

ELEMENTARY EDUCATION K-6 SCIENCE STANDARDS

3.J.. A teacher of children in kindergarten through grade 6 must demonstrate a fundamental knowledge of scientific perspectives, scientific connections, science in personal and social perspectives, the domains of science, and the methods and materials for teaching science and scientific inquiry. The teacher must:

3.J.5. know and apply the fundamental concepts and principles of **physical science** concerning properties of and changes in matter; position, motion, and force; light, heat, electricity, and magnetism; and kinds of and ways to transfer energy;

3.J.6. know and apply the fundamental concepts and principles of **life science** concerning the characteristics of organisms, the life cycle of organisms, the interrelationships of organisms and environments, structure and function in living systems, reproduction and heredity, regulation and behavior, populations and ecosystems and their interrelationships, and diversity and adaptations of organisms;

3.J.7. know and apply the fundamental concepts and principles of **earth and space** science concerning properties of earth materials; objects in the sky; changes in earth and sky; structure of the earth system, including hydrosphere, biosphere, atmosphere, and lithosphere; history of the earth; and earth in the solar system; and

3.J.1. understand science as a human endeavor, the **nature of scientific** knowledge, and the historical perspective of science;

3.J.2. know and apply the understandings and abilities of **scientific inquiry** including the ability to:

3.J.3. know how to make connections across the domains of science, between **science and technology**, and between science and other school subjects;

3.J.4. use scientific understandings and abilities when making decisions about personal and **societal issues**;

ELEMENTARY EDUCATION K-6 SCIENCE STANDARDS

| |
|--|
| <p>3.J.5. know and apply the fundamental concepts and principles of physical science concerning properties of and changes in matter; position, motion, and force; light, heat, electricity, and magnetism; and kinds of and ways to transfer energy;</p> |
| <p><u>K-</u> 1. Physical Properties: Objects can be described by what they are composed of as well as physical appearance</p> |
| <p><u>1-</u> None</p> |
| <p><u>2-</u> 1. Describe Physical Properties: Objects can be described by what they are composed of as well as physical appearance</p> <p>2. Physical properties Change: Physical properties can be changed, but not all materials will react the same with what is done to them</p> <p>3. Position: The motion of an object can be described by a change in its position over time</p> <p>4. Forces: Push or pull forces can change an object's motion over time</p> |
| <p><u>3-</u> 1. Sound and Light: Sound and light are a form of energy</p> |
| <p><u>4-</u> 1. Property: Objects have a variety of observable properties that can be measured</p> <p>2. States of Matter: Solids, liquids, and gases are all states of matter with individualized qualities</p> <p>3. Forms: Heat and electromagnetism are a form of energy</p> <p>4. Transformed: Energy can be transformed within a system or transferred to other systems or the environment</p> |
| <p><u>5-</u> 1. Forces: An object's motion is affected by forces and can be described by the object's speed and the direction it is moving</p> |
| <p><u>6-</u> 1. Particles: Pure substances are identified through individual properties in the sample of the substance. The properties can be explained by a model of matter that is composed of small particles</p> <p>2. Physical Changes: Substances go through physical changes that don't change the composition or the total mass of the substance</p> <p>3. Speed and Direction: An object's motion can be described in speed, direction and change of position</p> <p>4. Forces: Forces have magnitude and direction and these direct the motion of objects</p> <p>5. Waves: Waves transfer energy without the transfer of matter</p> <p>6. Transformation: Energy can be transformed within a system or transferred to other systems or the environment</p> |

ELEMENTARY EDUCATION K-6 SCIENCE STANDARDS

3.J.6. know and apply the fundamental concepts and principles of **life science** concerning the characteristics of organisms, the life cycle of organisms, the interrelationships of organisms and environments, structure and function in living systems, reproduction and heredity, regulation and behavior, populations and ecosystems and their interrelationships, and diversity and adaptations of organisms;

K 1. Living things are diverse with many different observable characteristics - Compare plants and animals, Living/nonliving, know external parts of organism
2. Natural systems have many components that interact to maintain the system - know components in a system

1 1. Living things are diverse with many different observable characteristics. - know characteristics and behaviors
2. Natural systems have many components that interact to maintain the living system. - Know animal and habitat needs
3. Plants and animals undergo a series of orderly changes during their life cycles. - Know animal life cycles and life cycles for offspring

2 1. Living things are diverse with many different observable characteristics. - Learn plant characteristics
2. Natural systems have many components that interact to maintain the system. - Learn plant needs
3. Plants and animals undergo a series of orderly changes during their life cycles. - Learn plant life cycles

3 1. Living things are diverse with many different characteristics that enable them to grow, reproduce and survive. - Know structures and functions, groups of plants and animals
2. Offspring are generally similar to their parents, but may have variations that can be advantageous or disadvantageous in a particular environment. - Learn about inherited similarities, how differences and survival relate

4 1. Microorganisms can get inside one's body and they may keep it from working properly. - Germs! Learn about our body defenses, diseases, and vaccinations

ELEMENTARY EDUCATION K-6 SCIENCE STANDARDS

| |
|---|
| <p>5 1. Living things are diverse with many different characteristics that enable them to grow, reproduce and survive. - Learn about diversity, how structure and survival are a part of diversity</p> <p>2. Natural systems have many parts that interact to maintain the living system. - Learn about interdependence among living systems. Relations in living systems and changes in natural systems</p> <p>3. Humans change environments in ways that can be either beneficial or harmful to themselves and other organisms. - Learn how humans change environments, humans and natural systems</p> |
| <p>6 None</p> |

| |
|---|
| <p>3.J.7. know and apply the fundamental concepts and principles of earth and space science concerning properties of earth materials; objects in the sky; changes in earth and sky; structure of the earth system, including hydrosphere, biosphere, atmosphere, and lithosphere; history of the earth; and earth in the solar system; and</p> |
| <p>K Weather: Teach students to describe weather in quantifiable changes from day to day and with the seasons. Benchmarks: Monitoring Weather & Sun's Heat and Light.</p> |
| <p>1 Earth Materials: Earth materials include solid rocks, sand, soil, and water. Students will identify the observable physical properties that make them useful. Benchmarks: Classifying Rocks, Comparing Soil and Rocks, Objects from Earth Materials</p> |
| <p>2</p> |

ELEMENTARY EDUCATION K-6 SCIENCE STANDARDS

Interdependence: Teach students to describe weather in measurable quantities and changes from day to day and within seasons.

Benchmarks: Recording Weather Conditions

3

Sun & Moon: Explain that the sun and moon have different locations and movements that can be observed and described. Benchmarks: Sun observations, Moon shapes and positions.

Solar System: Explain to students that objects in the solar system as seen from Earth have various sizes and distinctive patterns of motion. Benchmarks: apparent size of light source, orbits of planets and the moon

4

Rocks and Minerals: Rocks are Earth materials that may vary in composition. Benchmarks:Rocks and their Minerals, Properties of their minerals

The Water Cycle: Explain that water circulates through earth's crust, oceans, and atmosphere through a process called the water cycle. Benchmarks: The water cycle.

Water: To prove human existence, humans interact with and influence Earth systems. Benchmark: water supplies and uses.

5

Surface Changes: The surface of Earth changes due to slow and rapid processes.

Benchmarks: Rocks to Soil, Processes and Earth's Surfaces

Human Interaction with Earth Systems: To maintain and improve human existence, humans interact with and influence Earth systems.

Benchmarks: Renewable vs. Nonrenewable, Mineral and Energy Resources, Impact of Decisions

6

None

ELEMENTARY EDUCATION K-6 SCIENCE STANDARDS

- 3.J.1. understand science as a human endeavor, the **nature of scientific** knowledge, and the historical perspective of science;
- 3.J.2. know and apply the understandings and abilities of **scientific inquiry** including the ability to:
- 3.J.3. know how to make connections across the domains of science, between **science and technology**, and between science and other school subjects;
- 3.J.4. use scientific understandings and abilities when making decisions about personal and **societal issues**;

K 1. Inquiry- Students will use observations to make a description of a natural phenomenon and compare those observations and descriptions with others.

2. Practice of Engineering - Students will sort objects into groups, those that are found in nature and those that are found human made (cars, rocks, pencils, etc).

1 1. Scientists - Students will work as individual and in groups to to investigate the natural world. Students will support their answer with observations as well as describe things as accurately as possible so it enables people to compare their observations with those of others.

2. Nature of Science and Engineering - Designed and natural system exist in the world. These systems are made up of components that act within a system and interact with other systems. Students will observe that many living and nonliving things are made of parts and if they are broken or missing, they may not function the proper way.

3. Tools - Students will be able to recognize that tools are used to help solve problems and gather information. It is used by people, engineers, and scientists.

2 1. Practice of Science - Students will ask questions to observe. They will raise question about the natural world and seek answers by making observations, noting what happens when you interact with an object and sharing answers with others.

2. Practice of Engineering - *Objects to Meet Needs*: Students will identify a problem or need and construct an object that helps to solve the problem. *Materials for Certain Uses*: Students will describe why some materials are better than others for making a particular object. *Benefits of Engineered Items*: Students will explain how engineered or designed items from everyday life benefit people.

ELEMENTARY EDUCATION K-6 SCIENCE STANDARDS

3 1. Scientists - Students will provide evidence to support claims and question such reasons when given by others.

2. Inquiry - *Questions for Investigations*: Students will generate questions that can be answered when scientific knowledge is combined with knowledge gained from one's own observations.

Repeated Investigations: Students will recognize that when a science investigation is done the same way before, even in a different place, the same results will occur.

Observations vs. Inferences: Students will maintain a record of observations, procedures and explanations.

Explanation from Evidence: Make a chart comparing observations about the structures of plants and animals.

3. Cultures - *Uses of Evidence*: Students will understand that everybody can use evidence to learn about the natural world, identify patterns in nature and develop tools.

Involvement of Various people: Recognize that the practice of science and/or engineering involves many different kinds of work and engages men and women of all ages and backgrounds.

4. Tools & Mathematics - Students will use tools, including rulers, thermometers, magnifiers and simple balances, to improve observations and keep a record of the observations made.

4 1. Practice of Engineering - *Impact of Designed World*: Students will describe the positive and negative impacts that the designed world has on the natural world as more and more engineered products and services are created and used.

2. Practice of Engineering - *Designs for Solving Problems*: Identify and investigate a design solution and describe how it was used to solve an everyday problem.

Ideas & Constraints: Generate ideas and possible constraints for solving a problem through engineering design.

Evaluating Solutions: Test and evaluate solutions, considering advantages and disadvantages of the engineering solution, and communicate the results effectively.

3. Society's Influence - Students will describe a situation in which one invention led to other inventions.

5 1. A Way of Knowing - *Evidence & Communication*: Explain why evidence, clear communication, accurate record keeping, replication by others, and openness to scrutiny are essential parts of doing science.

Replicating Investigations: Recognize that when scientific investigations are replicated they generally produce the same results, and when results differ significantly, it is important to investigate what may have caused such differences.

Differing Explanations: Understand that different explanations for the same observations usually lead to making more observations and trying to resolve the differences.

Models for Phenomena: Understand that different models can be used to represent natural phenomena and these models have limitations about what they can explain.

ELEMENTARY EDUCATION K-6 SCIENCE STANDARDS

2. Inquiry - Planning Investigations: Generate a scientific question and plan an appropriate scientific investigation, such as systematic observations, field studies, open-ended exploration or controlled experiments to answer the question.

Collecting Relevant Evidence: Identify and collect relevant evidence, make systematic observations and accurate measurements, and identify variables in a scientific investigation.

Critiquing an Experiment: Conduct or critique an experiment, noting when the experiment might not be fair because some of the things that might change the outcome are not kept the same, or that the experiment is not repeated enough times to provide valid results.

3. Cultures - Students will describe how science and engineering influence and are influenced by local traditions and beliefs.

4. Tools - Tools for Data: Students will use appropriate tools and techniques (tables, spreadsheets, mean/mode/median, etc.) in gathering, analyzing and interpreting data.

Creating & Analyzing Graphs: Students will create and analyze different kinds of maps of the student's community and of Minnesota.

6 1. Engineers - Impact of Engineered Systems: Identify a common engineered system and evaluate its impact on the daily life of humans.

Risks in Technologies: Recognize that there is no perfect design and that new technologies have consequences that may increase some risks and decrease others.

Trade-offs in Technologies: Describe the trade-offs in using manufactured products in terms of features, performance, durability and cost.

Learning from Failures: Explain the importance of learning from past failures, in order to inform future designs of similar products or systems.

2. Practice of Engineering - Apply and document an engineering design process that includes identifying criteria and constraints, making representations, testing and evaluation, and refining the design as needed to construct a product or system that solves a problem.

3. Systems - Subsystems Within Systems: Students will describe a system in terms of its subsystems and parts, as well as its inputs, processes and outputs.

Investigating Systems: Distinguish between open and closed systems.

4. Emerging Technologies: Investigating Systems: Determine and use appropriate safety procedures, tools, measurements, graphs and mathematical analyses to describe and investigate natural and designed systems in a physical science context.

ELEMENTARY EDUCATION K-6 SCIENCE STANDARDS

Units of Measurement: Demonstrate the conversion of units within the International System of Units (SI, or metric) and estimate the magnitude of common objects and quantities using metric units.