

## **I. Teacher Preparation**

### ***A. Elementary School Licensure Requirements***

#### **1. Licensure Grade Levels**

a. Does the state offer an Early Elementary Education credential (Preschool/Kindergarten to Grade 2/3)?	Yes	Early Childhood Education (Birth-Age 8 or Grade 3) <sup>1</sup>
b. Does the state offer an Elementary Education credential (Kindergarten/Grade 1 to Grade 5/6)?	Yes	Elementary Education (Grades 1-8) <sup>2</sup>

#### **2. Early Elementary<sup>1</sup>**

a. Is an educational practice examination required for licensure?	Yes
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 Education<sup>2</sup>**

a. Is an educational practice examination required for licensure?	Yes
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		
	Greater than 5 years	X	6 years <sup>2</sup>
b. Can in-service teachers receive certification credit for professional development courses/programs in Earth and Space Sciences?	Yes	X	But there is no specific certification for Geosciences. <sup>3</sup>
	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	Note: SEA provides guidance/examples/supports but these are not 'guidelines' because districts are not required/mandated to use them.
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b. If yes, which of the following does the state provide?	1. Science frameworks		
	2. Curriculum maps		
	3. Learning progressions	X	K-5 Learning Progressions for Science <sup>4</sup>
	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	X	IDEAL <sup>5</sup>
	10. Model lesson plans	X	K-2 Inquiry Seed Lesson (5E Instructional Model) <sup>4</sup>
	11. Assessment guidelines		

### 2. Instructional Materials<sup>6</sup>

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

### 3. Support for New Standards<sup>3</sup>

a. Does that state provide resources to school systems to effectively implement the standards as they change?	Yes	X	The state will provide professional development on understanding and implementing the new standards when it becomes necessary. The professional development will highlight the major shifts from the previous standards, describe what it will look like in the classroom and align lessons and resources to the new standards. The state will provide guidance on curriculum mapping, backward planning, and unpacking the standards. New resources will be suggested and guidance on how to select resources will be provided by the state. Local districts will make decisions on how they will allocate funds to provide additional resources they might need when new standards are adopted.
	No		
	Local issue		
	Unknown		

### 4. Professional Development

a. Does the SEA provide professional development that	Yes, provided by SEA	X	
	Yes, but independent of SEA		

is, at least in part, specific to the geosciences?	No		
	Local issue		
	Unknown		

## **II. Curriculum**

### ***A. Elementary School State Science Standards***

#### **1. Organization<sup>7</sup>**

a. What is the name of the state's elementary school science standards?	Arizona Science Standard Articulated by Grade Level		
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)	X	d. What terms are used to identify each level?
	Sub-standard statements that provide more detail to the overarching standards (level two)	X	Concepts  Performance Objectives

#### **2. Content<sup>7</sup>**

a. Are the science standards subdivided according to scientific discipline (Physical Science, Life Science, and Earth and Space Science)?	Yes	
b. Are the Earth and Space Science standards identified by core ideas in the geosciences?	Yes	Properties of Earth Materials (K-4) Structure of the Earth (5-8) Objects in the Sky (K-3) Earth's Processes and Systems (4-8) Changes in the Earth and Sky (K-4) Earth in the Solar System (5-8)
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	In Kindergarten, students identify materials that can be recycled. In grade 2, they identify ways to conserve natural resources (e.g., reduce, reuse, recycle, find alternatives). In grade 2, they identify natural resources (air, water, soil, trees, wildlife) and consider ways to conserve these resources. In Grades 3-4, students describe the interactions between human populations, natural hazards, and the environment. In grade 5, students describe efforts to explore space, including the Apollo missions, space shuttles, Hubble and other space probes.
d. Do the state's standards include career exploration in the geosciences?	Yes	As part of Strand 2: History and Nature of Science, students identify science-related career opportunities in grades 2, 3, 4.

#### **3. Development**

a. When were the standards adopted or last revised?	Within the last two years (2014-2015)	Adopted 2004, revised 2005 <sup>7</sup>
	Between 3-6 years ago (2010-2014)	
	Between 7-10 years ago (2006-2009)	
	More than 10 years ago (before 2006)	X
b. Does the state have plans to review/revise its science standards?	Currently under review	The Arizona Academic Standards were the first set of AZ science standards and were adopted in 1997. These standards were refined in 2003 and the Arizona Science Standard was adopted in 2004. This is the current science standard. A timeframe for adopting new science standards in Arizona has not yet been determined. <sup>8</sup>
	Within the next 5 years (2015-2020)	
	Between 5 and 10 years from now (2020-2025)	
	No plan or timeline exists	X
	Unknown	

## ***B. Middle School State Science Standards***

### **1. Content<sup>7</sup>**

a. What is the name of the state's middle school science standards?	Arizona Science Standard Articulated by Grade Level
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. Content<sup>7</sup>**

a. What is the name of the state's high school science standards?	Arizona Science Standard Articulated by Grade Level
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 Graduation<sup>9</sup>**

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 Content<sup>9</sup>**

a. Is Life Science required?	Yes
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?	Not stated

### **III. Instruction**

#### ***A. Elementary School Approaches to Instruction***

##### **1. State Science Standards<sup>7</sup>**

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?	Three-Dimensional Learning
c. Do the state's science standards provide a rationale for this approach?	Yes
d. If so, what is the rationale?	<p>“The goal in the development of the standard was to assure that the six strands and five unifying concepts are interwoven into a fabric of science that represents the true nature of science. Students have the opportunity to develop both the skills and content knowledge necessary to be scientifically literate members of the community.</p> <p>Strands 1, 2, and 3 are designed to be explicitly taught <i>and</i> embedded <i>within</i> each of the content strands 4, 5, and 6, and are not intended to be taught in isolation. The processes, skills, and content of the first three strands are designed to “umbrella” and complement the content of Life Science, Physical Science, and Earth and Space Science. “ (page x)<sup>7</sup></p>

##### **2. Guidelines for Curriculum Planning<sup>4</sup>**

a. If the state offers guidelines for curriculum planning, do these advocate more specific strategies for science instruction?	Yes  Note: SEA offers guidance/examples, but these are not “guidelines” or requirements.
b. If so, what are the strategies?	5E Learning Cycle

##### **3. Technology<sup>3</sup>**

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 from district to district.

## **IV. Learning Contexts**

### ***A. Elementary School Classrooms***

#### **1. Class Size<sup>3</sup>**

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

#### **2. Instructional Time<sup>10</sup>**

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		The SEA recommended minutes of science instruction for elementary schools: Primary Grades (1-3): 30 min daily, 150 min weekly (this is half of recommended minutes for math and language arts) Upper Elementary (4-6): 40 min daily, 200 min weekly (this is 2/3 of recommended minutes for math and language arts) Note: The SEA recommended minutes of science instruction are provided as guidance. This is not a requirement. Time allocation for science is a local decision.
	Local decision	X	

### ***B. Elementary School Support Services***

#### **1. Specialized Support<sup>3</sup>**

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		A multi-tiered system of support is used with our students. The specifications of a student's IEP or ILP are made at the local level and teachers must follow those specifications.
	Depends on the specifications of a student's IEP or ILP	X	
	Teachers must follow specific practices regarding science		
	Unknown		

## **V. Extra-Curricular Programs**

### ***A. Elementary School Geosciences Enrichment Opportunities***

## 1. After-School and Informal Education<sup>3</sup>

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?  Opportunities to apply geosciences beyond the classroom depend on the local districts and schools. It varies from school to school.  Examples include programs provided by the following organizations: <ul style="list-style-type: none"><li>• Project Wet (Water project)</li><li>• WILD (through the Game and Fish state department)</li><li>• AZ Mineral and Mining Museum</li><li>• STEM Clubs</li></ul> The state has informal partnerships to work on short term goals that usually involve developing programs or reviewing curriculum. The partners may include: <ul style="list-style-type: none"><li>• AZ Science Center</li><li>• 21st Century Programs</li><li>• Helios Foundation</li><li>• Science Foundation AZ</li><li>• AZ Science Teachers Association</li><li>• Zoos and museums</li></ul>	

## 2. Remedial Education<sup>3</sup>

a. What remedial supports are in place for geosciences topics with which students are struggling?	Local level decision	X	Local Control issue. This information is not reported to the state.
	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?	Arizona's Instrument to Measure Standards (AIMS) <sup>11</sup>	
b. At what grade(s) is the assessment implemented?	4 <sup>11</sup>	
c. Does the statewide science assessment measure achievement of the state's standards, i.e. is the assessment aligned with state standards?	Yes <sup>11</sup>	
d. Is the content of the statewide science assessment sub-divided by discipline, namely Physical Science, Life Science, Earth and Space Science?	Yes <sup>12</sup>	
e. Are there any plans for revising or changing the current elementary level science assessment?	No plans for revision	X
	Revision is planned, but timeline is unknown	
	Revision is planned with implementation date set	
	Unknown	

#### **2. Results<sup>13</sup>**

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

#### **3. District Level Reporting<sup>14</sup>**

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)?	Yes	
c. If yes, is this data available to the public?	No	

#### **4. State Level Reporting<sup>14</sup>**

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?	N/A	

**B. Elementary School International Assessments in Science**

**1. TIMSS<sup>15</sup>**

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 Content<sup>16</sup>**

a. What is the name of the statewide standardized test in science at the middle school level?	Science AIMS
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?	No

**C. High School Statewide Science Assessment(s)**

**1. Structure and Content<sup>16</sup>**

a. What is the name of the state's standardized science assessment(s)?	Science AIMS
b. At what grade level is the assessment implemented?	9 or 10
c. Does the assessment address Life Science concepts?	Yes
d. Does the assessment address Physical Science concepts?	No
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 <sup>17</sup>	AZ statutes require that each school district provide a parent a copy of their child's test scores. AZ provides a science score, but does not subdivide the score according to science discipline.
b. Is the ISR made available to a student's parents or guardians?	Yes <sup>17</sup>	
c. Is the ISR made available to a student's teacher?	Yes <sup>3</sup>	
d. Does the ISR report student's performance in terms of scale score and achievement level?	Yes <sup>17</sup>	The science assessment is reported to the teacher and sub divided by strand.
e. Does the ISR subdivide results by science discipline (Physical Science, Life Science, Earth and Space Science)?	Yes <sup>3</sup>	

#### **2. Teacher Appraisal<sup>3</sup>**

a. Are students' results on the statewide science assessment a component of teacher evaluation?	They can be	State assessments may be used to evaluate teachers. However, the AIMS Science assessment is only administered at grade 4 at the elementary level.
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### ***B. District Level***

#### **1. District Accreditation<sup>3</sup>**

a. Are student outcomes in statewide science assessments at the elementary level part of accreditation of public schools at the district level?	Yes	Local districts decide if they were going to use it as a piece of their accreditation.
	No	
	At a future point	
	Local decision	X
	Unknown	

### ***C. State Level***

#### **1. Statewide Monitoring<sup>3</sup>**

a. Are student outcomes in statewide science assessments at the elementary level used in monitoring the adequacy of state educational systems?	No	The science assessment may be used in the future for statewide monitoring. There is legislation to include science but the accountability formula has not been fully developed.
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#### **2. Trends in Student Outcomes<sup>18</sup>**

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	5 years 2010-2014
	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	

<sup>1</sup> Arizona Department of Education, Educator Certification, Teaching Certificates, Early Childhood Education, PDF: <http://www.azed.gov/educator-certification/certificate-requirement/teaching-certificate/>

<sup>2</sup> Arizona Department of Education, Educator Certification, Teaching Certificates, Elementary Education, PDF: <http://www.azed.gov/educator-certification/certificate-requirement/teaching-certificate/>

<sup>3</sup> Arizona Department of Education (personal communication)

<sup>4</sup> Arizona Department of Education, K-12 Academic Standards, Science: <http://www.azed.gov/standards-practices/academic-standards/science/>

<sup>5</sup> IDEAL, Arizona's eLearning Platform, Arizona Department of Education: <https://www.ideal.azed.gov/p/>

<sup>6</sup> Education Commission of the States, State Textbook Adoption: <https://www.ecs.org/clearinghouse/57/75/5775.htm>

<sup>7</sup> Arizona Department of Education, K-12 Academic Standards, Science, The Science Standards Articulated by Grade Level, Arizona Standard by Strand, PDF: <http://www.azed.gov/standards-practices/files/2011/12/sciencestandard.pdf>

<sup>8</sup> Arizona Department of Education, K-12 Academic Standards, Science, Arizona Science Standards: <http://www.azed.gov/standards-practices/academic-standards/science/>

<sup>9</sup> Arizona Department of Education, High School Graduation Requirements: <http://www.azed.gov/hsgraduation/>

<sup>10</sup> Arizona Department of Education, K-12 Academic Standards, Standards Overview, Science, Arizona Course Requirements and Recommended Instructional Time, Recommended Instructional Time (elementary), MSWord Doc: <http://www.azed.gov/standards-practices/academic-standards/science/#>

<sup>11</sup> Arizona Department of Education, Assessment Overview: <http://www.azed.gov/assessment/>

<sup>12</sup> Arizona Department of Education, AIMS Science Support Materials, Science Students Guides, Grade 4 Science Student Guide, PDF: <http://www.azed.gov/assessment/aimssupportmaterials/>

<sup>13</sup> Arizona Department of Education, AIMS Support Materials, AIMS Science Performance Level Descriptors, PDF: <http://www.azed.gov/assessment/aimssupportmaterials/>

<sup>14</sup> Arizona Department of Education, AIMS Assessment Results, AIMS Results, AIMS and AIMSA 2014, MSEExcel Spreadsheet: <http://www.azed.gov/research-evaluation/aims-assessment-results/>

<sup>15</sup> 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>

<sup>16</sup> Arizona Department of Education, K-12 Academic Standards, Science, Arizona Science Assessment: <http://www.azed.gov/standards-practices/academic-standards/science/>

<sup>17</sup> Arizona Department of Education, A Parent's Guide to Understanding AIMS 3-8, PDF: [www.azed.gov/wp-content/uploads/PDF/AIMSDPAcolor.pdf](http://www.azed.gov/wp-content/uploads/PDF/AIMSDPAcolor.pdf)

<sup>18</sup> Arizona Department of Education, AIMS Assessment Results, AIMS Results, AIMS and AIMSA 2014: <http://www.azed.gov/research-evaluation/aims-assessment-results/>