

Idaho Partners - Science Standards for Grades 7-8

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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- **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:
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<ul style="list-style-type: none"> • Understand systems, order, and organization. 	<ul style="list-style-type: none"> • Define and order small systems of a whole for the purpose of investigation. 	<ul style="list-style-type: none"> • Illustrate how different organisms interact with one another to create an ecosystem. <p>Illustrate the make up and interactions of the Earth System (ESS poster).</p>
	<ul style="list-style-type: none"> • Know the different structural levels of which an organism is comprised: cells, tissues, organs, organ systems, and organisms. 	<ul style="list-style-type: none"> • n/a
	<ul style="list-style-type: none"> • Know that there is order and predictability in the universe. 	<ul style="list-style-type: none"> • Seasons Investigation
	<ul style="list-style-type: none"> • Know that patterns and similarities allow us to organize information about our universe. 	<ul style="list-style-type: none"> • Use taxonomic key to classify trees. • Classify soils by physical characteristics.

<ul style="list-style-type: none"> • Understand concepts and processes of evidence, models, and explanation. 	<ul style="list-style-type: none"> • Use observations and data as evidence on which to base scientific explanations and predictions. 	<ul style="list-style-type: none"> • Create a data table or graph using GLOBE data. • Create a comparison graph showing the average temperature of two regions. • Create a graph showing how the temperature a region changes over seasonst.
	<ul style="list-style-type: none"> • Use observations to make defendable inferences. 	<ul style="list-style-type: none"> • Use discrepant events to make observations and inferences to explain them. • Do weather predictions based on long-term GLOBE data
	<ul style="list-style-type: none"> • Develop and/or use models to explain or demonstrate a concept. 	<ul style="list-style-type: none"> • Build a model of a watershed (hydrology site)

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

and of equilibrium as a physical state.		
	<ul style="list-style-type: none"> Understand that evolution refers to the biological, geological, or astronomical change over time. 	<ul style="list-style-type: none"> n/a
	<ul style="list-style-type: none"> Understand that equilibrium is a physical state of balance in which changes and forces occur in opposite and offsetting directions. 	<ul style="list-style-type: none"> n/a

• CONCEPTS OF SCIENTIFIC INQUIRY.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> Understand scientific inquiry and develop critical thinking skills. 	<ul style="list-style-type: none"> Develop complex questions that can be answered by conducting long-term studies. 	<ul style="list-style-type: none"> Generate a question about a local water issue. macro invertebrates pH, temperature, nitrate, phosphates,

		turbidity, dissolved oxygen
	<ul style="list-style-type: none"> Design and conduct scientific investigations using controls and variables when appropriate. 	<ul style="list-style-type: none"> Hypothesize an answer to the stated question. Design and conduct experiment to answer the question about your local watershed.
	<ul style="list-style-type: none"> Select and use appropriate tools and techniques to gather and display data. 	<ul style="list-style-type: none"> Use hydrology kits, pH paper, dissolved O₂ test kits, to obtain information. Construct tables and graphs to display data.
	<ul style="list-style-type: none"> Analyze data in order to form conclusions. 	<ul style="list-style-type: none"> Compare data obtained with national water quality standards. Draw conclusions from individual or class data on the GLOBE website.
	<ul style="list-style-type: none"> Think critically and logically to accept 	<ul style="list-style-type: none"> Explain why a hypothesis was

	or reject a hypothesis.	accepted or rejected.
	<ul style="list-style-type: none"> Analyze alternative explanations and predictions. 	<ul style="list-style-type: none"> Write a letter to the Department of Environmental Quality explaining results. Formulate alternative hypotheses generated from collected hydrology data.
	<ul style="list-style-type: none"> Communicate and defend scientific procedures and explanations. 	<ul style="list-style-type: none"> Write a letter to the Department of Environmental Quality defending the results. Orally defend scientific results to classmates.
	<ul style="list-style-type: none"> Recognize the differences among observations, hypotheses, mathematical laws, and theories. 	<ul style="list-style-type: none"> n/a

• CONCEPTS OF PHYSICAL SCIENCE.

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

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

• CELLULAR AND MOLECULAR CONCEPTS.

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

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

	through asexual or sexual reproduction.	
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• INTERDEPENDENCE OF ORGANISMS AND BIOLOGICAL CHANGE.

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

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

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Know that the energy stored in food is primarily derived from the sun through photosynthesis. 	
	<ul style="list-style-type: none"> Know that the distribution and abundance of organisms and populations in ecosystems are limited by the availability of matter and energy. 	<ul style="list-style-type: none"> Complete and discuss the "Project Wild" How Many Bears Are in the Forest?
	<ul style="list-style-type: none"> Know that atoms and molecules cycle among the living and nonliving 	<ul style="list-style-type: none"> Diagram photosynthesis and respiration (oxygen cycle).

	<p>components of the biosphere.</p>	<ul style="list-style-type: none"> • Diagram the carbon cycle and nitrogen cycle.
	<ul style="list-style-type: none"> • Trace energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers. 	<ul style="list-style-type: none"> • Explain a food chain or the food pyramid, showing what happens to energy that came originally from the sun.
<ul style="list-style-type: none"> • Understand the individual behavior of organisms and their interactions in populations and communities as influenced by physiological and environmental factors. 	<ul style="list-style-type: none"> • Know that organisms have behavioral responses to internal and external stimuli. 	
	<p>b. Know that living organisms have the capacity to produce populations of infinite size but that environments and resources are finite.</p>	<ul style="list-style-type: none"> • Start with a large bag of M&Ms. One student representing the first generation removes M&Ms with a spoon into a cup. One

		<p>student representing the second generation removes M&Ms with a spoon into a cup. Allow each successive generation five seconds to fill cups until M&Ms are depleted. Discuss and relate to other finite resources.</p>
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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"> Understand scientific theories of origin and subsequent changes in the universe and earth systems. 	<ul style="list-style-type: none"> 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 place over hundreds of millions of years.) 	<ul style="list-style-type: none"> Students will create links between the categories of the ESS poster.

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

	the sequences at various locations).	
<ul style="list-style-type: none"> Understand geo-chemical cycles and energy in the earth system. 	<ul style="list-style-type: none"> Know that earth systems have internal and external sources of energy. 	<ul style="list-style-type: none"> n/a
	<ul style="list-style-type: none"> Know that the earth's internal heat causes the plates of the earth's surface to move. 	<ul style="list-style-type: none"> n/a
	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> GLOBE visualizations

• TECHNOLOGY.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
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<ul style="list-style-type: none"> Understand the relationship between science and technology and develop the abilities of technological design and application. 	<ul style="list-style-type: none"> Know that science and technology are human endeavors interrelated to each other, to society, and to the work place. 	<ul style="list-style-type: none"> Explain how science has aided in the development of a GLOBE technological device and how that device has aided in the advancement of science.
	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> n/a
	<ul style="list-style-type: none"> Create a tool to perform a specific function. 	<ul style="list-style-type: none"> i. Create a densiometer. ii. Create a clinometer.
	<ul style="list-style-type: none"> Use available and appropriate technology. 	<ul style="list-style-type: none"> i. Use the GLOBE website
	<ul style="list-style-type: none"> Know the elements of technological 	<ul style="list-style-type: none"> Construct a device or product that will

	<p>design, which include the following:</p> <ul style="list-style-type: none"> - Identify a problem; - Propose a solution; - Implement a proposed solution; - Evaluate the solution and its consequences; - Communicate the problem, process, and solution. 	<p>improve some aspect of the GLOBE program or solve a problem.</p>
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• PERSONAL AND SOCIAL PERSPECTIVES.

Standard - The student will:	Content Knowledge and Skills:	Samples of Applications:
<ul style="list-style-type: none"> • Understand common environmental quality issues, both natural and human induced. 	<ul style="list-style-type: none"> • Identify environmental issues and conduct studies. 	<ul style="list-style-type: none"> • Compile a case study of a local environmental issue and describe its impact on Idaho's economy.
<ul style="list-style-type: none"> • Understand the causes and effects of population change. 	<ul style="list-style-type: none"> • Understand the effect of technological development and the growth of human population 	<ul style="list-style-type: none"> • Take a field trip to the local sewage treatment center or water treatment plant.

	on the living and nonliving components of the environment.	<ul style="list-style-type: none"> Clean up the schoolyard, a park, or a waterway.
<ul style="list-style-type: none"> Understand the importance of natural resources and the need to manage and conserve them. 	<ul style="list-style-type: none"> Explore alternative sources of energy. 	<ul style="list-style-type: none"> Collect trash and divide into renewable and nonrenewable resources. Visit a managed forest or mine.
	<ul style="list-style-type: none"> Understand the role and effect of management of natural resources. 	<ul style="list-style-type: none"> Discuss the use of fire in a forest management program.

• HISTORY OF SCIENCE.

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

• **INTERDISCIPLINARY CONCEPTS.**

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

644. -- 646. (RESERVED).

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