

Earth Science & Environmental Science SOL

THE SOL FOR GRADE 6

The Virginia Science SOL for Grades K–6 are organized according to a set of strands, with the SOL in each strand developed progressively through the grade levels. There are two strands for Earth science (including some environmental science), two for life science, and two for physical science. There is also a strand for science process skills and the Resources strand, which cuts across the different science areas. When the original SOL from 1995 were revised for 2003, Grade 6 was the grade level that saw the most changes. The sixth grade SOL have been revised to focus more on Earth science and environmental science. This complements the seventh grade Life Science SOL and the eighth grade Physical Science SOL so that the three middle school grades now can each focus primarily on one of the three main areas of science.

According to the 2003 Virginia Science SOL introduction to the Grade 6 standards, “the standards present an integrated focus on the role of the sun’s energy on the Earth’s systems, water in the environment, air and atmosphere, and basic chemistry concepts.”

In addition, “natural resource management and its relation to public policy and cost /benefit tradeoffs are introduced.” The sixth grade SOL, like the other science SOL, also emphasize the importance of students developing and practicing the science process skills.

Three of the sixth grade SOL relate directly to water resources. Of these three SOL, the standard that is targeted in this section of our packet is SOL 6.5. This is a new SOL for the 2003 revisions that deals with “the unique properties and characteristics of water and its roles in the natural and human-made environment.” SOL 6.7 is another new SOL, dealing with “the natural processes and human interactions that affect watersheds systems.” SOL 6.7 is covered within this curriculum packet in the following section “How Healthy are Our Waterways?” SOL 6.9 falls under the Resources SOL strand and was discussed and incorporated in the previous section of the packet, “How Can We Help Protect Our Water Resources?” It should also be noted that SOL 6.5 further develops the third grade SOL, 3.9, dealing with the water cycle and its relationship to life on Earth.

HOW CAN WE HELP MAINTAIN OUR WATER SUPPLY?

— WATER-RELATED EARTH SCIENCE & ENVIRONMENTAL SCIENCE — SOL FOR GRADE 6

SUBJECT OF SOL	STANDARDS OF LEARNING
Process Skills <i>6.1</i>	The student will plan and conduct investigations in which a) observations are made involving fine discrimination between similar objects and organisms; b) a classification system is developed based on multiple attributes; c) precise and approximate measures are recorded; d) scale models are used to estimate distance, volume, and quantity; e) hypotheses are stated in ways that identify the independent (manipulated) and dependent (responding) variables; f) a method is devised to test the validity of predictions and inferences; g) one variable is manipulated over time with many repeated trials; h) data are collected, recorded, analyzed, and reported using appropriate metric measurement; i) data are organized and communicated through graphical representation (graphs, charts, and diagrams); j) models are designed to explain a sequence; and k) the nature of science is developed and reinforced.
Properties of Water and Its Role in the Environment <i>6.5</i>	The student will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Key concepts include a) water as the universal solvent; b) the properties of water in all three states; c) the action of water in physical and chemical weathering; d) the ability of large bodies of water to store heat and moderate climate; e) the origin and occurrence of water on Earth; f) the importance of water for agriculture, power generation, and public health; and g) the importance of protecting and maintaining water resources.

HOW CAN WE HELP MAINTAIN OUR WATER SUPPLY?

EARTH SCIENCE SOL FOR GRADE 9

The Earth Science Standards of Learning are usually taught to students in Grade 9. The general introduction to the Earth Science SOL makes plenty of mention of water and water resources.

“The Earth Science standards connect the study of the Earth’s composition, structure, processes, and history; its atmosphere, fresh water, and oceans; and its environment in space.... Major topics of study include plate tectonics, the rock cycle, Earth history, the oceans, the atmosphere, weather and climate, and the solar system and universe.” (Standards of Learning for Virginia Public Schools, Virginia Board of Education, 1995 – Revised 2003)

In addition, the introduction to these SOL emphasizes the importance of students using science process skills to carry out investigations and problem solving and decision-making skills to put their learning in a real-world context.

“The standards stress the interpretation of maps, charts, tables, and profiles; the use of technology to collect, analyze, and report data; and the utilization of science skills in systematic investigation. Problem solving and decision making are an integral part of the standards, especially as they relate to the costs and benefits of utilizing the Earth’s resources.” (Standards of Learning for Virginia Public Schools, Virginia Board of Education, 1995 – Revised 2003)

Standards ES.1, ES.2, and ES.3 cover different process skills to be practiced by students. Of the standards covering Earth science content, those relating particularly to water are ES.7, which deals with renewable and nonrenewable resources including water, ES.9, which specifically deals with freshwater resources including groundwater and watersheds, and ES.11, which covers oceanography.

HOW CAN WE HELP MAINTAIN OUR WATER SUPPLY?

— WATER-RELATED EARTH SCIENCE SOL —

SUBJECT OF SOL	STANDARDS OF LEARNING
Process Skills <i>ES.1</i> <i>ES.2</i> <i>ES.3</i>	<p>The student will plan and conduct investigations in which</p> <ul style="list-style-type: none">a) volume, area, mass, elapsed time, direction, temperature, pressure, distance, density, and changes in elevation/depth are calculated utilizing the most appropriate tools;b) technologies, including computers, graphing calculators, probeware, and geographic positioning systems are used to collect, analyze, and report data and to demonstrate concepts and simulate experimental conditions;c) scales, diagrams, maps, charts, graphs, tables, and profiles are constructed and interpreted;d) variables are manipulated with repeated trials; ande) a scientific viewpoint is constructed and defended. <p>The student will demonstrate scientific reasoning and logic by</p> <ul style="list-style-type: none">a) analyzing how science explains and predicts the interactions and dynamics of complex Earth systems;b) recognizing that evidence is required to evaluate hypotheses and explanations;c) comparing different scientific explanations for the same observations about the Earth;d) explaining that observation and logic are essential for reaching a conclusion; ande) evaluating evidence for scientific theories. <p>The student will investigate and understand how to read and interpret maps, globes, models, charts, and imagery. Key concepts include</p> <ul style="list-style-type: none">a) maps (bathymetric, geologic, topographic, and weather) and star charts;b) imagery (aerial photography and satellite images);c) direction and distance measurements on any map or globe; andd) location by latitude and longitude and topo-graphic profiles.
Renewable and Nonrenewable Resources <i>ES.7</i>	<p>The student will investigate and understand the differences between renewable and nonrenewable resources. Key concepts include</p> <ul style="list-style-type: none">a) fossil fuels, minerals, rocks, water, and vegetation;b) advantages and disadvantages of various energy sources;c) resources found in Virginia;d) making informed judgments related to resource use and its effects on Earth systems; ande) environmental costs and benefits.

HOW CAN WE HELP MAINTAIN OUR WATER SUPPLY?

<p>Freshwater Resources <i>ES.9</i></p>	<p>The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans. Key concepts include</p> <ul style="list-style-type: none">a) processes of soil development;b) development of karst topography;c) identification of groundwater zones including water table, zone of saturation, and zone of aeration;d) identification of other sources of fresh water including rivers, springs, and aquifers with reference to the hydrologic cycle;e) dependence on freshwater resources and the effects of human usage on water quality;f) identification of the major watersheds in Virginia; andg) importance of the Chesapeake Bay and its tributaries in the environmental and economic health of Virginia.
<p>Oceanography <i>ES.11</i></p>	<p>The student will investigate and understand that oceans are complex, interactive physical, chemical, and biological systems and are subject to long- and short-term variations. Key concepts include</p> <ul style="list-style-type: none">a) physical and chemical changes (tides, waves, currents, sea level and ice cap variations, upwelling, and salinity concentrations);b) importance of environmental and geologic implications;c) systems interactions (density differences, energy transfer, weather, and climate);d) features of the sea floor (continental margins, trenches, mid-ocean ridges, and abyssal plains) reflect tectonic processes; ande) economic and public policy issues concerning the oceans.

USING THIS PACKET

This section of our curriculum packet contains a content chapter on “The Importance of Groundwater,” and two lessons, “Lesson 3 – Conserving Water” and “Lesson 4 – Nitrate Levels in Wells.” The groundwater chapter and the “Nitrate Levels in Wells” lesson are written primarily for Grade 9 Earth Science teachers,

and specifically to be a resource for SOL ES.9. SOL ES.9 covers the influences on freshwater resources of geologic processes and human activities. The SOL includes karst topography, one major topic in the groundwater chapter. Our chapter also refers to each of Virginia’s physiographic provinces, as defined in the History and Social Science SOL. The groundwater chapter and nitrates in wells lesson also

relate to SOL ES.7, which deals with renewable and nonrenewable resources, and the lesson also strongly supports the process skill SOL, ES.1, ES.2, and ES.3.

The “Conserving Water” lesson has been written for Grade 6 and SOL 6.5. Several SOL in earlier grades also address the topic of water conservation. Conservation of resources is a theme for the SOL in the Resources strand at several earlier grade levels. Also, SOL 3.9, dealing with the water cycle, specifically covers water supply and water conservation. Lessons similar to our “Conserving Water” already exist for these younger grades and they are listed in the section near the end of this curriculum packet, “Virginia’s Water Resources and the Standards of Learning.”