

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	Elementary (K-8)

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?	No
c. Is a mathematics examination required for licensure?	No
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 ¹
	Greater than 5 years	

b. Can in-service teachers receive certification credit for professional development courses/programs in Earth and Space Sciences?	Yes	X	Teachers need 60 hours to renew their license. The course requirements are nonspecific. ²
	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		
	2. Curriculum maps		
	3. Learning progressions		
	4. Benchmark maps	X	Essential Learning Expectations (ELE) for Science ³
	5. Templates for unit design		
	6. Curriculum development guides	X	Montana Guide to Curriculum Development ⁴
	7. Model units		
	8. Lesson plan templates/guides		
	9. Web-based lesson plan portals		
	10. Model lesson plans		
	11. Assessment guidelines		

2. Instructional Materials⁴

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 Standards²

a. Does that state provide resources to school systems to effectively implement the standards as they change?	Yes	X	<p>The state is very locally controlled. Professional development offered by the state is non content specific and focuses on instruction only. There is a consortium that local system can become a part of that provides grants for local systems when they apply.</p> <p>Funding goes directly from the state budget to the local systems. The funding is approved by the legislature and is based per student. The locals would decide how to spend the funding on resources needed.</p>
	No		
	Local issue		
	Unknown		

4. Professional Development²

a. Does the SEA provide professional development that is, at least in part, specific to the geosciences?	Yes, provided by SEA	X	<p>Informal science partners provide professional development to teachers who volunteer to participate. The partners belong to the Montana Informal Education Network. The state has a formal partnership (MOU) with 30 agencies. The GLOBE, WET, Project Learning Tree and WILD are all used in the state. The primary partners are state parks, national parks, protected lands, museums, and universities. 50% of the resources provided through the agencies are geosciences related.</p> <p>The state is applying for a grant from the National Science Foundation to research the effect of the professional development from these agencies on instruction, or what happens after the field trip in the classroom. All 30 agencies have written letters of support for this evaluation grant.</p>
	Yes, but independent of SEA		
	No		
	Local issue		
	Unknown		

II. Curriculum

A. Elementary School State Science Standards

1. Organization⁵

a. What is the name of the state's elementary school science standards?	Montana K-12 Science Content Standards Framework
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b. What is the grade-level arrangement of the standards?	Grade specific	
	Grade-level bands	
	Benchmark grade levels	X (Grade 4)

c. How are the standards outlined?	Overarching standard statements (level one)	X	d. What terms are used to identify each level?	Standards
	Sub-standard statements that provide more detail to the overarching standards (level two)	X		Benchmarks

2. Content⁵

a. Are the science standards subdivided according to scientific discipline (Physical Science, Life Science, and Earth and Space Science)?	Yes	The benchmarks at the end of grade 4 and grade 8 are organized according to six Science Content Standards. Standard 1: Scientific Investigations Standard 2: Physical Science Standard 3: Life Science Standard 4: Earth/Space Science Standard 5: Impact on Society Standard 6: Historical Development
b. Are the Earth and Space Science standards identified by core ideas in the geosciences?	No	
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	By end of grade 4, students examine soil, rocks, water and gases and the resources they provide. By end of grade 8 (which includes grade 5), students look at rock and minerals and how they are used by humans.
d. Do the state's standards include career exploration in the geosciences?	Yes	By the end of grade 8 (which includes grade 5), students identify the specific fields of science and technology and occupations within those fields.

3. Development

a. When were the standards adopted or last revised?	Within the last two years (2014-2015)		November, 2006 ⁵
	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		
	Within the next 5 years (2015-2020)		
	Between 5 and 10 years from now (2020-2025)		
	No plan or timeline exists	X ²	
	Unknown		

B. Middle School State Science Standards

1. Content⁵

a. What is the name of the state's middle school science standards?	Montana K-12 Science Content Standards 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. Content⁵

a. What is the name of the state's high school science standards?	Montana K-12 Science Content Standards 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 Graduation⁶

a. What is the total number of credits required for graduation?	20
b. What is the number of science credits required for graduation?	2

2. Course Content⁶

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?	Not stated
f. Does Earth Science have to be lab-based?	Not stated

III. Instruction

A. Elementary School Approaches to Instruction

1. State Science Standards⁵

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?	Yes
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d. If so, what is the rationale?	Science is an inquiry process used to investigate natural phenomena, resulting in the formation of theories verified by directed observations. Inquiry challenges students to solve problems by observing and collecting data and constructing inferences from those data. In doing so, students acquire knowledge and develop a rich understanding of concepts, principles, models, and theories (National Research Council, National Science Education Standards 214). Inquiry requires the use of scientific thinking skills to address open-ended problems through non-prescriptive procedures and allows students to construct their own knowledge of the specific concepts. This validates different ways of gathering, synthesizing and communicating knowledge. Scientific theories are challengeable and changeable. Data used to support or contradict them must be reproducible
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2. Guidelines for Curriculum Planning^{3,4}

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. Technology²

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?	Varies across the state. Some districts have one to one technology and others do not have broad band.

IV. Learning Contexts

A. Elementary School Classrooms

1. Class Size²

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 Time²

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

B. Elementary School Support Services

1. Specialized Support²

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	Varies by school district. There are approximately 100 traditional ESL students (born in a foreign country). There are many districts that provide ESL low literacy services to Native Americans.
	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 Education²

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?	<p>Informal science partners provide professional development to teachers who volunteer to participate. The partners belong to the Montana Informal Education Network. The state has a formal partnership (MOU) with 30 agencies. The GLOBE, WET, Project Learning Tree and WILD are all used in the state. The primary partners are state parks, national parks, protected lands, museums, and universities. 50% of the resources provided through the agencies are geosciences related. Montana Tech and oil companies provide opportunities for teachers and students.</p> <p>Informal science partners provide professional development to teachers who volunteer to participate. The partners belong to the Montana Informal Education Network. The state has a formal partnership (MOU) with 30 agencies. The GLOBE, WET, Project Learning Tree and WILD are all used in the state. The primary partners are state parks, national parks, protected lands, museums, and universities. 50% of the resources provided through the agencies are geosciences related. Montana Tech and oil companies provide opportunities for teachers and students.</p>
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2. Remedial Education²

a. What remedial supports are in place for geosciences topics with which students are struggling?	Local level decision	
	Remediation services are being provided to students in science	
	No remediation support in science	X
	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?	Montana Comprehensive Assessment System (MontCAS), Criterion-Referenced Test in Science ⁷		
b. At what grade(s) is the assessment implemented?	4 ⁷		
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 ⁸		
e. Are there any plans for revising or changing the current elementary level science assessment?	No plans for revision	X	The current assessment is locked into a contract. It may change in two years. ²
	Revision is planned, but timeline is unknown		
	Revision is planned with implementation date set		
	Unknown		

2. Results⁹

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	The state reports results on the statewide science assessment at the district level. The SEA has created the GEMS website (Growth and Enhancement of Montana Students) to access data at the state, district, and school level. District level results made available to the public are aggregated and not subdivided by discipline.
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	

District educators and administrators can access assessment results through the Montana Analysis and Reporting System (MARS). This secure, on-line tool allows users to filter results based on content standard (Physical Science, Life Science, Earth/Space Science) at the district and school levels.

4. State Level Reporting¹⁰

a. At the state level, are the percentages of students	Yes	Results on the statewide science
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performing at each PLD reported to the public?		assessment at the state level are reported to the public through the GEMS website (Growth and Enhancement of Montana Students). Results are aggregated and not subdivided by discipline.
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?	N/A	

B. Elementary School International Assessments in Science

1. TIMSS¹²

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 Content⁷

a. What is the name of the statewide standardized test in science at the middle school level?	Montana Comprehensive Assessment System (MontCAS), Criterion-Referenced Test in 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 Life Science concepts?	Yes
e. Does the assessment address Earth Science concepts?	Yes

C. High School Statewide Science Assessment(s)

1. Structure and Content⁷

a. What is the name of the state's standardized science assessment(s)?	Montana Comprehensive Assessment System (MontCAS), Criterion-Referenced Test in Science
b. At what grade level is the assessment implemented?	10
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 Student¹¹

a. Does the state produce an Individual Student Report (ISR) that describes a student’s performance on the state’s science assessment?	Yes	<p>A student report is produced for each parent of a student who took or was eligible to take the Montana CRT.</p> <p>The report contains the results for each subject at the content standard level. The number of points earned by the student in each content standard is reported, as well as the range of points earned by students who achieve proficiency. Content standards are:</p> <p>1. Scientific Investigations 23% (14 points) 2. Physical Science 23% (14 points) 3. Life Science 23% (14 points) 4. Earth/Space Science 23% (14 points) 5. Impact on Society and 6. Historical Development 8% (5 points)</p> <p>The students report is shipped to school systems and posted online for school/system access.</p> <p>The SEA makes student reports available through secure on-line tool, the Montana Analysis and Reporting System (MARS). Additionally, educators and administrators can use the MARS tool to filter data based on test year, grade level, content area, standard, and student subgroup.</p>
b. Is the ISR made available to a student’s parents or guardians?	Yes	
c. Is the ISR made available to a student’s teacher?	Yes	
d. Does the ISR report student’s performance in terms of scale score and achievement level?	Yes	
e. Does the ISR subdivide results by science discipline (Physical Science, Life Science, Earth and Space Science)?	Yes	

2. Teacher Appraisal²

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

1. District Accreditation²

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

C. State Level

1. Statewide Monitoring²

a. Are student outcomes in statewide science assessments at the elementary level used in monitoring the adequacy of state educational systems?	No	
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2. Trends in Student Outcomes¹⁰

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)		
	4-7 years (2007-2008 to 2013-2014)	X	6 years of data (2007-2013)
	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 Montana Office of Public Instruction, Educator Licensure, Teacher:

http://www.opi.mt.gov/Cert/index.html#gpm1_1

² Montana Office of Public Instruction (personal communication).

³ Montana Office of Public Instruction, Curriculum and Assessment, Content Standards and Instruction: Science, Standards, Science Essential Learning Expectations, PDF: <http://www.opi.mt.gov/Curriculum/science/index.php>

⁴ Montana Office of Public Instruction, Curriculum and Assessment, Curriculum Development Guide:

<http://www.opi.mt.gov/Curriculum/Curriculum-Development-Guide/>

⁵ Montana Office of Public Instruction, Curriculum and Assessment, Content Standards and Instruction: Science, Standards, Montana Science Content Standards and Performance Descriptors, PDF:

<http://www.opi.mt.gov/Curriculum/science/index.php>

⁶ Montana Administrative Rules Services, Rule 10.55.905, Graduation Requirements:

<http://www.mtrules.org/gateway/ruleno.asp?RN=10.55.905>

⁷ Montana Office of Public Instruction, Curriculum and Assessment, MontCAS, CRT and CRT-ALT:

http://www.opi.mt.gov/Curriculum/MontCAS/#gpm1_2

⁸ Montana Office of Public Instruction, Curriculum and Assessment, MontCAS, CRT and CRT-ALT, CRT Tests, Specifications and Blueprints, Science, PDF: http://www.opi.mt.gov/Curriculum/MontCAS/#gpm1_2

⁹ Montana Office of Public Instruction, Curriculum and Assessment, MontCAS, CRT and CRT-ALT, CRT Tests, Development, CRT Technical Reports: http://www.opi.mt.gov/Curriculum/MontCAS/#gpm1_2

¹⁰ Montana Office of Public Instruction, Growth and Enhancement of Montana Students, Statewide Assessment, MontCAS (CRT) Proficiency Trends:

<http://gems.opi.mt.gov/StudentAchievement/Pages/CRTProficiencyTrends.aspx>

¹¹ Montana Office of Public Instruction, Curriculum and Assessment, MontCAS, CRT and CRT-ALT, CRT Tests, Development, CRT Technical Reports: http://www.opi.mt.gov/Curriculum/MontCAS/#gpm1_2

¹² 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>