

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)?	No	
b. Does the state offer an Elementary Education credential (Kindergarten/Grade 1 to Grade 5/6)?	Yes	Teacher, Elementary (Grades 1-6)

2. Early Elementary¹

a. Is an educational practice examination required for licensure?	N/A
b. Is an examination in reading and writing or language arts required for licensure?	N/A
c. Is a mathematics examination required for licensure?	N/A
d. Is a science examination required for licensure?	N/A

3. Elementary Education¹

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?	No

4. Licensure Renewal

a. What is the period of validity for an educator's license?	Less than 5 years	
	5 years	X ²
	Greater than 5 years	

b. Can in-service teachers receive certification credit for professional development courses/programs in Earth and Space Sciences?	Yes	X	They can receive credit as long as they are teaching science. ³
	No		
	Local issue		
	Unknown		

B. Elementary School Curriculum Support

1. Guidelines for Curriculum Development⁴

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		
	2. Curriculum maps		
	3. Learning progressions		
	4. Benchmark maps	X	Strand Maps
	5. Templates for unit design		
	6. Curriculum development guides		
	7. Model units	X	Model Curriculum Units (MCUs)
	8. Lesson plan templates/guides		
	9. Web-based lesson plan portals		
	10. Model lesson plans		
	11. Assessment guidelines		

2. Instructional Materials⁵

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

b. If the state is an adoption state, do adopted materials in science include those that address topics specific to the geosciences?	N/A	
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3. Support for New Standards³

a. Does that state provide resources to school systems to effectively implement the standards as they change?	Yes	X	MA is a locally controlled state. They do receive block funding, and the LEAs may spend it on resources and materials.
	No		
	Local issue		
	Unknown		

4. Professional Development³

a. Does the SEA provide professional development that is, at least in part, specific to the geosciences?	Yes, provided by SEA	X	SEA administers a statewide program of free graduate-level institutes designed to increase the content knowledge of Massachusetts educators. Institutes occur at all grade levels and content areas. Past Science Institute courses that have been offered included general science, science methods, and Earth and space sciences. GLOBE, WET and WILD are offered in the state independently of the SEA.
	Yes, but independent of SEA	X	
	No		
	Local issue		
	Unknown		

II. Curriculum

A. Elementary School State Science Standards

1. Organization⁶

a. What is the name of the state's elementary school science standards?		Massachusetts Science and Technology/Engineering Curriculum Framework		
b. What is the grade-level arrangement of the standards?		Grade specific		
		Grade-level bands	X (K-2 and 3-5)	
		Benchmark grade levels		
c. How are the standards outlined?	Overarching standard statements (level one)	X	d. What terms are used to identify each level?	Learning Standards
	Sub-standard statements that provide more detail to the overarching standards (level two)			

2. Content⁶

a. Are the science standards subdivided according to scientific discipline (Physical Science, Life Science, and Earth and Space Science)?	Yes	Yes, standards are grouped into four strands: 1) Earth and Space Science 2) Life Science (Biology) 3) Physical Sciences (Chemistry and Physics) 4) Technology/Engineering
b. Are the Earth and Space Science standards identified by core ideas in the geosciences?	Yes	Learning standards fall under the following subtopics: <u>PreK–2</u> Earth's Materials The Weather The Sun as a Source of Light and Heat Periodic Phenomena. <u>Grades 3–5</u> Rocks and Their Properties Soil Weather The Water Cycle Earth's History The Earth in the Solar System.
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	Yes	

activities or Earth science processes that affect human well-being.		
d. Do the state's standards include career exploration in the geosciences?	No	

3. Development

a. When were the standards adopted or last revised?	Within the last two years (2014-2015)		October 2006 ⁶
	Between 3-6 years ago (2010-2014)		
	Between 7-10 years ago (2006-2009)	X	
	More than 10 years ago (before 2006)		

b. Does the state have plans to review/revise its science standards?	Currently under review	X	The review of the Massachusetts Science and Technology/Engineering (STE) Curriculum Framework started in spring, 2009, and is now anticipated to be completed SY 2015-16. A draft revised Massachusetts curriculum framework has been developed and incorporates many features from the NGSS. The draft framework is being reviewed by districts and will be revised, based on their feedback, with adoption expected in 2015-2016. A timeline for implementation will be presented at that time. ³
	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. Content⁶

a. What is the name of the state's middle school science standards?	Massachusetts Science and Technology/Engineering Curriculum Framework
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. Content⁶

a. What is the name of the state's high school science standards?	Massachusetts Science and Technology/Engineering Curriculum Framework
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 Graduation⁷

a. What is the total number of credits required for graduation?	22
b. What is the number of science credits required for graduation?	3

2. Course Content⁷

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 Standards⁶

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?	Inquiry-Based Instruction
c. Do the state's science standards provide a rationale for this approach?	Yes
d. If so, what is the rationale?	Engaging students in inquiry-based instruction is one way of developing conceptual understanding, content knowledge, and scientific skills. Scientific inquiry as a means to understand the natural and human-made worlds requires the application of content knowledge through the use of scientific skills.

2. Guidelines for Curriculum Planning⁴

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. Technology³

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?	This is a local decision and varies from district to district. There are some districts that are 1 laptop/iPad per student. Additional funding has been allocated through the passing of a bond bill specifically for technology and the state has a digital connection grant that will provide funding for broadband, Wi-Fi, and computers.

IV. Learning Contexts

A. Elementary School Classrooms

1. Class Size³

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 Time³

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		
	Local decision	X	
	Teachers must spend a certain amount of time teaching science.		
	Unknown		

B. Elementary School Support Services

1. Specialized Support³

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	X	
	Depends on the specifications of a student's IEP or ILP		
	Teachers must follow specific practices regarding science		
	Unknown		

V. Extra-Curricular Programs

A. Elementary School Geosciences Enrichment Opportunities

1. After-School and Informal Education³

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
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b. If so, what are they?	After school programs are available through colleges, the Museum of Science, Boys and Girls Clubs and Science Fairs. The STEM Network that operates from the governor’s Office also provides opportunities for students. The SEA is not involved with these initiatives.
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2. Remedial Education³

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?	Massachusetts Comprehensive Assessment System (MCAS) in Science and Technology/Engineering ⁸
b. At what grade(s) is the assessment implemented?	5 ⁸
c. Does the statewide science assessment measure achievement of the state's standards, i.e. is the assessment aligned with state standards?	Yes ⁸
d. Is the content of the statewide science assessment sub-divided by discipline, namely Physical Science, Life Science, Earth and Space Science?	Yes ⁹

e. Are there any plans for revising or changing the current elementary level science assessment?	No plans for revision	X	The draft standards are posted to the website for teachers to implement. They are expected to undergo public review and comment in November/December 2015. ³
	Revision is planned, but timeline is unknown		
	Revision is planned with implementation date set		
	Unknown		

2. Results⁸

a. Is student achievement measured by Performance Level Descriptors?	Yes
b. If yes, how many performance levels are there?	4

3. District Level Reporting

a. At the district level, are the percentages of students performing at each PLD reported to the public?	Yes ¹⁰	<p>Statewide science assessment results can be found in two ways:</p> <p>1) On the SEA website, users identify a district and choose to view that district's Report Card. The Report Card provides the results on the statewide science assessment for students in the district.</p> <p>2) MCAS District Results by Standards report is available to district personnel through a secure web site (Edwin Analytics in the Department's Security Portal).</p> <p>District Report Cards do not subdivide statewide science assessment results by discipline.</p> <p>The MCAS District Results by Standards shows the percentage of students answering each item on the assessment correctly. Assessment items are identified by content area strand/topic. These reports are not available to the public.</p>
b. At the district level, is student achievement reported according to scientific discipline (Life Sciences, Physical Sciences, Earth and Space Sciences)?	Yes ¹¹	
c. If yes, is this data available to the public?	No ¹¹	

4. State Level Reporting¹²

a. At the state level, are the percentages of students performing at each PLD reported to the public?	Yes	The SEA website offers users the choice of looking at the state science assessment results on an item by item scale. Users can see the percentage of state's total students who responded correctly to each item on the assessment. Items are identified by one of four reporting categories: Life Science Physical Science Earth Science Technology/Engineering
b. At the state level, is student achievement reported according to scientific discipline (Life Sciences, Physical Sciences, Earth and Space Sciences)?	Yes	
c. If yes, is this data available to the public?	Yes	

B. Elementary School International Assessments in Science

1. TIMSS¹³

a. Has the state participated in the Trends in International Mathematics and Science Study (TIMSS)?	Yes
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b. If yes, in which years did the state participate?	1995	X
	2003	
	2007	X
	2011	X

C. Middle School Statewide Science Assessment

1. Structure and Content⁸

a. What is the name of the statewide standardized test in science at the middle school level?	Massachusetts Comprehensive Assessment System (MCAS) in Science and Technology/Engineering
b. At what grade(s) is the assessment implemented?	8
c. Does the assessment address Life Science concepts?	Yes
d. Does the assessment address Life Science concepts?	Yes
e. Does the assessment address Earth Science concepts?	Yes

C. High School Statewide Science Assessment(s)

1. Structure and Content⁸

a. What is the name of the state's standardized science assessment(s)?	MCAS High School STE Tests (Biology, Chemistry, Introductory Physics, Technology/Engineering)
b. At what grade level is the assessment implemented?	End-of-Course
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?	No

VII. Accountability

A. School Level

1. Individual Student

a. Does the state produce an Individual Student Report (ISR) that describes a student's performance on the state's science assessment?	Yes ¹⁴	Parents receive a Parent/Guardian Report that provides their child's results on the 2014 Massachusetts Comprehensive Assessment System (MCAS) tests.
b. Is the ISR made available to a student's parents or guardians?	Yes ¹⁴	The grade 5 report shows the child's achievement score in science (Advanced, Proficient, Needs Improvement, or Warning/Failing) as well as scores in reporting categories for science:
c. Is the ISR made available to a student's teacher?	Yes ¹⁵	
d. Does the ISR report student's performance in terms of scale score and achievement level?	Yes ¹⁵	Earth and Space Science: 30% (16 points) Life Science: 30% (16 points) Physical Sciences: 25% (14 points) Technology/Engineering: 15% (8 points)
e. Does the ISR subdivide results by science discipline (Physical Science, Life Science, Earth and Space Science)?	Yes ¹⁵	Student-level MCAS results are reported as scaled scores to schools and teachers. Teachers can also access the Science, Technology, and Engineering multiple choice results and raw scores for each student. Teachers can use a secure on-line reporting tool to conduct curriculum and item analyses at the district, school, and student levels. Scores can be broken down by standards, including: Earth and Space Science: 30% (16 points) Life Science: 30% (16 points) Physical Sciences: 25% (14 points) Technology/Engineering: 15% (8 points)

2. Teacher Appraisal¹⁶

a. Are students' results on the statewide science assessment a component of teacher evaluation?	No
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B. District Level

1. District Accreditation³

a. Are student outcomes in statewide science assessments at the elementary level part of accreditation of public schools at the district level?	Yes		
	No		
	At a future point		
	Local decision	X	
	Unknown		

C. State Level

1. Statewide Monitoring³

a. Are student outcomes in statewide science assessments at the elementary level used in monitoring the adequacy of state educational systems?	Yes	The science scores are used for accountability through a point system.
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2. Trends in Student Outcomes¹⁷

a. Does the SEA report to the public performance results on the state science assessment over time?	Yes
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b. If yes, how many years of achievement data are available?	3 years (2011-2012 to 2013-2014)	X	3 years of data (2011-2014)
	4-7 years (2007-2008 to 2013-2014)		
	8 to 10 years (2004-2005 to 2013-2014)		
	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
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¹ Massachusetts Department of Elementary and Secondary Education, Assessment/Accountability, Licensure Help – On-line: <https://gateway.edu.state.ma.us/elar/licensurehelp/LicenseRequirementsCriteriaPageControl/.ser?COMMAND.back=back>

² Massachusetts Department of Elementary and Secondary Education, Educator Services, Professional License Renewal: <http://www.doe.mass.edu/recert/>

³ Massachusetts Department of Elementary and Secondary Education (personal communication).

⁴ Massachusetts Department of Elementary and Secondary Education, Educator Services, Science, Technology Engineering, and Mathematics (STEM), Instructional Resources: <http://www.doe.mass.edu/STEM/instructional.html>

⁵ Education Commission of the States, State Textbook Adoption <https://www.ecs.org/clearinghouse/57/75/5775.htm>

⁶ Massachusetts Department of Elementary and Secondary Education, Educator Services, Teaching and Learning, Curriculum Resources, Current Frameworks, Science and Technology/Engineering, PDF: <http://www.doe.mass.edu/frameworks/current.html>

⁷ Massachusetts Department of Elementary and Secondary Education, Student Assessment, Accountability, Partnership & Assistance, Compliance/Monitoring, High School Graduation Requirements, Scholarships, and Academic Support Opportunities: <http://www.doe.mass.edu/mcas/graduation.html>

⁸ Massachusetts Department of Elementary and Secondary Education, Student Assessment, Massachusetts Comprehensive Assessment System, Overview: <http://www.doe.mass.edu/mcas/overview.html?faq=1>

⁹ Massachusetts Department of Elementary and Secondary Education, Assessment/Accountability, Student Assessment, Massachusetts Comprehensive Assessment System, Test Design and Development: <http://www.doe.mass.edu/mcas/tdd/sci.html?section=testdesign>

¹⁰ Massachusetts Department of Elementary and Secondary Education, School/District Profiles: <http://profiles.doe.mass.edu/>

¹¹ Massachusetts Department of Elementary and Secondary Education, Assessment/Accountability, Student Assessment, Massachusetts Comprehensive Assessment System, Test Design and Development, Spring 2014 MCAS Multiple Choice Results Interpretive Guide, PDF: <http://www.doe.mass.edu/mcas/results.html?yr=2014>

¹² Massachusetts Department of Elementary and Secondary Education, Assessment, Item by Item Results for Grade 05 Science and Technology: <http://profiles.doe.mass.edu/mcas/mcasitems2.aspx?grade=05&subjectcode=SCI&linkid=7&orgcode=00000000&fycode=2014&orgtypecode=0&>

¹³ 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>

¹⁴ Massachusetts Department of Elementary and Secondary Education, Assessment/Accountability, Massachusetts Comprehensive Assessment System, 2014 MCAS Parent/Guardian Report Templates: <http://www.doe.mass.edu/mcas/2014/pgguide/default.html>

¹⁵ Massachusetts Department of Elementary and Secondary Education, Assessment/Accountability, Massachusetts Comprehensive Assessment System, MCAS Results, Spring 2014 MCAS Multiple-Choice Results Interpretive Guide, PDF: <http://www.doe.mass.edu/mcas/results.html?yr=2014>

¹⁶ Massachusetts Department of Elementary and Secondary Education, School/District Administration, Education Laws and Regulations, Final Regulations on Evaluation of Educators: <http://www.doe.mass.edu/lawsregs/603cmr35.html?section=07>

¹⁷ Massachusetts Department of Elementary and Secondary Education, Assessment, MCAS Annual Comparisons: <http://profiles.doe.mass.edu/mcas/mcascharts2.aspx?linkid=33&orgcode=00000000&fycode=2014&orgtypecode=0&>