



**Standard 1: Content Knowledge**

Effective teachers of science understand and articulate the knowledge and practices of contemporary science and engineering. They connect important disciplinary core ideas, crosscutting concepts, and science and engineering practices for their fields of licensure.

Below are the elements of the standard.

Preservice teachers will:

- 1a) Use and apply the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields. Explain the nature of science and the cultural norms and values inherent to the current and historical development of scientific knowledge.
- 1b) Demonstrate knowledge of crosscutting concepts, disciplinary core ideas, practices of science and engineering, the supporting role of science-specific technologies, and contributions of diverse populations to science.
- 1c) Demonstrate knowledge of how to implement science standards, learning progressions, and sequencing of science content for teaching their licensure level PK-12 students.

**Assessment:** This Standard is met using Assessment 1 – State Content Exam for Certification, Assessment 2 – An Additional Comprehensive Content Exam or GPA, and Assessment 3 – Unit Plan.

**Standard 2: Content Pedagogy**

Effective teachers of science plan learning units of study and equitable, culturally-responsive opportunities for *all* students based upon their understandings of how students learn and develop science knowledge, skills, and habits of mind. Effective teachers also include appropriate connections to science and engineering practices and crosscutting concepts in their instructional planning.

Below are the elements of the standard.

Preservice teachers will design lessons:

- 2a) Using science standards and a variety of appropriate, student-centered, and culturally-relevant science disciplinary-based instructional approaches that follow safety procedures and incorporate science and engineering practices, disciplinary core ideas, and crosscutting concepts.
- 2b) Incorporating appropriate differentiation strategies, wherein *all* students develop conceptual knowledge and an understanding of the nature of science. Lessons should engage students in applying science practices, clarifying relationships, and identifying natural patterns from empirical experiences.
- 2c) Using engineering practices in support of science learning wherein all students design, construct, test and optimize possible solutions to a problem.
- 2d) Aligning instruction and assessment strategies to support instructional decision making that identifies and addresses student misunderstandings, prior knowledge, and naïve conceptions.
- 2e) Integrating science-specific technologies to support *all* students’ conceptual understanding of science and engineering.

**Assessment:** This Standard is met using Assessment 3 –Unit Plan.

### **Standard 3: Learning Environments**

Effective teachers of science are able to plan for engaging *all* students in science learning by identifying appropriate learning goals that are consistent with knowledge of how students learn science and are aligned with standards. Plans reflect the selection of phenomena appropriate to the social context of the classroom and community, and safety considerations, to engage students in the nature of science and science and engineering practices. Effective teachers create an anti-bias, multicultural, and social justice learning environment to achieve these goals.

Below are the elements of the standard.

Preservice teachers will:

- 3a) Plan a variety of lesson plans based on science standards that employ strategies that demonstrate their knowledge and understanding of how to select appropriate teaching and motivating learning activities that foster an inclusive, equitable, and anti-bias environment.
- 3b) Plan learning experiences for *all* students in a variety of environments (e.g., the laboratory, field, and community) within their fields of licensure.
- 3c) Plan lessons in which *all* students have a variety of opportunities to investigate, collaborate, communicate, evaluate, learn from mistakes, and defend their own explanations of: scientific phenomena, observations, and data.

**Assessment:** This Standard is met using Assessment 3 – Unit Plan.

### **Standard 4: Safety**

Effective teachers of science demonstrate biological, chemical, and physical safety protocols in their classrooms and workspace. They also implement ethical treatment of living organisms and maintain equipment and chemicals as relevant to their fields of licensure.

Below are the elements of the standard.

Preservice teachers will:

- 4a) Implement activities appropriate for the abilities of *all* students that demonstrate safe techniques for the procurement, preparation, use, storage, dispensing, supervision, and disposal of all chemicals/materials/equipment used within their fields of licensure.
- 4b) Demonstrate an ability to: recognize hazardous situations including overcrowding; implement emergency procedures; maintain safety equipment; provide adequate student instruction and supervision; and follow policies and procedures that comply with established state and national guidelines, appropriate legal state and national safety standards (e.g., OSHA, NFPA, EPA), and best professional practices (e.g., NSTA, NSELA).
- 4c) Demonstrate ethical decision-making with respect to safe and humane treatment of all living organisms in and out of the classroom, and comply with the legal restrictions and best professional practices on the collection, care, and use of living organisms as relevant to their fields of licensure.

**Assessment:** This Standard is met using Assessment 4 – Student Teaching Observation Form.

**Standard 5: Impact on Student Learning**

Effective teachers of science provide evidence that students have learned and can apply disciplinary core ideas, crosscutting concepts, and science and engineering practices as a result of instruction. Effective teachers analyze learning gains for individual students, the class as a whole, and subgroups of students disaggregated by demographic categories, and use these to inform planning and teaching.

Below are the elements of the standard.

Preservice teachers will:

- 5a) Implement assessments that show *all* students have learned and can apply disciplinary knowledge, nature of science, science and engineering practices, and crosscutting concepts in practical, authentic, and real-world situations.
- 5b) Collect, organize, analyze, and reflect on formative and summative evidence and use those data to inform future planning and teaching.
- 5c) Analyze science-specific assessment data based upon student demographics, categorizing the levels of learner knowledge, and reflect on results for subsequent lesson plans.

**Assessment:** This Standard is met using Assessment 5 – Impact on Student Learning.

**Standard 6: Professional Knowledge and Skills**

Effective teachers of science strive to continuously improve their knowledge of both science content and pedagogy, including approaches for addressing inequities and inclusion for *all* students in science. They identify with and conduct themselves as part of the science education community.

Below are the elements of the standard.

Preservice teachers will:

- 6a) Engage in critical reflection on their own science teaching to continually improve their instructional effectiveness.
- 6b) Participate in professional development opportunities to deepen their science content knowledge and practices.
- 6c) Participate in professional development opportunities to expand their science-specific pedagogical knowledge.

**Assessment:** This Standard is met through Assessment 6 using different means.