



Science Standards of Learning *Sample Scope & Sequence*

Grade 4

*Commonwealth of Virginia
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Grade 4 Science Standards of Learning Sample Scope and Sequence

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Virginia Department of Education
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Richmond, Virginia 23218-2120
www.pen.k12.va.us

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Superintendent of Public Instruction

Jo Lynne DeMary

Deputy Superintendent

M. Kenneth Magill

Assistant Superintendent for Instruction

Patricia I. Wright

Office of Middle Instructional Services

Maureen B. Hjar, Director

James C. Firebaugh, Jr., Science Specialist

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The *Science Standards of Learning Teacher Resource Guide* can be found in a PDF and Word file format on the Virginia Department of Education's Web site at <http://www.pen.k12.va.us>

Grade 4 Science Standards of Learning Sample Scope and Sequence

Preface

As an additional resource to help school divisions develop curricula aligned to the 1995 Standards of Learning, the Virginia Department of Education has developed sample scope and sequence documents for English, mathematics, and science in kindergarten through grade eight and in core high school courses. These sample documents provide guidance on how the essential knowledge, skills, and processes that are identified in the Standards of Learning and the Standards of Learning Teacher Resource Guides may be introduced to students in a logical, sequential, and meaningful manner.

These sample scope and sequence documents are intended to serve as general guides to help teachers and curriculum developers align their curricula and instruction to support the Standards of Learning. Each sample document is organized around specific topics to help teachers present information in an organized, articulated manner. Also included are correlations to the Standards of Learning for that curricular area for a particular grade level or course, as well as ideas for classroom assessments and teaching resources.

The sample scope and sequence documents are not intended to prescribe how curriculum should be developed or how instruction should be delivered. Instead, they provide examples showing how teachers and school divisions might present to students in a logical and effective manner information that has been aligned with the Standards of Learning. School divisions that need assistance in developing curricula aligned with the Standards of Learning are encouraged to consider the sample scope and sequence guides. Teachers who use the documents should correlate the content identified in the guides with available instructional resources and develop lesson plans to support instruction.

Copies of the sample scope and sequence guides are available at <http://www.pen.k12.va.us/VDOE/Instruction/sol.html> in both PDF and Microsoft Word formats. These materials are copyrighted, and all rights are reserved. Reproduction of these materials for instructional purposes in Virginia classrooms is permitted.

Grade 4 Science Standards of Learning Sample Scope and Sequence

Introduction

The following sample scope and sequence is based on the essential content, skills, and processes developed for each Fourth Grade standard in the Science Standards of Learning Teacher Resource Guide. It is not intended to be a complete or exhaustive set of all that students should master at this level, but instead the scope and sequence organizes a core of key skills, content, and processes around basic topic areas.

The topic areas generally correspond to individual standards; however, certain standards are reorganized and grouped with components of other standards to comprise meaningful instructional clusters. The various topics are not intended to require equal instructional time. Additional objectives have not been developed, and no attempt has been made to transition or further explain the content. Additional information may be obtained from the overview and introductory sections of the Fourth Grade Science Standards of Learning Teacher Resource Guide. (http://www.pen.k12.va.us/VDOE/Instruction/sci_resource.html)

An important and consistent thread among these organizational topics is the application of inquiry skills throughout. Students should have an opportunity to master the various science concepts in each topic area in the context of active learning and inquiry processes. The focus on inquiry is further reinforced by having the first topic in the scope and sequence as a discrete treatment of the science skills; however, a discrete treatment is certainly not required. This represents only one way to organize instruction; there are many other valid and useful organizational schemes.

Effective science teaching requires assessing and understanding what students know and need to learn and then challenging and supporting them to learn it well. The array of effective assessment techniques that teachers can employ in the classroom goes well beyond traditional assessments, and science instruction lends itself well to alternative approaches such as portfolios, student self assessments, and short videotaped presentations. The assessments mentioned in the scope and sequence are intended to be general. It is the role of the local curriculum to develop a detailed review of what is most effective for the particular concept being developed.

The resources section included in this scope and sequence provides a brief sample of instructional resources and staff development materials that are generally available without charge. There is a significant body of commercially available instructional materials that correlates well with the Science Standards of Learning and is of very high quality. This document, however, does not include references to those materials.

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Related Standards
Investigation Skills	4.1
Investigating Plant Anatomy and Life Processes	4.4, 4.1
Investigating Ecosystems	4.5, 4.1
Investigating the Weather	4.6, 4.1
Investigating Energy, Work, and Machines	4.2, 4.1
Investigating Electricity	4.3, 4.1
Investigating Natural Resources	4.8, 4.1
Investigating the Earth-Moon-Sun System	4.7, 4.1

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Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigation Skills (A discrete introduction to specific science skills is not necessary, as all of the inquiry skills should be incorporated within the following topical areas. Teachers may consider introducing some of these skills in isolation or coordinated with mathematics, English, and history instruction.)	Students should be able to:	4.1	<ul style="list-style-type: none"> ▪ Student demonstrations ▪ Classroom observations ▪ Student work ▪ Quizzes ▪ Tests 	<ul style="list-style-type: none"> ▪ <i>Teaching and Learning the Basic Science Skills</i> videotape teacher training series, site guide: http://www.pen.k12.va.us/VDOE/Instruction/sol.html ▪ SOL assessment blueprints and sample items ▪ <i>Science Standards of Learning Teacher Resource Guide</i> http://www.pen.k12.va.us/VDOE/Instruction/sol.html
	differentiate among simple observations, conclusions, and predictions, and correctly apply the terminology in oral and written work. This requires students to comprehend the basic terminology and apply it in novel situations related to 4th grade SOL concepts. analyze a set of twenty-five or fewer objects, measures, or pictures; classify into basic categories to organize the data (descriptive or numerical); and construct bar graphs depicting the distribution of those data. use millimeters, centimeters, meters, kilometers, milliliters, liters, grams, and kilograms in measurement. choose the appropriate instruments including centimeter rulers, meter sticks, graduated cylinders, beakers, scales and balances, and Celsius thermometers for making basic metric measures. make predictions based on picture graphs, bar graphs and basic line graphs.			

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigation Skills (cont'd)	<p>create a plausible hypothesis from a set of basic observations, stated in terms of cause and effect that can be tested. This requires a student to comprehend what “cause and effect” is, and be able to apply that idea in new situations. The application should occur in terms of 4th grade SOL-related concepts or other concrete situations. Hypotheses should be stated in terms such as, “if the water temperature is increased, then amount of sugar that can be dissolved in it will increase.”</p> <p>analyze the variables in a simple experiment, and decide which must be held constant (not allowed to change) in order for the investigation to represent a fair test. This requires students to comprehend what “variables” are, and apply that idea in new situations related to 4th grade SOL concepts.</p> <p>judge which, if any, data in a simple set of results (generally ten or fewer numbers) appear to be considerably outside the expected range. Students should be able to determine the significance of unusual data.</p>	4.1		

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Plant Anatomy and Life Processes	Students should be able to: create a model/diagram illustrating the parts of a flower and explain the functions of those parts. analyze a common plant: identify the roots, stems, leaves, and flowers; and explain the function of each. create a model/diagram illustrating the reproductive processes in typical flowering plants and explain the processes. compare and contrast different ways plants are pollinated. explain that ferns and mosses reproduce with spores rather than seeds. explain the process of photosynthesis. design an investigation to determine the relationship between the presence of sunlight and plant growth. explain the role of dormancy for common plants.	4.4	<ul style="list-style-type: none"> ▪ Student demonstrations ▪ Classroom observations ▪ Student work ▪ Quizzes ▪ Tests 	School Gardening http://www.kidsgardening.com/
	apply the 4.1 science skills in the context of the content of this topic.	4.1		

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Ecosystems	Students should be able to:	4.5	<ul style="list-style-type: none"> ▪ Student demonstrations ▪ Classroom observations ▪ Student work ▪ Quizzes ▪ Tests 	<ul style="list-style-type: none"> ▪ <i>Our Living Environment</i> teacher training module http://www.pen.k12.va.us/VDOE/Instruction/OurLivingEnvironment.doc ▪ <i>Project WILD, K-12</i> http://www.dgif.state.va.us/education/wildlife_ed.html ▪ <i>Project Aquatic WILD K-12</i> http://www.dgif.state.va.us/education/wildlife_ed.html
	<p>distinguish between structural and behavioral adaptations.</p> <p>infer the function of basic adaptations and provide evidence for the conclusion.</p> <p>understand that adaptations allow an organism to succeed in a given environment.</p> <p>explain how different organisms use their unique adaptations to meet their needs.</p> <p>create a model of an organism adapted to a unique environment.</p> <p>describe why certain communities exist in given habitats.</p> <p>illustrate the food webs in a local area and compare and contrast the niches of several different organisms within the community.</p> <p>compare and contrast the differing ways an organism interacts with its surroundings at various stages of its life cycle. Specific examples include a frog and a butterfly.</p>			

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Ecosystems (cont'd)	differentiate among positive and negative influences of human activity on ecosystems.	4.5		<ul style="list-style-type: none"> ▪ <i>WILD School Sites</i> http://www.dgif.state.va.us/education/wildlife_ed.html ▪ <i>Project Learning Tree, K-8</i> http://www.dof.state.va.us/kid/kidplt.htm ▪ <i>Project WET, K-12</i> http://www.deq.state.va.us/education/wetinfo.html
	apply the 4.1 science skills in the context of the content of this topic.	4.1		

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating the Weather	Students should be able to:	4.6	<ul style="list-style-type: none"> ▪ Student demonstrations ▪ Classroom observations ▪ Student work ▪ Quizzes ▪ Tests 	<ul style="list-style-type: none"> ▪ NOAA Weather Education Resources http://www.education.noaa.gov/ ▪ Weather Channel Education Resources http://www.weather.com/education/ ▪ Virginia Earth Science Resource Page - Meteorology http://vtso.geol.vt.edu/vesr/meteor/vesrmeteor.html
	<p>use a thermometer to compare air temperatures over a period of time.</p> <p>compare the humidity at different times of the day.</p> <p>analyze the changes in air pressure occurring over time using a barometer, and predict what the changes mean in terms of changing weather patterns.</p> <p>differentiate between the types of weather associated with high and low-pressure air masses. Illustrate and label high and low pressure air masses and warm and cold fronts.</p> <p>differentiate between cloud types (cirrus, stratus, cumulus, and cumulonimbus clouds) and associated weather.</p> <p>compare and contrast the formation of different types of precipitation. recognize a variety of storm types, describe the weather conditions associated with each, and when they occur (thunderstorms, hurricanes, and tornadoes).</p> <p>analyze and report information about temperature and precipitation on weather maps.</p>			

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating the Weather (cont'd)	measure the amount of moisture in the air using a hygrometer. measure wind speed using an anemometer. measure precipitation with a rain gauge. design an investigation where weather data are gathered using meteorological tools and charted to make weather predictions.	4.6		
	apply the 4.1 science skills in the context of the content of this topic.	4.1		

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Energy, Work, and Machines	Students should be able to: explain and demonstrate work being done. explain that energy is needed to do work. differentiate between potential and kinetic energy. determine whether energy is electrical, mechanical, or chemical. describe the six simple machines, how each functions, and give examples of each found in common household items. identify the simple machines in a compound machine. analyze common household items and identify the simple machine in them. design and investigation to determine the effect of friction on moving objects. explain and demonstrate inertia.	4.2	<ul style="list-style-type: none"> ▪ Student demonstrations ▪ Classroom observations ▪ Student work ▪ Quizzes ▪ Tests 	<i>Physical Science Solutions</i> module http://www.smv.org/pubs/index.html
	apply the 4.1 science skills in the context of the content of this topic.	4.1		

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Electricity	Students should be able to:	4.3	<ul style="list-style-type: none"> ▪ Student demonstrations ▪ Classroom observations ▪ Student work ▪ Quizzes ▪ Tests 	<i>Physical Science Solutions</i> module http://www.smv.org/pubs/index.html
	<p>apply the terms insulators, conductors, open and closed in describing electrical circuits.</p> <p>differentiate between an open and closed electric circuit.</p> <p>describe volts and amps as measures of electricity. (Students do not need to understand detailed definitions of these terms.)</p> <p>use the dry cell symbols (-) and (+).</p> <p>create and diagram a functioning series circuit using dry cells, wires, switches, bulbs, and bulb holders.</p> <p>create and diagram a functioning parallel circuit using dry cells, wires, switches, bulbs, and bulb holders.</p> <p>differentiate between a parallel and series circuit.</p> <p>create a diagram of a magnetic field using a magnet.</p> <p>compare and contrast a permanent magnet and an electromagnet.</p>			

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Electricity (cont'd)	<p>explain how electricity is generated by a moving magnetic field</p> <p>design an investigation using static electricity to attract or repel a variety of materials</p> <p>explain how static electricity is created and occurs in nature</p> <p>describe the contributions of Ben Franklin, Michael Faraday, and Thomas Edison to the understanding and harnessing of electricity.</p>	4.3		
	<p>apply the 4.1 science skills in the context of the content of this topic.</p>	4.1		

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating Natural Resources	Students should be able to: compare and contrast natural and man-made resources. differentiate between wild and domesticated animals and plants and categorize examples of each found in Virginia. distinguish among rivers, lakes, and bays; describe characteristics of each; and name an example of each in Virginia. create and interpret a model of a watershed. Evaluate the statement: "We all live downstream." recognize the importance of Virginia's mineral resources including coal, limestone, granite, and sand and gravel. appraise the importance of natural and cultivated forests in Virginia. describe a variety of soil and land uses important in Virginia.	4.8	<ul style="list-style-type: none"> ▪ Student demonstrations ▪ Classroom observations ▪ Student work ▪ Quizzes ▪ Tests 	<ul style="list-style-type: none"> ▪ <i>VA Natural Resources Education Guide</i> http://www.vanaturally.com/eduguide.htm ▪ Luck Stone Rock interactive multimedia kit ▪ Chesapeake Bay Program http://www.chesapeakebay.net/ ▪ Chesapeake Bay History http://www.chesapeakebay.net/pubs/gateways/plainandpiedmont/index.htm
	apply the 4.1 science skills in the context of the content of this topic.	4.1		

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Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating the Earth-Moon-Sun System	Students should be able to:	4.7	<ul style="list-style-type: none"> ▪ Student demonstrations ▪ Classroom observations ▪ Student work ▪ Quizzes ▪ Tests 	<ul style="list-style-type: none"> ▪ <i>The Earth in Space Teacher Training Module</i> (in development, to be posted at http://www.smv.org/pubs/index.html) ▪ NASA Space Resources electronic publications http://spacelink.nasa.gov/.index.html ▪ NASA Education Homepage http://education.nasa.gov
	<p>differentiate between rotation and revolution.</p> <p>distinguish between a solar and lunar eclipse and diagram how each occurs.</p> <p>describe how the Earth's axial tilt causes the seasons.</p> <p>model the formation of the eight moon phases, sequence the phases in order, and describe how the phases occur.</p> <p>describe the major characteristics of the sun, including approximate size, color, and overall composition.</p> <p>create and describe a model of the Earth-moon-sun system with approximate scale distances and sizes.</p> <p>assess the importance and implications of water to life and Earth processes.</p> <p>compare and contrast the Earth-centered to the sun-centered model of the solar system.</p> <p>analyze the differences in what Aristotle, Ptolemy, Copernicus, and Galileo observed and what influenced their conclusions</p>			

Grade 4 Science Standards of Learning Sample Scope and Sequence

Organizing Topic	Essential Knowledge, Skills, and Processes	Related SOL	Sample Classroom Assessment Methods	Sample Resources
Investigating the Earth-Moon-Sun System (cont'd)	compare and contrast the surface conditions of the Earth, moon, and sun describe a contribution of the NASA Apollo missions to our understanding of the moon.	4.7		
	apply the 4.1 science skills in the context of the content of this topic.	4.1		