The competent elementary teacher understands the interrelationships among science, technology, and society; understands the fundamental concepts of earth and space science, the life sciences, the physical sciences, and the environmental sciences; and uses strategies to engage all students in acquiring new knowledge through the use of scientific thinking and reasoning.

a) Knowledge Indicators – The competent elementary teacher:
   1) understands the interrelationships among science, technology, and society in historical and contemporary contexts.
   2) understands the fundamental concepts, principles, and interconnections of the life sciences, the physical sciences, the environmental sciences, and earth and space science and their use to interpret, analyze, and explain phenomena.
   3) understands principles and procedures, including safety practices, related to the design and implementation of scientific investigations and the application of inquiry skills and processes to develop explanations of natural phenomena.
   4) understands the use of scientific investigation and inquiry skills across the sciences to conduct experiments and solve problems.

b) Performance Indicators – The competent elementary teacher:
   1) demonstrates and communicates the concepts, theories, and practices of science.
   2) demonstrates and uses strategies to engage students in acquiring new knowledge through the use of scientific thinking and reasoning.
   3) selects and uses a wide range of instructional resources and technologies to support scientific learning.

Section 26.360 Curriculum: Physical Development and Health

The competent elementary teacher understands the comprehensive nature of students' physical, emotional, and social well-being; understands the role of human movement and physical activity as elements central to active, healthy lifestyles; and promotes all students' ability to develop and practice skills that contribute to good health and enhanced quality of life.

a) Knowledge Indicators – The competent elementary teacher:
   1) understands concepts related to movement, sports, and team-building skills.
   2) understands the systems of the human body, physical fitness concepts and practices, and interrelationships between fitness and body systems.
   3) understands basic principles and practices of personal, interpersonal, and community health and safety.
   4) understands conflict resolution and its relationship to health and well-being.

b) Performance Indicators – The competent elementary teacher:
   1) uses communication and decision-making skills to promote personal, interpersonal, and community health and well-being.
   2) promotes and adapts skills that contribute to health and safety.
   3) provides opportunities for individual and team physical activities.
4) models, teaches, and promotes conflict resolution and its relationship to health and well-being.
5) selects and uses a wide range of instructional resources and technologies to support physical development and health.

Association for Childhood Education International
Elementary Education Standards and Supporting Explanation
2007

Standard 2.2 Science—Candidates know, understand, and use fundamental concepts of physical, life, and earth/space sciences. Candidates can design and implement age-appropriate inquiry lessons to teach science, to build student understanding for personal and social applications, and to convey the nature of science;

Supporting explanation
Candidates have a broad general understanding of science and they teach elementary students the nature of science, and the content and fundamentals of physical, life, earth and space sciences, and their interrelationships. They are familiar with, and teach, the major concepts and principles that unify all scientific effort and that are used in each of the science disciplines: (1) systems, order, and organization; (2) evidence, models, and explanation; (3) change, constancy, and measurement; (4) evolution and equilibrium; and (5) form and function. Candidates engage elementary students in the science inquiry process that involves asking questions, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments and explanations. They introduce students to understandings about science and technology and to distinctions between natural objects and objects made by humans by creating experiences in making models of useful things, and by developing students’ abilities to identify and communicate a problem, and to design, implement, and evaluate a solution. They know naive theories and misconceptions most children have about scientific and technological phenomena and help children build understanding. Candidates understand the use of assessment through diverse data-collection methods as ways to inform their teaching and to help students learn scientific inquiry, scientific understanding of the natural world, and the nature and utility of science.

Standard 2.6 Health education—Candidates know, understand, and use the major concepts in the subject matter of health education to create opportunities for student development and practice of skills that contribute to good health.

Supporting explanation
Candidates understand the foundations of good health, including the structure and function of the body and its systems and the importance of physical fitness and sound nutrition. They help students understand the benefits of a healthy lifestyle for themselves and others as well as the dangers of diseases and activities that may contribute to disease. Teacher candidates are alert to major health issues concerning children and the social forces that affect them, and of the need to impart information on these issues sensitively. They address issues in ways that help students recognize potentially dangerous situations, clarify misconceptions, and find reliable sources of information.
2012 NSTA Preservice Science Standards

NSTA Standard 1: Content Knowledge
Effective teachers of science understand and articulate the knowledge and practices of contemporary science. They interrelate and interpret important concepts, ideas, and applications in their fields of licensure. Below are the elements of the standard.

Preservice teachers will:

1a) Understand the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association.

1b) Understand the central concepts of the supporting disciplines and the supporting role of science-specific technology.

1c) Show an understanding of state and national curriculum standards and their impact on the content knowledge necessary for teaching P-12 students.

Biology Competency Requirements
1. Features distinguishing living from nonliving systems.
2. Characteristics distinguishing plants, animals, and other living things.
3. Multiple ways to order and classify living things.
4. Ways organisms function and depend on their environments
5. Ways organisms are interdependent.
6. Reproductive patterns and life cycles of common organisms.
7. Growth, change, and interactions of populations to form communities.
8. Factors governing the structures, functions, and behaviors of living systems.
10. Cycles of matter, and flow of energy, through living and nonliving pathways.
11. Natural selection, adaptation, diversity, and speciation.
12. Structure, function, and reproduction of cells, including microorganisms.
13. Levels of organization from cells to biomes.
15. Behavior of living systems and the role of feedback in their regulation.
16. Hazards related to living things including allergies, poisons, disease, and aggression.

Physical Sciences Competency
1. Properties of matter such as mass, solubility, and density.
2. Combinations of matter to form solutions, mixtures, and compounds with different properties.
3. Variations in the physical and chemical states of matter and changes among states.
4. Ordering and classification of matter and energy and their behaviors.
5. Factors affecting the position, motion and behavior of objects.
6. Properties of simple machines and tools, such as levers and screws.
8. Types of energy, energy sources, and simple transformations of energy.
9. Properties and applications of sound, light, magnetism, and electricity.
10. Potential and kinetic energies and concepts of work.
11. Energy flow in physical and chemical systems, including simple machines
12. States of matter and bonding in relation to molecular behavior and energy.
14. Classifications of elements and compounds.
15. Solvents (especially water) and solutions.
17. Chemical, electrical and radiation hazards.

**Earth and Space Sciences Competency**
1. Natural objects in the sky and why they change in position and appearance.
2. Causes of the seasons and seasonal changes.
3. Changes in the atmosphere resulting in weather and climate.
5. Basic properties of rocks, minerals, water, air, and energy.
6. Differences between renewable and nonrenewable natural resources.
7. Structures of objects and systems in space.
8. Earth’s structure, evolution, history, and place in the solar system.

**Interdisciplinary Perspectives**
1. Differences between science, as investigation, and technology as design.
2. Impact of science and technology on themselves and their community, and on personal and community health.
3. How to use observation, experimentation, data collection, and inference to test ideas and construct concepts scientifically.
4. How to use metric measurement and mathematics for estimating and calculating, collecting and transforming data, modeling, and presenting results.
5. Interrelationships of pure and applied sciences, and technology.
6. Applications of science to local and regional problems and the relationship of science to one’s personal health, well-being, and safety.
7. Historical development and perspectives on science including contributions of underrepresented groups and the evolution of major ideas and theories.
8. Applications of science to the investigation of individual and community problems.
9. Use of technological tools in science, including calculators and computers.
10. Applications of basic statistics and statistical interpretation to the analysis of data.

**NSTA Standard 2: Content Pedagogy**
Effective teachers of science understand how students learn and develop scientific knowledge. Preservice teachers use scientific inquiry to develop this knowledge for all students. Below are the elements of the standard.
Preservice teachers will:
2a) Plan multiple lessons using a variety of inquiry approaches that demonstrate their knowledge and understanding of how all students learn science.
2b) Include active inquiry lessons where students collect and interpret data in order to develop and communicate concepts and understand scientific processes, relationships and natural patterns from empirical experiences. Applications of science-specific technology are included in the lessons when appropriate.
2c) Design instruction and assessment strategies that confront and address naïve concepts/preconceptions.
NSTA Standard 3: Learning Environments
Effective teachers of science are able to plan for engaging all students in science learning by setting appropriate goals that are consistent with knowledge of how students learn science and are aligned with state and national standards. The plans reflect the nature and social context of science, inquiry, and appropriate safety considerations. Candidates design and select learning activities, instructional settings, and resources—including science-specific technology, to achieve those goals; and they plan fair and equitable assessment strategies to evaluate if the learning goals are met. Below are the elements of the standard.

Preservice teachers will:

3a) Use a variety of strategies that demonstrate the candidates’ knowledge and understanding of how to select the appropriate teaching and learning activities—including laboratory or field settings and applicable instruments and/or technology—to allow access so that all students learn. These strategies are inclusive and motivating for all students.

3b) Develop lesson plans that include active inquiry lessons where students collect and interpret data using applicable science-specific technology in order to develop concepts, understand scientific processes, relationships and natural patterns from empirical experiences. These plans provide for equitable achievement of science literacy for all students.

3c) Plan fair and equitable assessment strategies to analyze student learning and to evaluate if the learning goals are met. Assessment strategies are designed to continuously evaluate preconceptions and ideas that students hold and the understandings that students have formulated.

3d) Plan a learning environment and learning experiences for all students that demonstrate chemical safety, safety procedures, and the ethical treatment of living organisms within their licensure area.

NSTA Standard 4: Safety
Effective teachers of science can, in a P-12 classroom setting, demonstrate and maintain chemical safety, safety procedures, and the ethical treatment of living organisms needed in the P-12 science classroom appropriate to their area of licensure. Below are the elements of the standard.

Preservice teachers will:

4a) Design activities in a P-12 classroom that demonstrate the safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used within their subject area science instruction.

4b) Design and demonstrate activities in a P-12 classroom that demonstrate an ability to implement emergency procedures and the maintenance of safety equipment, policies and procedures that comply with established state and/or national guidelines. Candidates ensure safe science activities appropriate for the abilities of all students.

4c) Design and demonstrate activities in a P-12 classroom that demonstrate ethical decision-making with respect to the treatment of all living organisms in and out of the classroom. They emphasize safe, humane, and ethical treatment of animals and comply with the legal restrictions on the collection, keeping, and use of living organisms.
NSTA Standard 5: Impact on Student Learning
Effective teachers of science provide evidence to show that P-12 students’ understanding of major science concepts, principles, theories, and laws have changed as a result of instruction by the candidate and that student knowledge is at a level of understanding beyond memorization. Candidates provide evidence for the diversity of students they teach. Below are the elements of the standard.
Preservice teachers will:

5a) Collect, organize, analyze, and reflect on diagnostic, formative and summative evidence of a change in mental functioning demonstrating that scientific knowledge is gained and/or corrected.

5b) Provide data to show that P-12 students are able to distinguish science from nonscience, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science.

5c) Engage students in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.