

**Idaho K-12 Science Standards Teacher's Guide To GLOBE**

**The Idaho GLOBE Partnership  
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**CONTRIBUTORS**

Dr. Michael Odell, Director, Idaho GLOBE, University of Idaho

Dr. Teresa Kennedy, Director, International/U.S. Partnerships, The GLOBE Program

Mr. John Ophus, IMITS, University of Idaho

Ms. Alexa Davis, IMITS, University of Idaho

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**526. SCIENCE STANDARDS - GRADE KINDERGARTEN.**

**The samples associated with the content standards are meant to illustrate meaning and to represent possible areas of applications. They are not intended to be an exhaustive list, but are samples of applications that would demonstrate learning.**

**527. UNIFYING CONCEPTS OF SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	GLOBE Applications:
1. Understand concepts and processes of evidence, models, and explanation.	1. Explore the concepts of observation and data collection.	1. GLOBE Atmosphere Protocols 2. Cloud Identification using Cloud Chart

	1. Explore and use various models.	1. Our Home Planet: The GLOBAL View 2. Blue Marble Activity
1. Understand constancy, change, and measurement.	1. Explore changes.	1. Seasons Investigation
	1. Measure in non-standard units.	1. Estimation of Cloud Cover. 2. Comparing height of other trees to themselves.
1. Understand the theory that evolution is a process that relates to the gradual changes in the universe and of equilibrium as a physical state.	1. Understand the concepts of yesterday, today, and tomorrow.	1. Seasons Investigation. 2. Variation in Temperature throughout the year.

**29. CONCEPTS OF SCIENTIFIC INQUIRY.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand scientific inquiry and develop critical thinking skills.	1. Make observations.	1. Weather observations. 2. Cloud Observation 3. Precipitation Observations 4. Seasons Investigation

	1. Use various tools to gather information.	<ol style="list-style-type: none"> <li>1. Cloud Charts</li> <li>2. Thermometers.</li> <li>3. Rain Gauge</li> <li>4. Meter Stick</li> </ol>
	1. Communicate observations.	<ol style="list-style-type: none"> <li>1. Draw a picture of observation.</li> <li>2. Classroom graphs of temperature.</li> </ol>

### 30. CONCEPTS OF PHYSICAL SCIENCE.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the structure and function of matter and molecules and their interactions.	1. Use senses to explore and describe matter.	<ol style="list-style-type: none"> <li>1. Water detectives.</li> <li>2. Soil characterization</li> <li>3. Just passing through.</li> </ol>

### 31. CELLULAR AND MOLECULAR CONCEPTS.

*Cellular and Molecular Concepts standards do not apply at this grade level.*

### 32. INTERDEPENDENCE OF ORGANISMS AND BIOLOGICAL CHANGE.

Standard . The student will:	Content Knowledge and Skills:	Samples of Applications:
01. Understand the theory of biological evolution.	1. Observe and explore the characteristics of plants and animals.	<ol style="list-style-type: none"> <li>1. Land cover protocols</li> <li>2. Macro invertebrates</li> </ol>

	<ul style="list-style-type: none"> <li>Sort animals into wild and domestic categories.</li> </ul>	n/a
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### 33. MATTER, ENERGY, AND ORGANIZATION IN LIVING SYSTEMS.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the relationship between matter, energy, and organization to trace matter as it cycles and energy as it flows through living systems and between living systems and the environment.	1. Recognize the difference between living and non-living things.	1. n/a.

### 34. EARTH AND SPACE SYSTEMS.

Standard . The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand scientific theories of origin and subsequent changes in the universe and earth systems.	1. Observe and identify the four seasons.	<ol style="list-style-type: none"> <li>Learn the terms fall, winter, spring, and summer.</li> <li>Use appropriate colors to draw a picture of each season.</li> <li>As a yearlong bulletin board display, dress a paper bear in clothing appropriate for daily weather.</li> <li>GLOBE seasons investigation</li> </ol>
	1. Observe different	1. Seasons investigation.

	weather conditions.	
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### 35. TECHNOLOGY.

Standard . The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the relationship between science and technology and develop the abilities of technological design and application.	1. Distinguish between natural objects and objects made by humans.	1. Tree versus computer.
	1. Recognize that people have invented tools for everyday life and for scientific investigations.	1. Classroom walk outside to find natural objects: classroom walk inside to find objects made by humans. 2. Use various writing tools (technological) and discuss their differences, (pencil, chalk, brush, charcoal, markers, mechanical pencil, and computer word processor).
	1. Create a tool to perform a specific function.	1. <ol style="list-style-type: none"> <li>1. Build a densitometer</li> <li>2. Build simple 45 degree clinometer</li> </ol>

		3.
	1. Use available and appropriate technology.	1. Use the GLOBE website

**36. PERSONAL AND SOCIAL PERSPECTIVES.**

Standard . The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand common environmental quality issues, both natural and human induced.	1. 1. Observe and discuss characteristics of the local environment.	1. Take a walk around the school and observe the physical characteristics of surrounding environment. 2. Observe GLOBE Landcover and water sites
1. Understand the importance of natural resources and the need to manage and conserve them.	1. Understand the concept of recycling.	1. Water Water Everywhere
	1. Discuss the conservation of natural resources.	1. Forests (Landcover) 2. Water. (Hydro) 3. Use GLOBE reading literature to

		illustrate concept. (FSU)
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**36. HISTORY OF SCIENCE.**

Standard . The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the significance of major scientific milestones.	1. 1. 1. 1. Understand major contributions of various scientists and researchers.	I. GLOBE Scientists Corner

**36. INTERDISCIPLINARY CONCEPTS.**

Standard . The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand that interpersonal relationships are important in scientific endeavors.	1. 1. Learn appropriate cooperation and interaction skills.	1. Provide opportunities and settings for the students to work together.
1. Understand technical communication.	1. Understand and follow instructions.	1. Follow protocol directions

**539. -- 541. (RESERVED).**

**42. SCIENCE STANDARDS - GRADE 1, SECTIONS 543 THROUGH 553.**

The samples associated with the content standards are meant to illustrate meaning and to represent possible areas of applications. They are not intended to be an exhaustive list, but are samples of applications that would demonstrate learning.

**43. UNIFYING CONCEPTS OF SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<p>1. Understand concepts and processes of evidence, models, and explanation.</p>	<p>1. Explore the concepts of observation and data collection.</p>	<p>1. Daily weather graph.</p> <ul style="list-style-type: none"> <li>• Predict</li> <li>• Observe</li> <li>• Record</li> </ul> <p>1. Observe metamorphosis of insects and record observations.</p> <p>2. Seasons Investigation</p> <p>3. Macro Invertebrates investigation</p>
	<p>1. Explore and use various models.</p>	<p>1. Use GLOBE website to learn geography.</p> <p>2. Learn about the parts of macro invertebrates</p>
<p>1. Understand constancy, change, and measurement.</p>	<p>1. Understand that changes occur and can be measured.</p>	<p>1. Measure a plant's growth on Landover site and discuss its changes each semester.</p> <p>2. Observe the three states of matter (ice cube, water, water vapor).</p>



		3. Seasons Investigation
	1. Measure in both standard and non-standard units.	<ol style="list-style-type: none"> <li>1. Metrics.</li> <li>2. Cloud cover Estimation.</li> <li>3. Use a balance scale to weigh different objects.</li> <li>4. Use a melting snow to measure time.</li> <li>5. Using different containers, find out how many scoops are needed to fill each container.</li> </ol>
1. Understand the theory that evolution is a process that relates to the gradual changes in the universe and of equilibrium as a physical state.	1. Understand the concepts of past, present, and future.	<ol style="list-style-type: none"> <li>1. Seasons Investigation</li> <li>2. Hydrology Investigation</li> </ol>
1. Understand concepts of form and function.	1. Identify shape and use of objects.	<ol style="list-style-type: none"> <li>1. Play an invertebrate matching game. <ul style="list-style-type: none"> <li>• Match mouths to diet</li> <li>• Match feet to habitat</li> <li>• Match body type to land, air, and water</li> </ul> </li> <li>1. Match GLOBE Scientific instrument to its use.</li> </ol>

		2. GLOBE Bird Classification
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**44. CONCEPTS OF SCIENTIFIC INQUIRY.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand scientific inquiry and develop critical thinking skills.	1. Brainstorm questions that can be investigated.	<ol style="list-style-type: none"> <li>1. Where does the color of the water in the stream come from?</li> <li>2. Why do leaves fall?</li> <li>3. Cloud Estimation activity.</li> </ol>
	1. Make observations.	<ol style="list-style-type: none"> <li>1. Seasons Investigation</li> <li>2. Hydro Investigation</li> <li>3. Soil investigation</li> <li>4. Atmosphere Investigation</li> <li>5. Use five senses to observe</li> </ol>
	1. Use various tools to gather information.	1. Given an assortment of GLOBE tools, students will choose the appropriate tool(s) to measure an object.
	1. Explore information and evidence.	<ol style="list-style-type: none"> <li>1. Share ideas through class discussion.</li> <li>2. Graph information to note change or compare and contrast.</li> </ol>

	1. Use observations to make guesses.	1. Use observations to make predictions about tomorrow's weather.
	1. Communicate observations.	1. Use GLOBE website, logs, journals, pictures, and/or oral discussions to communicate observations.

#### 45. CONCEPTS OF PHYSICAL SCIENCE.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the structure and function of matter and molecules and their interactions.	1. Know that objects have combinations of properties.	1. Water Detectives
	1. Recognize and classify matter as a solid, liquid, or gas.	1. Solid and Liquid Precipitation protocols
	1. Recognize that matter can change states (solid, liquid, gas).	1. Seasons Investigation. 2. Melt Solid precipitation to measure ml of liquid.

1. Understand concepts of motion and forces.	1. Explore the position and motion of objects.	1. n/a
	1. Explore different kinds of energy.	1. n/a

**46. CELLULAR AND MOLECULAR CONCEPTS.**

*Cellular and Molecular Concepts standards do not apply at this grade level.*

**47. INTERDEPENDENCE OF ORGANISMS AND BIOLOGICAL CHANGE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the theory of biological evolution.	1. Observe and explore the life cycles of plants and animals and their basic needs.	1. GLOBE Monarch Butterfly Activities 2. GLOBE Phenology.
	1. Recognize that animals live in different habitats for which they are suited.	1. Macro invertebrate Investigation 2. GLOBE Bird Investigation.

**48. MATTER, ENERGY, AND ORGANIZATION IN LIVING SYSTEMS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:

<p>1. Understand the relationship between matter, energy, and organization to trace matter as it cycles and energy as it flows through living systems and between living systems and the environment.</p>	<p>1.</p> <p>1.</p> <p>1. Understand that living things need food to survive.</p>	<p>1. Learn about different systems that keep a tree alive ("Project Learning Tree," Tree Factory).</p> <p>2. Identify the components of a habitat and the basic need for them ("Project Wild," Habitat Lap Sit Activity).</p> <p>3. Choose an animal in your hydrology site and create a diorama or mobile of that animal in their habitat keeping in mind their needs.</p>
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**48. EARTH AND SPACE SYSTEMS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<p>1. Understand scientific theories of origin and subsequent changes in the universe and earth systems.</p>	<p>1. Identify the four seasons and their characteristics.</p>	<p>1. Study the cycle of a tree through the four seasons (Phenology).</p> <p>2. Draw a picture of a tree depicting its appearance through all four seasons.</p>

		<ul style="list-style-type: none"> <li>3. As a yearlong bulletin board display, decorate a deciduous tree according to the season.</li> <li>4. Seasons Investigations</li> </ul>
	<ul style="list-style-type: none"> <li>1. Understand the characteristics of different weather conditions.</li> </ul>	<ul style="list-style-type: none"> <li>1. As you are graphing your weather, discuss the different characteristics of the weather.</li> <li>2. Seasons Investigation</li> <li>3. Atmosphere Investigation</li> </ul>

## 50. TECHNOLOGY.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>1. Understand the relationship between science and technology and develop the abilities of technological design and application.</li> </ul>	<ul style="list-style-type: none"> <li>1. Distinguish between natural objects and objects made by humans.</li> </ul>	<ul style="list-style-type: none"> <li>1. Tree versus computer.</li> </ul>
	<ul style="list-style-type: none"> <li>1. Recognize that people have invented tools for everyday life and for scientific investigations.</li> </ul>	<ul style="list-style-type: none"> <li>1. Use and experience tools.</li> </ul>

	<ol style="list-style-type: none"> <li>1. Create a tool to perform a specific function.</li> </ol>	<ol style="list-style-type: none"> <li>i. Build densimeters and clinometers</li> </ol>
	<ul style="list-style-type: none"> <li>• Use available and appropriate technology.</li> </ul>	<ol style="list-style-type: none"> <li>1. Use computers and calculators.</li> <li>2. Use the GLOBE website</li> </ol>

**51. PERSONAL AND SOCIAL PERSPECTIVES.**

Standards - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ol style="list-style-type: none"> <li>1. Understand common environmental quality issues, both natural and human induced.</li> </ol>	<ol style="list-style-type: none"> <li>1.           <ol style="list-style-type: none"> <li>1. Identify the characteristics of the local environment.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Take a walk outside and observe the physical characteristics of surrounding environment. (GLOBE Site Seen)</li> <li>2. Draw picture of Land cover site.</li> </ol>
<ol style="list-style-type: none"> <li>1. Understand the importance of natural resources and the need to manage and conserve them.</li> </ol>	<ol style="list-style-type: none"> <li>1. Understand the concept of recycling.</li> </ol>	<ol style="list-style-type: none"> <li>1. Participate in a recycling program.</li> <li>2. Create a recycled art project.</li> <li>3. Create a compost tub using worms.</li> <li>4. Bury garbage that includes organic and inorganic</li> </ol>

		materials. Dig up and check weekly.
	1. Understand the conservation of natural resources.	<ol style="list-style-type: none"> <li>1. Plant trees.</li> <li>2. Make posters to remind people to conserve the natural resources.</li> <li>3. Learn about GLOBAL change</li> </ol>

**52. HISTORY OF SCIENCE.**

Standards - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the significance of major scientific milestones.	1. Understand major contributions of various scientists and researchers.	I. GLOBE Scientists corner

**53. INTERDISCIPLINARY CONCEPTS.**

Standards - The student will:	Content Knowledge and Skills:	Samples of Applications:
01. Understand that interpersonal relationships are important in scientific endeavors.	a. Learn appropriate cooperation and interaction skills.	i. Learn to cooperate to conduct protocols.
02. Understand technical communication.	a. Understand and follow instructions.	i. Follow GLOBE Protocols.

**554. -- 556. (RESERVED).**

**57. SCIENCE STANDARDS - GRADE 2,**



The samples associated with the content standards are meant to illustrate meaning and to represent possible areas of applications. They are not intended to be an exhaustive list, but are samples of applications that would demonstrate learning.

**58. UNIFYING CONCEPTS OF SCIENCE.**

Standards - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand concepts and processes of evidence, models, and explanation.	1. Explore the concepts of observation and data collection.	1. Seasons Investigation 2. Use GLOBE observations to predict the local weather
	1. Explore and use various models.	1. Water cycle. 2. Macro- Invertebrate Habitats. 3. Use GLOBE visualizations.
1. Understand constancy, change, and measurement.	a. Understand that changes occur and can be measured.	1. Atmosphere protocols 2. Seasons Investigation
	b. Measure in standard and non-standard systems.	<ul style="list-style-type: none"> <li>• Log of Land cover site.</li> <li>• Keep GLOBE journal.</li> <li>• Metrics</li> </ul>
<ul style="list-style-type: none"> <li>• Understand the theory that evolution is a process that relates to the gradual changes in the universe and of equilibrium as a physical state.</li> </ul>	1. Understand the concepts of past, present, and future.	1. Plant experiments (monitor changes under different conditions [dark, under watered, over watered, no soil]).

		2. Compare the changes in the Seasons Investigation.
1. Understand concepts of form and function.	1. Identify shape and use of objects.	<ol style="list-style-type: none"> <li>1. Research birds to learn why they have different beaks or feet. (GLOBE)</li> <li>2. Write a story about why animals have certain characteristics (webbed feet, flat tails, claws, fangs).</li> </ol>

#### 59. CONCEPTS OF SCIENTIFIC INQUIRY.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand scientific inquiry and develop critical thinking skills.	1. Brainstorm questions that can be investigated.	<ol style="list-style-type: none"> <li>1. Scientific experiments that stimulate students to ask questions such as: <ul style="list-style-type: none"> <li>o GLOBE Investigation</li> <li>o GLOBE student research projects</li> </ul> </li> </ol>
	1. Make observations.	1. Atmosphere, Land cover, Hydrology protocols
	1. Use various tools to gather information.	1. Given an assortment of GLOBE tools, students will choose the appropriate tool(s) to measure and weigh an object and record data.

	<ol style="list-style-type: none"> <li>1. Explore information and evidence.</li> </ol>	<ol style="list-style-type: none"> <li>1. Analyze data by: <ul style="list-style-type: none"> <li>• Graphing</li> <li>• Class discussion</li> <li>• Using GLOBE graphing and Visualization tools</li> </ul> </li> </ol>
	<ol style="list-style-type: none"> <li>1. Use observations to make guesses.</li> </ol>	<ol style="list-style-type: none"> <li>1. Present data from GLOBE investigations.</li> <li>2. Compare results.</li> </ol>
	<ol style="list-style-type: none"> <li>1. Communicate observations.</li> </ol>	<ol style="list-style-type: none"> <li>1. GLOBE graphing tools</li> <li>2. GLOBE Visualization</li> <li>3. Maps of study sites</li> </ol>

## 60. CONCEPTS OF PHYSICAL SCIENCE.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ol style="list-style-type: none"> <li>1. Understand the structure and functions of matter and molecules and their interactions.</li> </ol>	<ol style="list-style-type: none"> <li>1. Know that objects have combinations of properties.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify objects and two or more of their properties (color, harness, size, shape, texture, smell).</li> <li>2. Water Detectives</li> </ol>
	<ol style="list-style-type: none"> <li>1. Recognize and classify matter as a solid, liquid, or gas.</li> </ol>	<ol style="list-style-type: none"> <li>1. Explain the water cycle</li> <li>2. Discuss GLOBE precipitation protocols fro winter and summer</li> </ol>

	1. Recognize that matter can change states (solid, liquid, gas).	1. Seasons Investigation
1. Understand concepts of motion and forces.	1. Explore the position and motion of objects.	n/a
	<ul style="list-style-type: none"> <li>Explore different kinds of energy.</li> </ul>	n/a

**61. CELLULAR AND MOLECULAR CONCEPTS.**

*Cellular and Molecular Concepts standards do not apply at this grade level.*

**62. INTERDEPENDENCE OF ORGANISMS AND BIOLOGICAL CHANGE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the theory of biological evolution.	1. Observe and explore the life cycles of plants and animals and their basic needs.	<ol style="list-style-type: none"> <li>Plant a seed and monitor its growth.</li> <li>Hatch an egg.</li> <li>Observe macroinvertebrates as they turn into adults.</li> <li>Observe tadpoles in an aquarium over time.</li> </ol>
	1. Recognize that animals live in different habitats for which they are suited.	<ol style="list-style-type: none"> <li>Macroinvertebrates Activity</li> <li>GLOBE Bird Activity</li> <li>Create a habitat in your classroom by adding animals that would live there. Observe</li> </ol>

		different habitats (ant farm, aquarium, beehive).
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**63. MATTER, ENERGY, AND ORGANIZATION IN LIVING SYSTEMS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<p>1. Understand the relationship between matter, energy, and organization to trace matter as it cycles and energy as it flows through living systems and between living systems and the environment.</p>	<p>1. Understand that living things need food to survive.</p>	<p>1.</p> <ol style="list-style-type: none"> <li>1. Learn about different systems that keep a tree alive ("Project Learning Tree," Tree Factory).</li> <li>2. Identify the components of a habitat and the basic need for them ("Project Wild," Habitat Lap Sit Activity).</li> <li>3. Choose an animal in your hydrology site and create a diorama or mobile of that animal in their habitat keeping in mind their needs.</li> </ol>

**64. EARTH AND SPACE SYSTEMS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
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<p>1. Understand scientific theories of origin and subsequent changes in the universe and earth systems.</p>	<p>1. Identify the four seasons and their characteristics.</p>	<p>1. GLOBE Seasons activities 2. Draw a picture of a tree depicting its appearance through all four seasons. 3. As a yearlong bulletin board display, decorate a deciduous tree according to the season.</p>
	<p>1. Understand the characteristics of different weather conditions.</p>	<p>1. 1. GLOBE Atmosphere protocols 2. GLBOE Seasons Activities</p>
<p>1. Understand geo-chemical cycles and energy in the earth system.</p>	<p>1. Explore evaporation and precipitation.</p>	<p>1. Using a wet paper towel, wipe a chalkboard or desk and determine where the water goes. 2. Water cycle</p>

**65. TECHNOLOGY.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<p>1. Understand the relationship between science and technology and develop the abilities of technological design and application.</p>	<p>1. Distinguish between natural objects and objects made by humans.</p>	<p>1. Tree versus computer</p>

	<ol style="list-style-type: none"> <li>1. Recognize that people have invented tools for everyday life and for scientific investigations.</li> </ol>	<ol style="list-style-type: none"> <li>1. Do a GLOBE activity with and without a GLOBE tool and determine which task was easier.</li> <li>2. Invent a tool to complete a task.</li> </ol>
	<ol style="list-style-type: none"> <li>1. Create a tool to perform a specific function.</li> </ol>	<ol style="list-style-type: none"> <li>1. <ol style="list-style-type: none"> <li>1. Create a tubular densiometer</li> </ol> </li> </ol>
	<ol style="list-style-type: none"> <li>1. Use available and appropriate technology.</li> </ol>	<ol style="list-style-type: none"> <li>1. Use the GLOBE website as a research source.</li> <li>2. Use a GLOBE tools to see more detail than the human eye can provide.</li> </ol>

**66. PERSONAL AND SOCIAL PERSPECTIVES.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ol style="list-style-type: none"> <li>1. Understand common environmental quality issues, both natural and human induced.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify the characteristics of the local environment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Observe a map of the town using Terraserver software</li> </ol>
<ol style="list-style-type: none"> <li>1. Understand the importance of natural resources and the need to</li> </ol>	<ol style="list-style-type: none"> <li>1. <ol style="list-style-type: none"> <li>1. Understand the concept of recycling.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Start a classroom/school-recycling program.</li> <li>2. Field trip to a recycling center.</li> </ol>

manage and conserve them.		3. Make your own recycled paper.
	1. 1. Understand the conservation of natural resources.	1. Guest speakers from various natural resource and conservation professions. 2. Measure classroom and home resource use (how much water to wash hands, brush teeth, drinking).

#### 67. HISTORY OF SCIENCE.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the significance of major scientific milestones.	1. Understand major contributions of various scientists and researchers.	1. 1. GLOBE Scientists Corner

#### 68. INTERDISCIPLINARY CONCEPTS.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand that interpersonal relationships are important in scientific endeavors.	1. Learn appropriate cooperation and interaction skills.	1. Perform GLOBE protocols where each student is given a particular task.



1. Understand technical communication.	1. Understand and follow instructions.	1. Follow GLOBE protocols
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569. -- 571. (RESERVED).

**72. SCIENCE STANDARDS - GRADES 3-4, SECTIONS 573 THROUGH 583.**

**The samples associated with the content standards are meant to illustrate meaning and to represent possible areas of applications. They are not intended to be an exhaustive list, but are samples of applications that would demonstrate learning.**

**73. UNIFYING CONCEPTS OF SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand systems, order, and organization.	a. Recognize that a system is an organized group of related objects that form a whole.	1. Show how animals and plants rely on one another for oxygen/carbon dioxide. 2. Water cycle
	b. Explore the solar system.	1. 1. Landsat Images
1. Understand concepts and processes of evidence, models, and explanation.	1. Develop skills in observation and data collection.	1. Adopt-A-Tree: predict, observe, and record changes throughout the year. 2. Seasons activity
	1. Recognize the difference	1.

	<p>between observations and inferences.</p>	<p>1. Hydrology Investigation: observe clear water and see if it is clean or not.</p>
	<p>1. Develop and/or use models to explain how things work.</p>	<p>1. Water Cycle</p>
<p>1. Understand constancy, change, and measurement.</p>	<p>1. Explore concepts in science that do not change with time.</p>	
	<ul style="list-style-type: none"> <li>• Understand that changes occur and can be measured.</li> </ul>	<p>1. Track the sun. Measure or trace shadows throughout the day. (Solar Noon Activity) 2. Record and predict the daily temperature.</p>
	<ul style="list-style-type: none"> <li>• Measure in both the standard and metric systems.</li> </ul>	<p>1. Measure temperature in Fahrenheit and Celsius.</p>
<p>1. Understand the theory that evolution is a process that relates to the gradual changes in the universe and of</p>	<p>1. Understand the relationships of past, present, and future.</p>	<p>1. Water cycle 2. Soil investigations</p>

equilibrium as a physical state.		
1. Understand concepts of form and function.	1. Discover the relationship between shape and use.	1. GLOBE bird investigation (beaks)

**74. CONCEPTS OF SCIENTIFIC INQUIRY.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand scientific inquiry and develop critical thinking skills.	1. Identify questions that can be answered by conducting scientific tests.	1. GLOBE student research projects

1. Conduct scientific tests.	1. GLOBE student research projects 2. Macro invertebrate study at different sites 3. GLOBE bird investigation at different sites
1. Use appropriate tools and techniques to gather and display data.	1. Given an assortment of GLOBE tools, students will choose the appropriate tool(s) to measure and weigh an object and record data.
1. Use data to construct a reasonable explanation.	1. Analyze GLOBE data by: <ul style="list-style-type: none"> <li>• graphing</li> </ul>

		<ul style="list-style-type: none"> <li>class discussion</li> </ul>
	1. Make simple predictions based on data.	1. Predicting data based off GLOBE atmosphere protocols
	1. Explore alternative explanations.	1. Discuss alternate methods and designs that could be used to achieve more successful results.
	1. Communicate the results of tests to others.	<ol style="list-style-type: none"> <li>Share design with the class by posting on GLOBE website</li> <li>Compare results on GLOBE website.</li> </ol>

**75. CONCEPTS OF PHYSICAL SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the structure and function of matter and molecules and their interactions.	1. Use simple instruments to measure properties.	<ol style="list-style-type: none"> <li>Thermometers</li> <li>Graduate cylinders</li> </ol>
	<ul style="list-style-type: none"> <li>Explore the properties of solids, liquids, and gases.</li> </ul>	<ol style="list-style-type: none"> <li>Water detectives</li> <li>Compare GLOBE atmosphere protocols for Winter and Summer</li> </ol>

	<ul style="list-style-type: none"> <li>Know that heating and cooling can cause changes of state in common materials.</li> </ul>	1. Seasons Investigations
1. Understand concepts of motion and forces.	1. Investigate the effect of pull/push on the motion and direction of objects.	n/a
	<ul style="list-style-type: none"> <li>Recognize different forms of energy.</li> </ul>	n/a
	<ul style="list-style-type: none"> <li>Explore and investigate the six simple machines: demonstrate that the six simple machines can decrease the amount of force necessary to complete a task.</li> </ul>	n/a
1. Understand the total energy in the universe is constant.	1. 1. Compare and contrast potential and kinetic energy.	n/a

**75. CELLULAR AND MOLECULAR CONCEPTS.**

*Cellular and Molecular Concepts standards do not apply at this grade level.*

**77. INTERDEPENDENCE OF ORGANISMS AND BIOLOGICAL CHANGE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
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1. Understand the theory of biological evolution.	1. Investigate diversity of plants and animals and how they adapt in order to survive in their environment.	1. Macro invertebrate study 2. GLOBE bird investigation
	<ul style="list-style-type: none"> <li>Investigate how plants and animals become extinct if their adaptations do not fit their environment.</li> </ul>	1. Macro invertebrate study 2. GLOBE bird investigation 3. GLOBE landcover activities
	<ul style="list-style-type: none"> <li>Recognize the difference between vertebrate and invertebrate animals: classify vertebrate animals (mammals, reptiles, birds, fish, amphibians).</li> </ul>	1. Macro invertebrate study 2. GLOBE bird investigation.

#### 78. MATTER, ENERGY, AND ORGANIZATION IN LIVING SYSTEMS.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the relationship between matter, energy, and organization to trace matter as it cycles and energy as it flows through living systems and between	1. Know that living systems require energy to survive.	1. 1. Learn about different systems that keep a tree alive ("Project Learning Tree," Tree Factory). 2. Identify the components of a habitat and the

<p>living systems and the environment.</p>		<p>basic need for them ("Project Wild," Habitat Lap Sit Activity).</p> <p>3. Choose an animal in your hydrology site and create a diorama or mobile of that animal in their habitat keeping in mind their needs.</p>
	<p>1. Understand the food chain and know that organisms both cooperate and compete in ecosystems.</p>	<p>1.</p> <p>1. Macro invertebrate study</p> <p>2. GLOBE bird activity</p>

**79. EARTH AND SPACE SYSTEMS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<p>1. Understand scientific theories of origin and subsequent changes in the universe and earth systems.</p>	<p>1. Explore the length of a day, the seasons, the year, phases of the moon, and eclipses.</p>	<p>1. GLOBE Seasons activities</p> <p>2. GLOBE Atmosphere activities</p> <p>3. Solar noon activity</p>

	<ul style="list-style-type: none"> <li>• Compare and contrast the contents of the solar system.</li> </ul>	n/a
	<ul style="list-style-type: none"> <li>• Explore the effect of gravity on the solar system; include elements within the solar system such as the Earth, Moon and tides.</li> </ul>	n/a

**79. TECHNOLOGY.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ol style="list-style-type: none"> <li>1. Understand the relationship between science and technology and develop the abilities of technological design and application.</li> </ol>	<ol style="list-style-type: none"> <li>1. Know that technology is the means by which people use knowledge, tools, and systems to make their lives easier and better.</li> </ol>	<ol style="list-style-type: none"> <li>1. Explore the history of the microscope, telescope, telephone, computer, and how advances in technology has improved the device.</li> <li>2. Tree versus computer.</li> </ol>
	<ol style="list-style-type: none"> <li>1. Recognize that people have invented tools for everyday life and for scientific investigations.</li> </ol>	<ol style="list-style-type: none"> <li>1. Choose an invention, write about the inventor, and describe any advances that have improved the invention and everyday life.</li> </ol>



	<ol style="list-style-type: none"> <li>1. Create a tool to perform a specific function.</li> </ol>	<ol style="list-style-type: none"> <li>1.             <ol style="list-style-type: none"> <li>1. Tubular densiometer</li> <li>2. 45 degree clinometers</li> </ol> </li> </ol>
	<ol style="list-style-type: none"> <li>1. Use available and appropriate technology.</li> </ol>	<ol style="list-style-type: none"> <li>1.             <ol style="list-style-type: none"> <li>1. Use GLOBE website</li> <li>2. Use 45 degree clinometer for finding the height of a tree</li> </ol> </li> </ol>

**79. PERSONAL AND SOCIAL PERSPECTIVES.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ol style="list-style-type: none"> <li>1. Understand common environmental quality issues, both natural and human induced.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify issues in the local environment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Collect newspaper and magazine articles.</li> <li>2. Make a current issue's bulletin board.</li> <li>3. Discuss issues and possible solutions.</li> <li>4. Write a letter to government representatives or the newspaper.</li> <li>5. Write a letter to GLOBE Scientists.</li> </ol>
<ol style="list-style-type: none"> <li>1. Understand the causes and effects of population change.</li> </ol>	<ol style="list-style-type: none"> <li>1. Understand the effect of technological development and human population</li> </ol>	<ol style="list-style-type: none"> <li>1. Students examine LandSat images from around the world</li> </ol>

	<p>growth on local towns and/or Idaho.</p>	<p>2. Students use the NASA Earth at Night Image to estimate population</p>
<p>1. Understand the importance of natural resources and the need to manage and conserve them.</p>	<p>1. Understand the concept of recycling.</p>	<p>1.</p> <ol style="list-style-type: none"> <li>1. Participate in a recycling program.</li> <li>2. Field trip to a recycling center.</li> <li>3. Make your own recycled paper.</li> <li>4. Build a compost pile.</li> <li>5. Make things (planters, bird feeders, mobiles, toys) using recyclable materials.</li> </ol>
	<p>1. Understand the conservation of natural resources.</p>	<ol style="list-style-type: none"> <li>1. Measure classroom and home resource use (how much water to wash hands, brush teeth, drinking).</li> <li>2. Guest speakers from various natural resource and conservation professions.</li> </ol>
<p>1. Understand different uses of technology in science and how</p>	<p>1. Identify examples of technologies used in scientific fields.</p>	<ol style="list-style-type: none"> <li>1. Brainstorm what technologies are used in a particular field (</li> <li>2. Guest speaker from above to describe</li> </ol>

they affect our standard of living.		technology used. Compare brainstorm results with actual technology used.
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**79. HISTORY OF SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the significance of major scientific milestones.	1. Understand major contributions of various scientists and researchers.	i. Scientists Corner

**79. INTERDISCIPLINARY CONCEPTS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand that interpersonal relationships are important in scientific endeavors.	1. Work in teams to solve problems.	1. Give a task to perform individually and as a group (GLOBE protocols). 2. Student Research Projects
1. Understand technical communication.	1. Read and understand instructions.	1. Give students a GLOBE Protocol to follow and compare results.

**584. -- 586. (RESERVED).**

**602. SCIENCE STANDARDS . GRADES 5-6.**

The samples associated with the content standards are meant to illustrate meaning and to represent possible areas of applications. They are not intended to be an exhaustive list, but are samples of applications that would demonstrate learning.

### 3. UNIFYING CONCEPTS OF SCIENCE.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand systems, order, and organization.	1. Know that a system is an organized group of related objects that form a whole.	<ol style="list-style-type: none"> <li>1. Using a clear plastic container, create a biome using soil, plants, and earthworms.</li> <li>2. Explain the water cycle</li> <li>3. Earth as a System Activity</li> <li>4. Blue Marble Activity</li> </ol>
1. Understand concepts and processes of evidence, models, and explanation.	<ol style="list-style-type: none"> <li>1. Know that observations and data are evidence on which to base scientific explanations and predictions.</li> </ol>	<ol style="list-style-type: none"> <li>1. Compare biomes with different variables such as light, temperature, water.</li> <li>2. Compare and graph temperature data from GLOBE schools in various latitudes and longitudes .</li> </ol>
	<ol style="list-style-type: none"> <li>1. Know the difference between observations and inferences.</li> </ol>	<ol style="list-style-type: none"> <li>1. Use GLOBE remote sensing images to find differences between observation and inference.</li> <li>2. During a GLOBE investigation experiment, discuss the difference</li> </ol>

		between observation and inference.
	<ol style="list-style-type: none"> <li>1.             <ol style="list-style-type: none"> <li>1. Use models to explain or demonstrate a concept.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. ESS poster activity.</li> </ol>
	<ol style="list-style-type: none"> <li>1.             <ol style="list-style-type: none"> <li>1. Develop skills to create scientific explanations based on scientific knowledge, logic, and analysis.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1.             <ol style="list-style-type: none"> <li>1. GLOBE student research projects</li> <li>2. Students propose project</li> </ol> </li> </ol>
<ol style="list-style-type: none"> <li>1. Understand constancy, change, and measurement.</li> </ol>	<ol style="list-style-type: none"> <li>1.             <ol style="list-style-type: none"> <li>1. Recognize that some concepts in science do not change with time.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Water Cycle</li> <li>2. Seasons Investigation</li> <li>3. Hydrology Investigation</li> </ol>
	<ol style="list-style-type: none"> <li>1.             <ol style="list-style-type: none"> <li>1. Analyze changes that occur in and among systems.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. GLOBE investigations.</li> <li>2. Measure the temperature of air in different colored shelters over time.</li> </ol>
	<ol style="list-style-type: none"> <li>1.             <ol style="list-style-type: none"> <li>1. Measure using standard and</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Measure various objects (temperature, volume, weight,</li> </ol>

	metric systems with an emphasis on the metric system.	length) using both metric and customary systems.
1. Understand the theory that evolution is a process that relates to the gradual changes in the universe and of equilibrium as a physical state.	1. 1. Understand the relationships of past, present, and future.	1. GLOBE soil investigation 2. Create and demonstrate an erosion model with sand, gravel, humus, and dirt before and after addition of vegetation and other soil components. 3. Seasons investigation 4. GLOBE Phenology
1. Understand concepts of form and function.	1. 1. Understand that the shape or form of an object or system is frequently related to its use or function.	1. GLOBE Bird Activity 2. GLOBE Macroinvertebrates

#### 4. CONCEPTS OF SCIENTIFIC INQUIRY.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
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<p>1. Understand scientific inquiry and develop critical thinking skills.</p>	<p>1. Develop questions that can be answered by conducting scientific experiments.</p>	<p>1. GLOBE student research projects</p>
	<p>1. Conduct scientific investigations using controls and variables when appropriate.</p>	<p>1. GLOBE student research projects. 2. Conduct an experiment to test several variables.</p>
	<p>1. Select and use appropriate tools and techniques to gather and display data.</p>	<p>1. 1. GLOBE graphing and Visualization 2. GLOBE manual mapping of Land Cover</p>
	<p>1. Analyze data in order to develop descriptions, explanations, predictions, and models using evidence.</p>	<p>1. Develop an explanation using GLOBE data 2. GLOBE graphing and Visualizations</p>
	<p>1. Develop a hypothesis based on observations.</p>	<p>1. GLOBE student research projects</p>
	<p>1. Compare alternative explanations and predictions.</p>	<p>1. Discuss and recognize other possible variables.</p>

	<ol style="list-style-type: none"> <li>1. Communicate scientific procedures and explanations.</li> </ol>	<ol style="list-style-type: none"> <li>1. Have class present data to a music teacher in written or oral form. Present data to the class in a meaningful way.</li> <li>2. Present findings on the GLOBE student research site</li> </ol>
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**5. CONCEPTS OF PHYSICAL SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ol style="list-style-type: none"> <li>1. Understand the structure and function of matter and molecules and their interactions.</li> </ol>	<ol style="list-style-type: none"> <li>1. Explore and describe the differences among elements, compounds, and mixtures.</li> </ol>	<ol style="list-style-type: none"> <li>1. n/a</li> </ol>
	<ol style="list-style-type: none"> <li>1. Explore and calculate properties of matter.</li> </ol>	<ol style="list-style-type: none"> <li>1. n/a</li> </ol>
	<ol style="list-style-type: none"> <li>1. Compare differences among solids, liquids, and gases using the concept of density: explore the effect of temperature on density.</li> </ol>	<ol style="list-style-type: none"> <li>1. n/a</li> </ol>
	<ol style="list-style-type: none"> <li>1. Understand the nature of physical change and how it relates to physical properties.</li> </ol>	<ol style="list-style-type: none"> <li>1. n/a</li> </ol>



1. Understand chemical reactions.	1. 1. Observe and know that substances react with each other to form new substances with different properties.	1. n/a
1. Understand concepts of motion and forces.	1. 1. Observe the effects of different forces (gravity and friction) on the movement, speed, and direction of an object.	1. n/a
	1. 1. Investigate different forms of energy.	1. n/a

## 6. CELLULAR AND MOLECULAR CONCEPTS.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the cell is the basis of form and function for all living things and how living things carry out their life functions.	1. Explore the different structural levels of which an organism is comprised: cells, tissues, organs, organ systems, and organisms.	1. n/a
	1. Recognize the structural differences between plant and animal cells.	1. 1. n/a

	1. Explore the concept that traits are passed from parents to offspring.	1. n/a
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**7. INTERDEPENDENCE OF ORGANISMS AND BIOLOGICAL CHANGE.**

**Interdependence of Organisms and Biological Change standards do not apply at this grade level.**

**8. MATTER, ENERGY, AND ORGANIZATION IN LIVING SYSTEMS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the relationship between matter, energy, and organization to trace matter as it cycles and energy as it flows through living systems and between living systems and the environment.	1. Know that the energy for life is primarily derived from the sun through photosynthesis.	1. Plant grass in small container. Put some grass in the dark and some in the sunlight. Compare results. 2. GLOBE grassland protocol 3. GLOBE Biomass protocol

**7. EARTH AND SPACE SYSTEMS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand scientific theories of	1. Investigate the interactions between the solid earth,	1. Research topics: pollution, oceans affect on climate,

<p>origin and subsequent changes in the universe and earth systems.</p>	<p>oceans, atmosphere, and organisms.</p>	<p>global warming, weather, plate tectonics or continental drift.  2. GLOBE Investigations  3. Student Research projects  4. GLOBE visualizations</p>
	<p>1. Know the water cycle and its relationship to weather and climate.</p>	<p>i. Students explain the water cycle and illustrate an example..</p>
	<ul style="list-style-type: none"> <li>Identify cumulus, cirrus, and stratus clouds and their relationship to weather changes.</li> </ul>	<p>i. GLOBE Cloud ID protocol</p>
	<ul style="list-style-type: none"> <li>Know that fossils are evidence of past life forms.</li> </ul>	<p>1. n/a</p>
<p>1. Understand geo-chemical cycles and energy in the earth system.</p>	<p>1.  1.  1. Know the rock cycle and identify the three classifications of rocks.</p>	<p>1. n/a</p>
	<p>1.  1.  1. Know the layers and</p>	<p>1. n/a</p>

	composition of the earth.	
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**7. TECHNOLOGY.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
1. Understand the relationship between science and technology and develop the abilities of technological design and application.	1. Know that science and technology are human endeavors interrelated to each other, to society, and to the work place.	1. Participate in a GLOBE web chat 2. Scientists Corner
	1. Compare scientific inquiry and technological design in terms of activities, results, and influences on individuals and society: know that science enables technology and vice versa.	1. n/a
	1. Create a tool to perform a specific function.	i. GLOBE densimeters, clinometers, transparency tubes
	<ul style="list-style-type: none"> <li>Use available and appropriate technology.</li> </ul>	i. Use GLOBE website
	<ul style="list-style-type: none"> <li>Explore the elements of technological design,</li> </ul>	1. 1. n/a.

	<p>which include the following:</p> <ul style="list-style-type: none"> <li>- Identify a problem;</li> <li>- Propose a solution;</li> <li>- Implement a proposed solution;</li> <li>- Evaluate the solution and its consequences;</li> <li>- Communicate the problem, process, and solution.</li> </ul>	
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**7. PERSONAL AND SOCIAL PERSPECTIVES.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<p>1. Understand common environmental quality issues, both natural and human induced.</p>	<p>1. Identify issues for environmental studies.</p>	<p>1. Research an environmental issue and describe its impact on the United States using GLOBE data.</p>
<p>1. Understand the causes and effects of population change.</p>	<p>1. Understand the effect of technological development and human population growth on the United States and/or the world.</p>	<p>1. Compare and contrast pictures of your study sites today and ten years ago</p> <p>2. Take a field trip to the local sewage treatment center or water treatment plant.</p>

		<ol style="list-style-type: none"> <li>3. Clean up the schoolyard, park or waterway.</li> </ol>
<ol style="list-style-type: none"> <li>1. Understand the importance of natural resources and the need to manage and conserve them.</li> </ol>	<ol style="list-style-type: none"> <li>1. <ol style="list-style-type: none"> <li>1. Understand the differences between renewable and nonrenewable resources.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Separate lunchroom trash into renewable and nonrenewable resources.</li> </ol>
	<ol style="list-style-type: none"> <li>1. <ol style="list-style-type: none"> <li>1. Understand the conservation of natural resources.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Compare and contrast the different forms of transportation and their impact on natural resources, for instance, public transportation, automobiles, bicycles.</li> <li>2. Map these transportation items on a LandSat Image using manual mapping techniques</li> </ol>
<ol style="list-style-type: none"> <li>1. Understand different uses of technology in science and how they affect our standard of living.</li> </ol>	<ul style="list-style-type: none"> <li>• Identify examples of technologies used in these scientific fields: <ul style="list-style-type: none"> <li>- Food production;</li> <li>- Environmental cleanup;</li> <li>- Advances in medicine;</li> </ul> </li> </ul>	n/a

	<ul style="list-style-type: none"> <li>- Communications;</li> <li>- The space program;</li> <li>- Weather forecasting.</li> </ul>	
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• **HISTORY OF SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>• Understand the significance of major scientific milestones.</li> </ul>	<ul style="list-style-type: none"> <li>• Understand major contributions of various scientists and researchers.</li> </ul>	<ul style="list-style-type: none"> <li>• Choose a scientist in the Scientist Corner from a topic studied this year and explain how their contribution was significant to society.</li> </ul>

• **INTERDISCIPLINARY CONCEPTS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>• Understand that interpersonal relationships are important in scientific endeavors.</li> </ul>	<ul style="list-style-type: none"> <li>• Work in teams to solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>• Work in cooperative teams to solve problems.</li> <li>• Given a problem, students attempt to solve individually then solve the same problem in groups. Compare results.</li> </ul>
<ul style="list-style-type: none"> <li>• Understand technical communication.</li> </ul>	Read, understand, and follow technical instructions.	Follow instructions to perform a GLOBE protocol

- **SCIENCE STANDARDS - MIDDLE GRADES, (GRADES 7-8) SECTIONS 633 THROUGH 643.**

Based on the necessary math knowledge and skills, student maturation level, and the need for secondary level Physical Science exposure, it is recommended that Earth Science be scheduled at the middle school level. The standards reflect this recommendation.

The samples associated with the content standards are meant to illustrate meaning and to represent possible areas of applications. They are not intended to be an exhaustive list, but are samples of applications that would demonstrate learning.

- **UNIFYING CONCEPTS OF SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>• Understand systems, order, and organization.</li> </ul>	<ul style="list-style-type: none"> <li>• Define and order small systems of a whole for the purpose of investigation.</li> </ul>	<ul style="list-style-type: none"> <li>• Illustrate how different organisms interact with one another to create an ecosystem.</li> </ul> <p>Illustrate the make up and interactions of the Earth System (ESS poster).</p>
	<ul style="list-style-type: none"> <li>• Know the different structural levels of which an organism is comprised: cells, tissues, organs, organ systems, and organisms.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that there is order and predictability in the universe.</li> </ul>	<ul style="list-style-type: none"> <li>• Seasons Investigation</li> </ul>



	<ul style="list-style-type: none"> <li>• Know that patterns and similarities allow us to organize information about our universe.</li> </ul>	<ul style="list-style-type: none"> <li>• Use taxonomic key to classify trees.</li> <li>• Classify soils by physical characteristics.</li> </ul>
<ul style="list-style-type: none"> <li>• Understand concepts and processes of evidence, models, and explanation.</li> </ul>	<ul style="list-style-type: none"> <li>• Use observations and data as evidence on which to base scientific explanations and predictions.</li> </ul>	<ul style="list-style-type: none"> <li>• Create a data table or graph using GLOBE data.</li> <li>• Create a comparison graph showing the average temperature of two regions.</li> <li>• Create a graph showing how the temperature a region changes over seasonst.</li> </ul>
	<ul style="list-style-type: none"> <li>• Use observations to make defensible inferences.</li> </ul>	<ul style="list-style-type: none"> <li>• Use discrepant events to make observations and inferences to explain them.</li> <li>• Do weather predictions based on long-term GLOBE data</li> </ul>
	<ul style="list-style-type: none"> <li>• Develop and/or use models to explain or demonstrate a concept.</li> </ul>	<ul style="list-style-type: none"> <li>• Build a model of a watershed (hydrology site)</li> </ul>

	<ul style="list-style-type: none"> <li>• Develop scientific explanations based on scientific knowledge, logic, and analysis.</li> </ul>	<ul style="list-style-type: none"> <li>• GLOBE student research project</li> </ul>
<ul style="list-style-type: none"> <li>• Understand constancy, change, and measurement.</li> </ul>	<ul style="list-style-type: none"> <li>• Identify concepts in science that do not change with time.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Analyze changes that occur in and among systems.</li> </ul>	<ul style="list-style-type: none"> <li>• GLOBE ESS activity.</li> <li>• Using model cars compare the speed at different points along a ramp.</li> </ul>
	<ul style="list-style-type: none"> <li>• Measure precisely in metric units using appropriate tools.</li> </ul>	<ul style="list-style-type: none"> <li>• Measure length, volume, mass (balance), weight (scale), and temperature.</li> </ul>
<ul style="list-style-type: none"> <li>• Understand the theory that evolution is a process that relates to the gradual changes in the universe and of equilibrium as a physical state.</li> </ul>	<ul style="list-style-type: none"> <li>• Understand the relationships of past, present, and future.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Understand that evolution refers to the biological, geological, or</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>

	astronomical change over time.	
	<ul style="list-style-type: none"> <li>Understand that equilibrium is a physical state of balance in which changes and forces occur in opposite and offsetting directions.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

• **CONCEPTS OF SCIENTIFIC INQUIRY.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand scientific inquiry and develop critical thinking skills.</li> </ul>	<ul style="list-style-type: none"> <li>Develop complex questions that can be answered by conducting long-term studies.</li> </ul>	<ul style="list-style-type: none"> <li>Generate a question about a local water issue.</li> <li>macro invertebrates</li> <li>pH, temperature, nitrate, phosphates, turbidity, dissolved oxygen</li> </ul>
	<ul style="list-style-type: none"> <li>Design and conduct scientific investigations using controls and variables when appropriate.</li> </ul>	<ul style="list-style-type: none"> <li>Hypothesize an answer to the stated question.</li> <li>Design and conduct experiment to answer the question about your local watershed.</li> </ul>
	<ul style="list-style-type: none"> <li>Select and use appropriate tools and</li> </ul>	<ul style="list-style-type: none"> <li>Use hydrology kits, pH paper, dissolved</li> </ul>

	<p>techniques to gather and display data.</p>	<p>O<sub>2</sub> test kits, to obtain information.</p> <ul style="list-style-type: none"> <li>• Construct tables and graphs to display data.</li> </ul>
	<ul style="list-style-type: none"> <li>• Analyze data in order to form conclusions.</li> </ul>	<ul style="list-style-type: none"> <li>• Compare data obtained with national water quality standards.</li> <li>• Draw conclusions from individual or class data on the GLOBE website.</li> </ul>
	<ul style="list-style-type: none"> <li>• Think critically and logically to accept or reject a hypothesis.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain why a hypothesis was accepted or rejected.</li> </ul>
	<ul style="list-style-type: none"> <li>• Analyze alternative explanations and predictions.</li> </ul>	<ul style="list-style-type: none"> <li>• Write a letter to the Department of Environmental Quality explaining results.</li> <li>• Formulate alternative hypotheses generated from collected hydrology data.</li> </ul>
	<ul style="list-style-type: none"> <li>• Communicate and defend scientific procedures and explanations.</li> </ul>	<ul style="list-style-type: none"> <li>• Write a letter to the Department of Environmental Quality defending the results.</li> <li>• Orally defend scientific results to classmates.</li> </ul>
	<ul style="list-style-type: none"> <li>• Recognize the differences among</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>

	<p>observations, hypotheses, mathematical laws, and theories.</p>	
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• **CONCEPTS OF PHYSICAL SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand the structure and function of matter and molecules and their interactions.</li> </ul>	<ul style="list-style-type: none"> <li>Understand that all matter is made up of atoms, which may be combined in various kinds, ways, and numbers.</li> </ul>	<ul style="list-style-type: none"> <li>n/a.</li> </ul>
	<ul style="list-style-type: none"> <li>Use properties to identify matter.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Identify physical properties and know the nature of a physical change.</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrate a phase change of a substance (ice to water) by observing hydrology data from summer and winter.</li> </ul>
<ul style="list-style-type: none"> <li>Understand chemical reactions.</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrate that chemical reactions may release or consume energy.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

<ul style="list-style-type: none"> <li>Understand concepts of motion and forces.</li> </ul>	<ul style="list-style-type: none"> <li>Know how an object's position, direction of motion, and speed can be measured.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Compare and contrast the relationships among different forms of energy.</li> </ul>	n/a
<ul style="list-style-type: none"> <li>Understand that the total energy in the universe is constant.</li> </ul>	<ul style="list-style-type: none"> <li>Explain how energy can be transformed from one form to another but is neither destroyed nor created.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Understand that energy is transferred from one place to another.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

• **CELLULAR AND MOLECULAR CONCEPTS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand the cell is the basis of form and function for all living things and how living things carry out their life functions.</li> </ul>	<ul style="list-style-type: none"> <li>Know the relationships among specialized cells, tissues, organs, organ systems, and organisms.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

	<ul style="list-style-type: none"> <li>• Know the parts of plant and animal cells and the functions of the various cell structures.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that most cell functions involve chemical reactions.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that genes and chromosomes carry the information for traits.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that traits are inherited, including dominant and recessive traits.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that genetic information is replicated and passed on to new cells.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that transmission of chromosomal information to offspring occurs through asexual or sexual reproduction.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>

- **INTERDEPENDENCE OF ORGANISMS AND BIOLOGICAL CHANGE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
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<ul style="list-style-type: none"> <li>Understand the theory of biological evolution.</li> </ul>	<ul style="list-style-type: none"> <li>Know that species change over time when random variations in individuals enhance their survival and reproductive success in a particular environment.</li> </ul>	<ul style="list-style-type: none"> <li>GLOBE bird activity</li> <li>GLOBE macro invertebrate activity</li> </ul>
	<ul style="list-style-type: none"> <li>Know that species may become extinct when the environment changes and their adaptive characteristics are insufficient to allow their survival.</li> </ul>	<ul style="list-style-type: none"> <li>GLOBE bird activity</li> <li>GLOBE macro invertebrate study.</li> </ul>
	<ul style="list-style-type: none"> <li>Know that biological classifications are based on similarities, which reflect their evolutionary relationships.</li> </ul>	<ul style="list-style-type: none"> <li>Classify a tree using a dichotomous key</li> </ul>

**MATTER, ENERGY, AND ORGANIZATION IN LIVING SYSTEMS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand the relationship between matter, energy, and organization to trace matter as it cycles and energy as it flows through living systems and</li> </ul>	<ul style="list-style-type: none"> <li>Know that the energy stored in food is primarily derived from the sun through photosynthesis.</li> </ul>	



<p>between living systems and the environment.</p>		
	<ul style="list-style-type: none"> <li>• Know that the distribution and abundance of organisms and populations in ecosystems are limited by the availability of matter and energy.</li> </ul>	<ul style="list-style-type: none"> <li>• Complete and discuss the "Project Wild" How Many Bears Are in the Forest?</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that atoms and molecules cycle among the living and nonliving components of the biosphere.</li> </ul>	<ul style="list-style-type: none"> <li>• Diagram photosynthesis and respiration (oxygen cycle).</li> <li>• Diagram the carbon cycle and nitrogen cycle.</li> </ul>
	<ul style="list-style-type: none"> <li>• Trace energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain a food chain or the food pyramid, showing what happens to energy that came originally from the sun.</li> </ul>
<ul style="list-style-type: none"> <li>• Understand the individual behavior of organisms and their interactions in populations and communities as</li> </ul>	<ul style="list-style-type: none"> <li>• Know that organisms have behavioral responses to</li> </ul>	

influenced by physiological and environmental factors.	internal and external stimuli.	
	b. Know that living organisms have the capacity to produce populations of infinite size but that environments and resources are finite.	<ul style="list-style-type: none"> <li>Start with a large bag of M&amp;Ms. One student representing the first generation removes M&amp;Ms with a spoon into a cup. One student representing the second generation removes M&amp;Ms with a spoon into a cup. Allow each successive generation five seconds to fill cups until M&amp;Ms are depleted. Discuss and relate to other finite resources.</li> </ul>

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- **EARTH AND SPACE SYSTEMS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand scientific theories of origin and subsequent changes in the universe and earth systems.</li> </ul>	<ul style="list-style-type: none"> <li>Know that there are interactions among the solid earth, oceans, atmosphere, and organisms, which result in a change of the earth's system. (Some interactions are observable such as earthquakes and volcanic eruptions, but many take</li> </ul>	<ul style="list-style-type: none"> <li>Students will create links between the categories of the ESS poster.</li> </ul>

	place over hundreds of millions of years.)	
	<ul style="list-style-type: none"> <li>Compare earth with other planets with emphasis on conditions necessary for life.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Understand the motions that explain such occurrences as the day, the seasons, the year, phases of the moon, eclipses, and tides.</li> </ul>	<ul style="list-style-type: none"> <li>ESS poster activity showing the motions of solar energy</li> </ul>
	<ul style="list-style-type: none"> <li>Know that the development of life caused dramatic changes in the composition of the earth's atmosphere.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that the universe is constantly expanding.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that stars and galaxies have a life cycle.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know methods used to estimate geologic time (observing rock sequences, using fossils to correlate the sequences at various locations).</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
<ul style="list-style-type: none"> <li>Understand geo-chemical cycles and energy in</li> </ul>	<ul style="list-style-type: none"> <li>Know that earth systems have internal and external sources of energy.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

the earth system.		
	<ul style="list-style-type: none"> <li>Know that the earth's internal heat causes the plates of the earth's surface to move.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that the heating of the earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents affecting global climate.</li> </ul>	<ul style="list-style-type: none"> <li>GLOBE visualizations</li> </ul>

• **TECHNOLOGY.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand the relationship between science and technology and develop the abilities of technological design and application.</li> </ul>	<ul style="list-style-type: none"> <li>Know that science and technology are human endeavors interrelated to each other, to society, and to the work place.</li> </ul>	<ul style="list-style-type: none"> <li>Explain how science has aided in the development of a GLOBE technological device and how that device has aided in the advancement of science.</li> </ul>

	<ul style="list-style-type: none"> <li>Compare and contrast scientific inquiry and technological design in terms of activities, results, and influence on individuals and society: know that science enables technology and vice versa.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Create a tool to perform a specific function.</li> </ul>	<ul style="list-style-type: none"> <li>i. Create a densiometer.</li> <li>ii. Create a clinometer.</li> </ul>
	<ul style="list-style-type: none"> <li>Use available and appropriate technology.</li> </ul>	<ul style="list-style-type: none"> <li>i. Use the GLOBE website</li> </ul>
	<ul style="list-style-type: none"> <li>Know the elements of technological design, which include the following: <ul style="list-style-type: none"> <li>- Identify a problem;</li> <li>- Propose a solution;</li> <li>- Implement a proposed solution;</li> <li>- Evaluate the solution and its consequences;</li> <li>- Communicate the problem, process, and solution.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Construct a device or product that will improve some aspect of the GLOBE program or solve a problem.</li> </ul>

- PERSONAL AND SOCIAL PERSPECTIVES.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand common environmental quality issues, both natural and human induced.</li> </ul>	<ul style="list-style-type: none"> <li>Identify environmental issues and conduct studies.</li> </ul>	<ul style="list-style-type: none"> <li>Compile a case study of a local environmental issue and describe its impact on Idaho's economy.</li> </ul>
<ul style="list-style-type: none"> <li>Understand the causes and effects of population change.</li> </ul>	<ul style="list-style-type: none"> <li>Understand the effect of technological development and the growth of human population on the living and nonliving components of the environment.</li> </ul>	<ul style="list-style-type: none"> <li>Take a field trip to the local sewage treatment center or water treatment plant.</li> <li>Clean up the schoolyard, a park, or a waterway.</li> </ul>
<ul style="list-style-type: none"> <li>Understand the importance of natural resources and the need to manage and conserve them.</li> </ul>	<ul style="list-style-type: none"> <li>Explore alternative sources of energy.</li> </ul>	<ul style="list-style-type: none"> <li>Collect trash and divide into renewable and nonrenewable resources.</li> <li>Visit a managed forest or mine.</li> </ul>
	<ul style="list-style-type: none"> <li>Understand the role and effect of management of natural resources.</li> </ul>	<ul style="list-style-type: none"> <li>Discuss the use of fire in a forest management program.</li> </ul>

- HISTORY OF SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand the significance of major scientific milestones.</li> </ul>	<ul style="list-style-type: none"> <li>Understand the impact of historical scientific events.</li> </ul>	<ul style="list-style-type: none"> <li>Create a timeline showing scientific events.</li> <li>Compile a timeline of GLOBE data from certain locations</li> </ul>

**• INTERDISCIPLINARY CONCEPTS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand that interpersonal relationships are important in scientific endeavors.</li> </ul>	<ul style="list-style-type: none"> <li>Work in teams to solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct an GLOBE student research experiment while working on a team.</li> </ul>
<ul style="list-style-type: none"> <li>Understand technical communication.</li> </ul>	<ul style="list-style-type: none"> <li>Read, understand, and follow technical instructions.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct a GLOBE protocol</li> </ul>
	<ul style="list-style-type: none"> <li>Write and articulate technical information.</li> </ul>	<ul style="list-style-type: none"> <li>Keep a lab notebook of GLOBE protocols and data.</li> </ul>
	<ul style="list-style-type: none"> <li>Write a long-term investigation.</li> </ul>	<ul style="list-style-type: none"> <li>GLOBE student research projects.</li> </ul>

644. -- 646. (RESERVED).

647. SCIENCE STANDARDS. . GRADES 9 THROUGH 12, SECTIONS 648 THROUGH 658.

The samples associated with the content standards are meant to illustrate meaning and to represent possible areas of application. They are not intended to be an exhaustive list, but are samples of applications that would demonstrate learning.

648. UNIFYING CONCEPTS OF SCIENCE.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand systems, order, and organization.</li> </ul>	<ul style="list-style-type: none"> <li>Know the scientific meaning and application of the concepts of system, order, and organization.</li> </ul>	<ul style="list-style-type: none"> <li>ESS poster activity</li> </ul>
<ul style="list-style-type: none"> <li>Understand concepts and processes of evidence, models, and explanation.</li> </ul>	<ul style="list-style-type: none"> <li>Know that observations and data are evidence on which to base scientific explanations.</li> </ul>	<ul style="list-style-type: none"> <li>ESS poster activity</li> <li>Base predictions off of accumulations of GLOBE weather data</li> </ul>
	<ul style="list-style-type: none"> <li>Use models to explain how things work.</li> </ul>	<ul style="list-style-type: none"> <li>Build and demonstrate a model of the water cycle.</li> </ul>
	<ul style="list-style-type: none"> <li>Develop scientific explanations based on scientific knowledge, logic, and analysis.</li> </ul>	<ul style="list-style-type: none"> <li>Through research explain the value of a recycling program.</li> </ul>
<ul style="list-style-type: none"> <li>Understand constancy, change, and measurement.</li> </ul>	<ul style="list-style-type: none"> <li>Identify constancy in some concepts in science that do not change with time</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>



	such as the speed of light.	
	<ul style="list-style-type: none"> <li>Recognize that change occurs in and among systems and change can be measured.</li> </ul>	<ul style="list-style-type: none"> <li>Atmosphere protocols</li> <li>Soils protocols</li> </ul>
	<ul style="list-style-type: none"> <li>Measure in both the metric and U.S. customary system.</li> </ul>	<ul style="list-style-type: none"> <li>Record Celsius and Fahrenheit temperature readings over a period of time.</li> </ul>
<ul style="list-style-type: none"> <li>Understand the theory that evolution is a process that relates to the gradual changes in the universe and of equilibrium as a physical state.</li> </ul>	<ul style="list-style-type: none"> <li>Know that the present arises from materials and forms of the past.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Understand evolution as a series of changes, some gradual and some sporadic, that account for present form and function of objects, organisms, and natural or mechanical systems.</li> </ul>	<ul style="list-style-type: none"> <li>GLOBE bird activity</li> <li>Macroinvertebrate activity.</li> </ul>
	<ul style="list-style-type: none"> <li>Know that equilibrium is a physical state in which forces and changes occur in opposite and offsetting directions.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

<ul style="list-style-type: none"> <li>Understand concepts of form and function.</li> </ul>	<ul style="list-style-type: none"> <li>Know that form refers to function and function refers to form.</li> </ul>	<ul style="list-style-type: none"> <li>GLOBE bird activity</li> <li>Macroinvertebrate activity</li> </ul>
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**649. CONCEPTS OF SCIENTIFIC INQUIRY.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand scientific inquiry and develop critical thinking skills.</li> </ul>	<ul style="list-style-type: none"> <li>Identify questions and concepts that guide scientific investigations.</li> </ul>	<ul style="list-style-type: none"> <li>GLOBE student research projects.</li> </ul>
	<ul style="list-style-type: none"> <li>Design and conduct scientific investigations.</li> </ul>	<ul style="list-style-type: none"> <li>GLOBE student research projects</li> </ul>
	<ul style="list-style-type: none"> <li>Use technology and mathematics to improve investigations and communication.</li> </ul>	<ul style="list-style-type: none"> <li>Students use GLOBE website to communicate and collaborate with other schools.</li> </ul>
	<ul style="list-style-type: none"> <li>Formulate and revise scientific explanations and models using logic and evidence.</li> </ul>	<ul style="list-style-type: none"> <li>Students will predict weather data based on previous GLOBE atmosphere data</li> <li>Students will predict water test values based on previous GLOBE hydrology data.</li> </ul>
	<ul style="list-style-type: none"> <li>Recognize and analyze alternative explanations and models.</li> </ul>	<ul style="list-style-type: none"> <li>i. Students will be presented hydrology values from stream site and will be asked to explain the results</li> </ul>

	<ul style="list-style-type: none"> <li>Communicate and defend a scientific argument.</li> </ul>	i. GLOBE student research projects
	<ul style="list-style-type: none"> <li>Know the differences among observations, hypotheses, and theories.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

## 650. CONCEPTS OF PHYSICAL SCIENCE.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand the structure of atoms.</li> </ul>	<ul style="list-style-type: none"> <li>Know the function and location of protons, neutrons, and electrons.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Understand the processes of fission and fusion.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know the characteristics of isotopes.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know the basic electrical properties of matter.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
<ul style="list-style-type: none"> <li>Understand the structure and function of matter and molecules and their interactions.</li> </ul>	<ul style="list-style-type: none"> <li>Know how atoms interact with one another by transferring or sharing electrons.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know how bonds between atoms are created when electrons are shared or transferred to form molecules or ionic substances.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know how the physical properties of compounds reflect</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

	the nature of the interactions among its molecules.	
	<ul style="list-style-type: none"> <li>Know how solids, liquids, and gases differ in the energy that bonds them together.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
<ul style="list-style-type: none"> <li>Understand chemical reactions.</li> </ul>	<ul style="list-style-type: none"> <li>Know that chemical reactions may release or consume energy.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that chemical reactions can occur in time periods that vary from very fast to very slow and that catalysts can affect the rate of a chemical reaction.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Identify chemical reactions that are occurring all around us.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
<ul style="list-style-type: none"> <li>Understand concepts of motion and forces.</li> </ul>	<ul style="list-style-type: none"> <li>Know that gravitational force and electrical force are universal forces.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that objects change their motion only when a net force is applied.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Understand that moving electrical charges produce magnetic forces, and moving magnets produce electrical forces.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
<ul style="list-style-type: none"> <li>Understand that the total energy in the universe is constant.</li> </ul>	<ul style="list-style-type: none"> <li>Understand that energy can be transferred but it can neither be destroyed nor created.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that energy can be classified as either potential</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

	energy, kinetic energy, or energy contained by a field.	
	<ul style="list-style-type: none"> <li>Know that heat is evidenced by random motion and the vibrations of atoms, molecules, and ions.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that energy is transferred by various types of waves and by electrons flowing through matter.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

### 651. CELLULAR AND MOLECULAR CONCEPTS.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand the cell is the basis of form and function for all living things and how living things carry out their life functions.</li> </ul>	<ul style="list-style-type: none"> <li>Know that cells have particular structures that underlie their functions.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that most cell functions involve chemical reactions.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that cells store and use information in the form of DNA to guide their functions.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that cell functions are regulated by expressed genes that provide code for the synthesis of proteins.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that cellular differentiation is regulated through the expression of different genes. A single cell can</li> </ul>	n/a

	differentiate to form many specialized cells, tissues, and organs.	
<ul style="list-style-type: none"> <li>Understand the form and function of DNA.</li> </ul>	<ul style="list-style-type: none"> <li>Know that the instructions for specifying the characteristics of the organism are carried in DNA.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that genetic information is both encoded in genes and replicated.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that most of the cells in a human contain 23 pairs of chromosomes, and that transmission of chromosomal information to offspring occurs through the combination of egg and sperm cells.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that changes in DNA (mutations) occur spontaneously at low rates. Some of these changes make no difference to the organism whereas others can change cells and organisms. Only mutations in gametes can create the variation that changes an organism's off-spring.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that DNA plays a major role in health issues. Through the development of new technologies we have discovered new information about the human genome, medical disorders, and forensic sciences.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

**652. INTERDEPENDENCE OF ORGANISMS AND BIOLOGICAL CHANGE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand the theory of</li> </ul>	<ul style="list-style-type: none"> <li>Know that the theory of evolution explains how species evolve over time and how</li> </ul>	<ul style="list-style-type: none"> <li>GLOBE bird activity</li> </ul>

<p>biological evolution_</p>	<p>evolution is the consequence of interactions of:</p> <ul style="list-style-type: none"> <li>- Potential of a species to increase its numbers;</li> <li>- Genetic variability;</li> <li>- A finite supply of resources;</li> <li>- Selection by the environment of those offspring better able to survive and leave offspring.</li> </ul>	<ul style="list-style-type: none"> <li>• GLOBE macro invertebrates activity</li> <li>• Explain why some species have changed little over time and others have become extinct.</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of organisms.</li> </ul>	<p>n/a</p>
	<ul style="list-style-type: none"> <li>• Know that the theory of evolution explains how different species of plants, animals, and microorganisms that live on earth today are related by descent from common ancestors.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that biological classifications are based on similarities, which reflect their evolutionary relationships.</li> </ul>	<ul style="list-style-type: none"> <li>• Classify an tree using a dichotomous key.</li> </ul>
<ul style="list-style-type: none"> <li>• Understand the interdependence of organisms.</li> </ul>	<ul style="list-style-type: none"> <li>• Know that atoms and molecules cycle among the living and nonliving components of the biosphere.</li> </ul>	<ul style="list-style-type: none"> <li>• Diagram the water cycle.</li> <li>• Diagram a food web</li> </ul>

	<ul style="list-style-type: none"> <li>Trace energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers.</li> </ul>	<ul style="list-style-type: none"> <li>Explain a food chain.</li> </ul>
	<ul style="list-style-type: none"> <li>Know that organisms both cooperate and compete in ecosystems.</li> </ul>	<ul style="list-style-type: none"> <li>Explain niches in an ecosystem.</li> </ul>
	<ul style="list-style-type: none"> <li>Know that living organisms have the capacity to produce populations of infinite size, but environments and resources are finite.</li> </ul>	<ul style="list-style-type: none"> <li>i. List limiting factors of a population in a closed environment.</li> </ul>
	<ul style="list-style-type: none"> <li>Know that human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption.</li> </ul>	<ul style="list-style-type: none"> <li>i. Conduct an extended investigation of a local land cover area affected by human actions.</li> </ul>

**653. MATTER, ENERGY, AND ORGANIZATION IN LIVING SYSTEMS.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand the relationship between matter, energy, and organization to trace matter as it cycles and energy as it flows through living systems and between living systems and the environment.</li> </ul>	<ul style="list-style-type: none"> <li>Know that all matter tends toward more disorganized states.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that living systems require a continuous input of energy to</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>



	<p>maintain their chemical and physical organization.</p>	
	<ul style="list-style-type: none"> <li>• Know that the energy for life is primarily derived from the sun through photosynthesis.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Understand cellular respiration and the synthesis of macromolecules.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that chemical bonds of food molecules contain energy, which is released when the bonds are broken.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that cells usually store energy as Adenosine Triphosphate (ATP).</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Know that the distribution and abundance of organisms and populations in ecosystems are limited by the availability of matter and energy.</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
	<ul style="list-style-type: none"> <li>• Trace how matter cycles and energy flows through different levels of organization of living systems - cells, organs, organisms, communities - and between living</li> </ul>	<ul style="list-style-type: none"> <li>• Construct a food web for a community of organisms and explain how elimination of a particular part of a chain affects the rest of the chain</li> </ul>

	systems and the physical environment.	and web. Diagram the carbon and oxygen cycles.
<ul style="list-style-type: none"> <li>Understand the individual behavior of organisms and their interactions in populations and communities as influenced by physiological and environmental factors.</li> </ul>	<ul style="list-style-type: none"> <li>Know that multi-cellular animals have nervous systems that generate behavior.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that the nerve cells communicate with each other by secreting specific excitatory and inhibitory molecules.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that organisms have behavioral responses to internal changes and to external stimuli., The and that broad patterns of behavior have evolved to ensure reproductive success.</li> </ul>	<ul style="list-style-type: none"> <li>i. n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that behaviors often have an adaptive logic when viewed in terms of natural selection.</li> </ul>	<ul style="list-style-type: none"> <li>i. n/a</li> </ul>

#### 654. EARTH AND SPACE SYSTEMS.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
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<ul style="list-style-type: none"> <li>Understand scientific theories of origin and subsequent changes in the universe and earth systems.</li> </ul>	<ul style="list-style-type: none"> <li>Know that current scientific theory suggests that the Sun, the Earth, and the rest of the solar system formed from a nebular cloud of dust and gas.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know methods used to estimate geologic time (observing rock sequences and using fossils to correlate the sequences at various locations).</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that interactions among the solid earth, the oceans, the atmosphere, and organisms have resulted in the ongoing change of the earth system. Some activities are observable (earthquakes and volcanic eruptions) but many take place over hundreds of millions of years.</li> </ul>	<ul style="list-style-type: none"> <li>Explain the processes involved in the formation of Hell.s Canyon or the Snake River Canyon.</li> <li>Sphere.s activity</li> </ul>
	<ul style="list-style-type: none"> <li>Know that the development of life caused dramatic changes in the composition of the earth.s atmosphere.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know that the universe is constantly expanding.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
	<ul style="list-style-type: none"> <li>Know the life history of stars and galaxies.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
<ul style="list-style-type: none"> <li>Understand geo-chemical cycles and energy in the earth system.</li> </ul>	<ul style="list-style-type: none"> <li>Know that earth systems have internal and external sources of energy, both of which create heat. The sun is the major external source of energy.</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>

	<ul style="list-style-type: none"> <li>Know that the two primary sources of internal energy are the decay of radioactive isotopes and the gravitational energy from the earth's original formation.</li> </ul>	i. n/a
	<ul style="list-style-type: none"> <li>Know that the outward transfer of earth's internal heat drives convection circulation in the mantle that propels the plates comprising the earth's surface across the face of the globe.</li> </ul>	i. n/a
	<ul style="list-style-type: none"> <li>Know that the heating of the earth's surface and atmosphere by the sun drive convection within the atmosphere and oceans, producing winds and ocean currents.</li> </ul>	i. GLOBE visualizations with El Nino
	<ul style="list-style-type: none"> <li>Know that global climate is determined by energy transfer from the sun at and near the earth's surface.</li> </ul>	<ul style="list-style-type: none"> <li>Explain why many scientists are concerned about the greenhouse effect.</li> </ul> ii. ESS poster
	<ul style="list-style-type: none"> <li>Know that the movement of matter through the solid earth, oceans, and atmosphere is driven by the earth's internal and external sources of energy. These movements are often accompanied by a change in the physical and chemical properties of matter.</li> </ul>	i. n/a

**655. TECHNOLOGY.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
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<ul style="list-style-type: none"> <li>Understand the relationship between science and technology and develop the abilities of technological design and application.</li> </ul>	<ul style="list-style-type: none"> <li>Know the ways that science advances technology and technology advances science.</li> </ul>	<p>i. Write a paper highlighting how GIS technology has advanced science and how science has advanced technology such as the telescope, microscope, computer chips, etc.</p>
	<ul style="list-style-type: none"> <li>Recognize that science and technology are pursued for different purposes and that scientific inquiry is driven by the desire to understand the natural world and technological design is driven by the need to meet human needs and solve human problems.</li> </ul>	<ul style="list-style-type: none"> <li>Compile a case study of a technological development that has had a significant impact on the environment.</li> </ul> <p>ii. GLOBE visualizations</p>
	<ul style="list-style-type: none"> <li>Know that critical thinking, creativity, imagination, and a good knowledge base are all required in the work of science and engineering.</li> </ul>	<p>i. Using GLOBE data, identify a problem or concern and utilize the scientific process to study the problem or concern and identify what technology is available to assist the process.</p>
	<ul style="list-style-type: none"> <li>Know the elements of technological design, which include the following: <ul style="list-style-type: none"> <li>- Identify a problem or design an opportunity;</li> <li>- Propose designs and choose between alternative solutions;</li> <li>- Implement a proposed solution;</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Using GLOBE data, identify a problem or concern and utilize the scientific process to study the problem or concern and identify what technology is available to assist the process.</li> </ul>

	<ul style="list-style-type: none"> <li>- Evaluate the solution and its consequences;</li> <li>- Communicate the problem, process, and solution.</li> </ul>	
	<ul style="list-style-type: none"> <li>• Use available technology to assist in solving problems.</li> </ul>	<ul style="list-style-type: none"> <li>i. Use GLOBE computer models to simulate problems and determine "what if" scenarios.</li> <li>ii. Use current computer software to develop reports and other documents to communicate information. (multispec)</li> </ul>

**656. PERSONAL AND SOCIAL PERSPECTIVES.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>• Understand common environmental quality issues, both natural and human induced.</li> </ul>	<ul style="list-style-type: none"> <li>• Identify issues, including but not limited to: <ul style="list-style-type: none"> <li>- Water quality;</li> <li>- Air quality;</li> <li>- Hazardous waste;</li> <li>- Forest health.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Using GLOBE data, Compile a case study of a local environmental issue and describe its impact on Idaho.s economy.</li> </ul>
<ul style="list-style-type: none"> <li>• Understand the causes and effects of population change.</li> </ul>	<ul style="list-style-type: none"> <li>• Understand the impact of technological development and the growth of human population on the living and nonliving environment.</li> </ul>	<ul style="list-style-type: none"> <li>i. Using GIS and landcover mapping, determine the impact of a changing population on local land use.</li> </ul>
	<ul style="list-style-type: none"> <li>• Understand the impact of population</li> </ul>	<ul style="list-style-type: none"> <li>i. Using GIS, develop a model of a community that describes</li> </ul>

	change on natural resources and community infrastructure.	the impact on natural resources and community infrastructure as the population changes.
<ul style="list-style-type: none"> <li>Understand the importance of natural resources and the need to manage and conserve them.</li> </ul>	<ul style="list-style-type: none"> <li>Understand the differences between renewable and nonrenewable resources.</li> </ul>	i. n/a.
	<ul style="list-style-type: none"> <li>Understand the differences between preservation and conservation.</li> </ul>	i. n/a
	<ul style="list-style-type: none"> <li>Understand the role and effect of management of natural resources.</li> </ul>	<ul style="list-style-type: none"> <li>Examine the role one of remote sensing and its role in the management of our public lands.</li> <li>GLOBE Visualizations</li> </ul>
<ul style="list-style-type: none"> <li>Understand different uses of technology in science and how they affect our standard of living.</li> </ul>	<ul style="list-style-type: none"> <li>Identify examples of technologies used in scientific fields, including but not limited to: <ul style="list-style-type: none"> <li>- Weather forecasting;</li> <li>- Food production;</li> <li>- Environmental cleanup;</li> <li>- Advances in medicine;</li> <li>- Communications;</li> <li>- The space program.</li> </ul> </li> </ul>	i. Identify specific technologies used in a particular scientific field and how they have affected our standards of living.

**657. HISTORY OF SCIENCE.**

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand the significance of major scientific milestones.</li> </ul>	<ul style="list-style-type: none"> <li>Understand the social and economic impact of historical scientific events.</li> </ul>	<ul style="list-style-type: none"> <li>Watch a video, "Eyes in the Sky"</li> </ul>
	<ul style="list-style-type: none"> <li>Understand the contributions of notable scientists.</li> </ul>	<ul style="list-style-type: none"> <li>GLOBE scientists corner</li> </ul>

### 658. INTERDISCIPLINARY CONCEPTS.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> <li>Understand that interpersonal relationships are important in scientific endeavors.</li> </ul>	<ul style="list-style-type: none"> <li>Know the importance of working in interdisciplinary teams to solve scientific problems.</li> </ul>	<ul style="list-style-type: none"> <li>While working in a team, use the information learned in GLOBE to study an environmental issue.</li> </ul>
<ul style="list-style-type: none"> <li>Understand technical communication.</li> </ul>	a. Read for information.	<ul style="list-style-type: none"> <li>Conduct advanced GLOBE protocols.</li> </ul>
	b. Write and articulate technical information.	i. GLOBE student research project

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