Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error, and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Additional content that may be included in the Grade 8 NAEP Science assessment includes:

- Rocks and rock formations bear evidence of the minerals, materials, temperature/pressure conditions, and forces that created them. (SC.4.E.6.1 and SC.4.E.6.2)
- Earth as a whole has a magnetic field that is detectable at the surface with a compass, with north and south poles and lines of force. (SC.912.P.10.16)
- The Sun is the major source of energy for phenomena on Earth's surface. (SC.3.L.17.2; SC.3.E.5.2; SC.3.E.6.1; SC.4.P.10.4; SC.4.L.17.2)
- Water, which covers the majority of Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the water cycle. (SC.5.E.7.1; SC.5.E.7.2; SC.5.E.7.6)
- A tiny fraction of the light energy from the Sun is Earth's primary source of energy, heating Earth surfaces and providing the energy that results in wind, ocean currents, and storms. (SC.2.E.7.2; SC.3.E.6.1)
- Following fertilization, cell division produces a small cluster of cells that then differentiate by appearance and function to form the basic tissues of an embryo. (SC.912.L.16.13)
- Characteristics of organisms are influenced by heredity and environment. (SC.4.L.16.2 and SC.4.L.16.3)
- Nuclear reactions take place in the Sun. (SC.912.P.10.10; SC.912.P.10.11)

The NAEP frameworks for Science may be accessed at http://www.nagb.org/publications/frameworks/science-09.pdf

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access...
Integrate Florida Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.8.E.5.1</td>
<td>Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.</td>
</tr>
<tr>
<td>SC.8.E.5.2</td>
<td>Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.</td>
</tr>
<tr>
<td>SC.8.E.5.3</td>
<td>Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.</td>
</tr>
<tr>
<td>SC.8.E.5.4</td>
<td>Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.</td>
</tr>
<tr>
<td>SC.8.E.5.5</td>
<td>Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).</td>
</tr>
<tr>
<td>SC.8.E.5.6</td>
<td>Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.</td>
</tr>
<tr>
<td>SC.8.E.5.7</td>
<td>Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.</td>
</tr>
<tr>
<td>SC.8.E.5.8</td>
<td>Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.</td>
</tr>
<tr>
<td>SC.8.E.5.9</td>
<td>Explain the impact of objects in space on each other including: 1. the Sun on the Earth including seasons and gravitational attraction 2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.</td>
</tr>
<tr>
<td>SC.8.E.5.10</td>
<td>Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.</td>
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<tr>
<td>SC.8.E.5.11</td>
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<tr>
<td>SC.8.E.5.12</td>
<td>Summarize the effects of space exploration on the economy and culture of Florida.</td>
</tr>
<tr>
<td>SC.8.L.18.1</td>
<td>Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.</td>
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<tr>
<td>SC.8.L.18.3</td>
<td>Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.</td>
</tr>
<tr>
<td>SC.8.L.18.4</td>
<td>Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.</td>
</tr>
<tr>
<td>SC.8.N.1.1</td>
<td>Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.8.N.1.2</td>
<td>Design and conduct a study using repeated trials and replication.</td>
</tr>
<tr>
<td>SC.8.N.1.3</td>
<td>Use phrases such as &quot;results support&quot; or &quot;fail to support&quot; in science, understanding that science does not offer conclusive &quot;proof&quot; of a knowledge claim.</td>
</tr>
<tr>
<td>SC.8.N.1.4</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.8.N.1.5</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
</tr>
<tr>
<td>SC.8.N.1.6</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
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</table>

Remarks/Examples:
Remarks/Examples: Science is testable; pseudo-science is not. Science seeks falsifications, pseudo-science seeks confirmations (e.g., astrology is pseudoscience).

SC.8.N.2.1 Discuss what characterizes science and its methods.

Remarks/Examples: Science is the systematic, organized inquiry that is derived from observations and experimentation that can be verified through testing to explain natural phenomena.

SC.8.N.2.2 Select models useful in relating the results of their own investigations.


SC.8.N.3.1 Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.

Remarks/Examples: Recognize that matter is composed of discrete units called atoms and atoms are composed of sub-atomic particles called protons, neutrons, and electrons. Solid is the state in which intermolecular attractions keep the molecules in fixed spatial relationships. Liquid is the state in which intermolecular attractions keep molecules in proximity, but not in fixed relationships. Gas is the state in which molecules are comparatively separated and intermolecular attractions have relatively little effect on their respective motions.


SC.8.B.8.2 Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.


SC.8.B.8.3 Explore and describe the densities of various materials through measurement of their masses and volumes.


SC.8.B.8.4 Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.


SC.8.B.8.5 Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

Remarks/Examples: Demonstrate with atomic models how atoms can combine in many ways. Explain why there are many, but limited, combinations. Use models to demonstrate the conservation of mass in modeled chemical reactions.

SC.8.B.8.6 Recognize that elements are grouped in the periodic table according to similarities of their properties.

Remarks/Examples: Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).

SC.8.B.8.7 Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts. Distinguish among mixtures (including solutions) and pure substances.

Remarks/Examples: Pure substances include elements and compounds. Mixtures are classified as heterogeneous (mixtures) or homogeneous (solutions). Methods for separating mixtures include: distillation, chromatography, reverse osmosis, diffusion through semi-permeable membranes.

SC.8.B.8.8 Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

Remarks/Examples: SC.8.P.9.1: Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations (e.g., astrology is pseudoscience). Discuss what characterizes science and its methods. SC.8.N.2.1 Science is the systematic, organized inquiry that is derived from observations and experimentation that can be verified through testing to explain natural phenomena. SC.8.N.2.2 Select models useful in relating the results of their own investigations. SC.8.N.3.1 Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases. SC.8.B.8.2 Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass. SC.8.B.8.3 Explore and describe the densities of various materials through measurement of their masses and volumes. SC.8.B.8.4 Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample. SC.8.B.8.5 Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter. SC.8.B.8.6 Recognize that elements are grouped in the periodic table according to similarities of their properties. SC.8.B.8.7 Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts. Distinguish among mixtures (including solutions) and pure substances. SC.8.B.8.8 Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

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d. Establish and maintain a formal style.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

a. Write a research report, focused on a single aspect of a larger or more complex whole, in which the development, organization, and this is appropriate to task, purpose, and audience.

b. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source.

With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Give relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Identify and cite the sources of information used in presentations, including multimedia and visual displays, and evaluate the credibility, accuracy, and effectiveness of the sources.

Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.

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Related Certifications

Science (Secondary Grades 7-12)
Middle Grades Integrated Curriculum (Middle Grades 5-9)
Physics (Grades 6-12)
Earth/Space Science (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)
Chemistry (Grades 6-12)
Biology (Grades 6-12)

There are more than 915 related instructional/educational resources available for this on CPALMS. Click on the following link to access them: http://www.cpalms.org/Public/PreviewCourse/Preview/13074