

I. Teacher Preparation

A. Elementary School Licensure Requirements

1. Licensure Grade Levels¹

a. Does the state offer an Early Elementary Education credential (Preschool/Kindergarten to Grade 2/3)?	Yes	Early/Primary Education (PreK - Grade 3)
b. Does the state offer an Elementary Education credential (Kindergarten/Grade 1 to Grade 5/6)?	Yes	Elementary Education (PreK – Grade 6)

2. Early Elementary²

a. Is an educational practice examination required for licensure?	No
b. Is an examination in reading and writing or language arts required for licensure?	Yes
c. Is a mathematics examination required for licensure?	Yes
d. Is a science examination required for licensure?	Yes

3. Elementary Education²

a. Is an educational practice examination required for licensure?	No
b. Is an examination in reading and writing or language arts required for licensure?	Yes
c. Is a mathematics examination required for licensure?	Yes
d. Is a science examination required for licensure?	Yes

4. Licensure Renewal

a. What is the period of validity for an educator's license?	Less than 5 years	
	5 years	X ³
	Greater than 5 years	
b. Can in-service teachers receive certification credit for professional development courses/programs in Earth and Space Sciences?	Yes	X
	No	
	Local issue	
	Unknown	

B. Elementary School Curriculum Support

1. Guidelines for Curriculum Development

a. Does the SEA provide guidelines for curriculum development, beyond the state's science standards?	Yes
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b. If yes, which of the following does the state provide?	1. Science frameworks	X	Curriculum Framework ⁵
	2. Curriculum maps		
	3. Learning progressions	X	Practices for Science Investigation ⁶
	4. Benchmark maps		
	5. Templates for unit design		
	6. Curriculum development guides		
	7. Model units		
	8. Lesson plan templates/guides		
	9. Web-based lesson plan portals		
	10. Model lesson plans	X	Sample Lesson Plans for the 2010 Science Standards of Learning ⁷
	11. Assessment guidelines	X	Virginia Standards of Learning Assessments Test Blueprint, Grade 3 Science and Grade 5 Science ⁸

2. Instructional Materials⁹

a. At what level does adoption of instructional materials occur?	State level	X
	Local level	

b. If the state is an adoption state, do adopted materials in science include those that address topics specific to the geosciences?	Yes	<u>Publishers</u> Delta Education, LLC Houghton Mifflin Harcourt School Education Group, a division of The McGraw-Hill Companies, Inc. Discovery Education, Inc.
		Elementary science program titles indicate general science programs, e.g. Delta Education Science for Grade K, 1, 2, 3, 4, and 5. 2 of the 4 titles listed are specific to VA. If they are aligned to VA Standards of Learning, then they need to cover geoscience topics.

3. Support for New Standards⁴

a. Does that state provide resources to school systems to effectively implement the standards as they change?	Yes	X	Resources would include the standards, frameworks, and lesson samples found on the web in addition to the recommended text list. Teachers and principals attend Standards of Learning (SOL) Institutes.
	No		
	Local issue		
	Unknown		

4. Professional Development⁴

a. Does the SEA provide professional development that is, at least in part, specific to the geosciences?	Yes, provided by SEA	X	The SOL Institutes work with teachers from each division in the state through the year. Teachers attend 4 weekend workshops. This year's focus is on taking an interdisciplinary approach to teaching science with a content focus on environment, space and geology. Principals of those teachers will attend a three day conference on the same topic. ESL teachers have been targeted to attend the Institute as well. A separate training was provided for them because of the increasing enrollment of ELLs in VA. The training included science simulations, modeling, and discourse appropriate for ELLs. In addition, the Virginia Association of Science Teachers, environmental organizations, and the Virginia Resource Education Council provides professional development for science teachers.
	Yes, but independent of SEA		
	No		
	Local issue		
	Unknown		

II. Curriculum

A. Elementary School State Science Standards

1. Organization¹⁰

a. What is the name of the state's elementary school science standards?	Science Standards of Learning (SOL) for Virginia Public Schools		
b. What is the grade-level arrangement of the standards?	Grade specific	X	
	Grade-level bands		
	Benchmark grade levels		
c. How are the standards outlined?	Overarching standard statements (level one) Sub-standard statements that provide more detail to the overarching standards (level two)	X	d. What terms are used to identify each level? Standards

2. Content¹⁰

a. Are the science standards subdivided according to scientific discipline (Physical Science, Life Science, and Earth and Space Science)?	Yes	Standards are identified according to 8 content strands, or topics. Although not explicitly stated, the strands are specific to scientific disciplines. 1) Scientific Investigation, Reasoning, and Logic; 2) Force, Motion, and Energy; 3) Matter; 4) Life Processes; 5) Living Systems; 6) Interrelationships in Earth/Space Systems; 7) Earth Patterns, Cycles, and Change; and 8) Earth Resources.
b. Are the Earth and Space Science standards identified by core ideas in the geosciences?	Yes	Standards are identified according to 8 content strands, or topics. Earth/Space Sciences core ideas are: 1) Interrelationships in Earth/Space Systems; 2) Earth Patterns, Cycles, and Change; and 3) Earth Resources.
c. Do the state's standards include current issues in the geosciences? Current issues in the geosciences can be described as Earth science processes altered by human activities or Earth science processes that affect human well-being.	Yes	The "Earth Resources" strand exists at every elementary grade level. K-5 students examine: <ul style="list-style-type: none">- reducing, reusing, and recycling of natural resources- air and water quality and conservation- effects of human activity on air, water, and habitat- energy sources, use, and conservation In addition, the Standards of Learning document presents 5 key components for scientific literacy that transcend all grade levels. This includes: <ul style="list-style-type: none">- Make informed decisions regarding contemporary issues

d. Do the state's standards include career exploration in the geosciences?	Yes	Standards at each grade level do not specify examination of geoscience/science careers. However, the standards document presents 5 key components for scientific literacy at all levels. This includes: - Explore science-related careers and interests.
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3. Development

a. When were the standards adopted or last revised?	Within the last two years (2014-2015)	2010 ¹⁰
	Between 3-6 years ago (2010-2013)	
	Between 7-10 years ago (2006-2009)	
	More than 10 years ago (before 2006)	
b. Does the state have plans to review/revise its science standards?	Currently under review	Previous versions of the VA Standards of Learning were adopted in 1995 and 2003. The next review of the VA Standards of Learning for Science is scheduled for 2017. ¹¹
	Within the next 5 years (2015-2020)	
	Between 5 and 10 years from now (2020-2025)	
	No plan or timeline exists	
	Unknown	

B. Middle School State Science Standards

1. Content¹⁰

a. What is the name of the state's middle school science standards?	Science Standards of Learning (SOL) for Virginia Public Schools
b. Are Earth and Space Science topics included in the standards?	Yes
c. Is Life Science and Physical Science content included in the standards?	Yes

C. High School State Science Standards

1. Content¹⁰

a. What is the name of the state's high school science standards?	Science Standards of Learning (SOL) for Virginia Public Schools
b. Are Earth and Space Science topics included in the standards?	Yes
c. Is Life Science and Physical Science content included in the standards?	Yes

D. High School Course Requirements

1. Credits Required for Graduation¹²

a. What is the total number of credits required for graduation?	Unknown
b. What is the number of science credits required for graduation?	3

2. Course Content¹²

a. Is Life Science required?	No
b. Is Physical Science required?	No
c. Is Earth Science required?	No
d. Is Environmental Science required?	No
e. Is Earth Science accepted?	Yes
f. Does Earth Science have to be lab-based?	Yes

III. Instruction

A. Elementary School Approaches to Instruction

1. State Science Standards¹⁰

a. Do the state's science standards provide guidelines regarding any specific approach to be used for science teaching?	Yes
b. If so, what is the term used to identify this approach?	Scientific Inquiry
c. Do the state's science standards provide a rationale for this approach?	No
d. If so, what is the rationale?	N/A

2. Guidelines for Curriculum Planning

a. If the state offers guidelines for curriculum planning, do these advocate more specific strategies for science instruction?	No
b. If so, what are the strategies?	N/A

3. Technology⁴

a. Are decisions regarding the use of technology in elementary science classrooms made at the state level or local level?	Local level
b. What kinds of technology are being used by elementary school science teachers in the state?	Technology is a local decision. The state cannot recommend specific programs. They can recommend districts as good examples.

IV. Learning Contexts

A. Elementary School Classrooms

1. Class Size⁴

a. What is the average number of students in an elementary classroom?	Unknown (local data)
b. What is the maximum allowable number of students in an elementary classroom?	Unknown (local data)

2. Instructional Time⁴

a. At the elementary level, are teachers recommended or required to dedicate a certain amount of instructional time to science?	There is no time requirement	X	There is not a required amount of time to be spent on science. The only mandate is to spend a specific amount of time on the core content areas. Some principals focus on math and language arts and don't require teachers to teach science. Technically they are breaking the law. To be in compliance, they would only have to spend one minute in the school year teaching science. This is why there is an interdisciplinary push for science.
	Local decision		
	Teachers must spend a certain amount of time teaching science.		
	Unknown		

B. Elementary School Support Services

1. Specialized Support⁴

a. Are there specific policies in place regarding English as a Second Language (ESL) and Special Education services that could impact science instruction (e.g. pull-out or push-in models)?	Local level decision		If science is taught, students are usually pulled out of science for remediation. ESL teachers have received professional development in teaching science concepts.
	Depends on the specifications of a student's IEP or ILP		
	Teachers must follow specific practices regarding science	X	
	Unknown		

V. Extra-Curricular Programs

A. Elementary School Geosciences Enrichment Opportunities

1. After-School and Informal Education⁴

a.	Are opportunities to engage in geoscience-related topics outside of school (e.g. after-school programs and informal education programs) being offered to students in the state?	Yes
b.	If so, what are they? As part of the Chesapeake 2000 Agreement, the states of Virginia, Maryland, and Pennsylvania, along with the District of Columbia, the Chesapeake Bay Commission, and the U.S. Environmental Protection Agency, reaffirmed their long-term commitment to "protect and restore the Chesapeake Bay's ecosystem." In co-signing this document, Virginia agreed to accomplish specific goals, including the following regarding public education: -Beginning with the class of 2005, provide a meaningful Bay or stream outdoor experience for every school student in the watershed before graduation from high school. -Provide students and teachers alike with opportunities to directly participate in local restoration and protection projects and to support stewardship efforts in schools and on school property.	

2. Remedial Education⁴

a. What remedial supports are in place for geosciences topics with which students are struggling?	Local level decision	X	
	Remediation services are being provided to students in science		
	No remediation support in science		
	Unknown		

VI. Monitoring Systems

A. Elementary School Statewide Science Assessment

1. Structure and Content

a. What is the name of the statewide standardized test in science at the elementary level?	Virginia Standards of Learning (SOL) Assessments ¹³	
b. At what grade(s) is the assessment implemented?	5 ¹³	
c. Does the statewide science assessment measure achievement of the state's standards, i.e. is the assessment aligned with state standards?	Yes ¹⁴	
d. Is the content of the statewide science assessment sub-divided by discipline, namely Physical Science, Life Science, Earth and Space Science?	Yes ¹⁴	

e. Are there any plans for revising or changing the current elementary level science assessment?	No plans for revision	X	Yes, there was a Bill last year that passed stating that only 5th graders will be assessed in science. More revisions are in the works for the assessment but specialist was not at liberty to explain the changes. The change that only 5th grade be tested in science came about because of the over testing of students, particularly since benchmark testing has been added, and students are still required to take SOL at the end of the school year. ⁴
	Revision is planned, but timeline is unknown		
	Revision is planned with implementation date set		

2. Results¹⁵

a. Is student achievement measured by Performance Level Descriptors?	Yes
b. If yes, how many performance levels are there?	3

3. District Level Reporting¹⁵

a. At the district level, are the percentages of students performing at each PLD reported to the public?	Yes	
b. At the district level, is student achievement reported according to scientific discipline (Life Sciences, Physical Sciences, Earth and Space Sciences)?	No	
c. If yes, is this data available to the public?	No	

4. State Level Reporting¹⁵

a. At the state level, are the percentages of students performing at each PLD reported to the public?	Yes	
b. At the state level, is student achievement reported according to scientific discipline (Life Sciences, Physical Sciences, Earth and Space Sciences)?	No	
c. If yes, is this data available to the public?	No	

B. Elementary School International Assessments in Science

1. TIMSS¹⁶

a. Has the state participated in the Trends in International Mathematics and Science Study (TIMSS)?	No
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b. If yes, in which years did the state participate?	1995	
	2003	
	2007	
	2011	

C. Middle School Statewide Science Assessment

1. Structure and Content¹³

a. What is the name of the statewide standardized test in science at the middle school level?	Virginia Standards of Learning (SOL) Assessments Grade 8 Science
b. At what grade(s) is the assessment implemented?	8
c. Does the assessment address Life Science concepts?	Yes
d. Does the assessment address Physical Science concepts?	Yes
e. Does the assessment address Earth Science concepts?	Yes

C. High School Statewide Science Assessment(s)

1. Structure and Content¹³

a. What is the name of the state's standardized science assessment(s)?	Virginia Standards of Learning (SOL) Assessments for Earth Science, Biology, and Chemistry
b. At what grade level is the assessment implemented?	9-12
c. Does the assessment address Life Science concepts?	Yes
d. Does the assessment address Physical Science concepts?	Yes
e. Does the assessment address Earth Science concepts?	Yes

VII. Accountability

A. School Level

1. Individual Student¹⁷

a. Does the state produce an Individual Student Report (ISR) that describes a student's performance on the state's science assessment?	Yes	A Standards of Learning Score Report is provided to parents/guardians. This report describes an individual student's performance on statewide assessments in terms of scale score and performance level.
b. Is the ISR made available to a student's parents or guardians?	Yes	Grade 5 reports include student performance on the science assessment in terms of scale score and proficiency level. In addition, results are subdivided according to Reporting Category.
c. Is the ISR made available to a student's teacher?	Unknown	
d. Does the ISR report student's performance in terms of scale score and achievement level?	Yes	The Reporting Categories for science are: Scientific Investigation Force, Motion, Energy, and Matter Life Processes and Living Systems Earth/Space Systems and Cycles
e. Does the ISR subdivide results by science discipline (Physical Science, Life Science, Earth and Space Science)?	Yes	Unknown if same report is provided to teachers.

2. Teacher Appraisal⁴

a. Are students' results on the statewide science assessment a component of teacher evaluation?	Yes
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B. District Level

1. District Accreditation⁴

a. Are student outcomes in statewide science assessments at the elementary level part of accreditation of public schools at the district level?	Yes	X	Each school has an assessment cut off score to meet. If they do not, schools receive assistance.
	No		
	At a future point		
	Local decision		
	Unknown		

C. State Level

1. Statewide Monitoring

a. Are student outcomes in statewide science assessments at the elementary level used in monitoring the adequacy of state educational systems?	Unknown	
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2. Trends in Student Outcomes¹⁸

a. Does the SEA report to the public performance results on the state science assessment over time?	Yes
b. If yes, how many years of achievement data are available?	
3 years (2011-2012 to 2013-2014)	
4-7 years (2007-2008 to 2013-2014)	
8 to 10 years (2004-2005 to 2013-2014)	X 9 years of data (2004-2014)
11 or more years (before 2004-2005)	
c. Are the results also subdivided by science discipline (Life Sciences, Physical Sciences, Earth and Space Sciences)?	No

¹ Virginia Department of Education, Teaching in Virginia, Licensure, Application for a Virginia License, June 2014: <http://www.doe.virginia.gov/teaching/licensure/index.shtml#queries>

² Virginia Department of Education, Teaching in Virginia, Licensure, Assessment Requirements for Virginia Licensure, August 2014, PDF: <http://www.doe.virginia.gov/teaching/licensure/index.shtml#queries>

³ Virginia Department of Education, Teaching in Virginia, Licensure Renewal, Licensure Renewal at a Glance, March 2014: <http://www.doe.virginia.gov/teaching/licensure/index.shtml#queries>

⁴ Virginia Department of Education (personal communication).

⁵ Virginia Department of Education, Standards of Learning (SOL) and Testing, Standards of Learning Documents for Science – Adopted 2010, Curriculum Frameworks, PDFs:

http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

⁶ Virginia Department of Education, Standards of Learning (SOL) and Testing, Science, Science, Practices for Science Investigation, PDF: http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

⁷ Virginia Department of Education, Standards of Learning (SOL) and Testing, Science, Science Sample Lesson Plans: http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/index.shtml

⁸ Virginia Department of Education, Standards of Learning (SOL) and Testing, Standards of Learning Documents for Science – Adopted 2010, Blueprints, Grade 3 Science, Grade 5 Science, PDFs:

http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

⁹ Virginia Department of Education, Instruction, Textbooks and Instructional Materials, Science, Textbooks Approved by the Virginia Board of Education, 2012, PDF:

<http://www.doe.virginia.gov/instruction/textbooks/science/index.shtml>

¹⁰ Virginia Department of Education, Standards of Learning (SOL) and Testing, Science, Standards of Learning Documents for Science – Adopted 2010, Science Standards of Learning for Virginia Public Schools, Board of Education, Commonwealth of VA, January 2010, PDF:

http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

¹¹ Virginia Department of Education, Standards of Learning (SOL) and Testing, Science, Standards of Learning Documents for Science – Adopted 2010, SOL Review Schedule, PDF:

http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

¹² Virginia Department of Education, Graduation: <http://www.doe.virginia.gov/instruction/graduation/standard.shtml>

¹³ Virginia Department of Education, Standards of Learning (SOL) and Testing, SOL Test Administration and Development: http://www.doe.virginia.gov/testing/test_administration/index.shtml

¹⁴ Virginia Department of Education, Standards of Learning (SOL) and Testing, Standards of Learning Documents for Science – Adopted 2010, Blueprints, Grade 3 Science, Grade 5 Science, PDFs:
http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

¹⁵ Virginia Department of Education, School, School Division, and State Report Cards:
<https://p1pe.doe.virginia.gov/reportcard/>

¹⁶ U.S. Dept. of Education, Institute of Education Sciences, National Center for Education Statistics, Trends in International Mathematics and Science Study (TIMSS), State and District Participation in TIMSS:
<https://nces.ed.gov/TIMSS/benchmark.asp>

¹⁷ Virginia Department of Education, Standards of Learning (SOL) and Testing, SOL Performance Reports, Understanding Your Child's SOL Report – Non-Writing, PDF
<http://www.doe.virginia.gov/testing/scoring/>

¹⁸ Virginia Department of Education, Virginia SOL Assessment Build-A-Table:
<http://bi.virginia.gov/BuildATab/rdPage.aspx>