Balance and Motion

Pebbles, Sand, and Silt

Year B

New Plants

Solids and Liquids

Air and Weather

Grade 3 and 4:

(Taught in a two year cycle)

Year A

Earth Materials

Human Body

Magnetism and Electricity

Ideas and Inventions

Year B

Water

Sound

Structures of Life

Grade 5:

Solar Energy

Environments

Levers and Pulleys

Models and Designs

Grade 6:

Food and Nutrition

Mixtures and Solutions

Landforms

Variables

Appendix C: Readings from FOSS Science Stories

Kindergarten

Reading Assignments
Fabric FOSS Science Stories Pages 3-13, 14-15,16-24
Trees FOSS Science Stories Pages 3-13
Wood and Paper FOSS Science Stories Pages 3-8, 13-18

First and Second Grades

Reading Assignments
Air and Weather FOSS Science Stories Pages 3-6,18-23
Balance and Motion FOSS Science Stories Pages 3-17, 21-32
Insects FOSS Science Stories Pages 8-33
New Plants FOSS Science Stories Pages 3-7, 22-30, 40-43
Pebbles, Sand, and Silt FOSS Science Stories Pages 16-22
Solids and Liquids FOSS Science Stories Pages 6-13

Third and Fourth Grade:

Reading Assignments
Earth Materials FOSS Science Stories Pages 1-7, 12-15, 30-34
Human Body FOSS Science Stories Pages 25-27
Ideas and Inventions FOSS Science Stories Pages 1-30
Magnetism and Electricity FOSS Science Stories Pages 1-6,10-30
Physics of Sound FOSS Science Stories Pages 6-21,30
Structures of Life FOSS Science Stories Pages 1-16, 14-36,43
Water FOSS Science Stories Pages 1-2, 4-9,12 –17, 22-23

Fifth Grade:

Reading Assignments
Environments FOSS Science Stories Pages 1-35,38-45, 49-55
Levers and Pulleys FOSS Science Stories Pages 1-32
Models and Designs FOSS Science Stories Pages 1-40, 44-47, 52-55
Models and Designs Investigation 2 Parts 1-3
Solar Energy FOSS Science Stories Pages 1-5, 12-13,16-44

Sixth Grade:

Reading Assignments
Environments FOSS Science Stories, Pages 46-49
Food and Nutrition FOSS Science Stories Pages 6-9,15-20,41-45
Landforms FOSS Science Stories Pages 13-36
Mixtures and Solutions FOSS Science Stories Pages 1-8, 11-12, 23-28, 32-42
Variables FOSS Science Stories Pages 8-33, 38