KINDERGARTEN-4TH GRADE

Earth and Space Science

Content Standard D:

As a result of the activities in grades K-4, all students should develop an understanding of

- **Properties of earth materials**
- **Objects in the sky**
- **Changes in earth and sky**

Content Summary

National Science Education Content Standards

K-4

Properties of earth materials

Objects in the sky

Changes in earth and sky

5-8

Structure of the earth systems

Earth's history

Earth in the solar system

9-12

Energy in the earth system

Geochemical cycles

Origin and evolution of the earth system

Origin and evolution of the universe

Minnesota Graduation Standards

Primary Level

Direct Science Experience:

Understand basic science concepts through direct experience

Intermediate Level

Living and Non-living Systems:

Understand how individuals and objects interact in life, earth/space systems and physical systems

Middle Level

Earth Systems:

Recognize concepts and evaluate interactions of earth/space systems and the impact upon human life

High School Level

Earth and Space Systems:

Understand concepts, theories and principles of earth and space systems through investigation and analysis

Focus K-12

Grade	Early	Late
K-4	The focus of instruction early in this grade range is on providing opportunities for all students to observe earth materials, their properties, and how they change over time.	The focus of instruction later in this grade range is on providing opportunities for all students to observe and describe objects in the sky and changes in the earth and sky as they identify sequences, look for patterns, and develop possible explanations of phenomena in the earth system.
5-8	The focus of instruction for all students early in this grade range is on developing a basic understanding of the components of the earth system and the movement of objects in the solar system.	The focus of instruction for all students later in this grade range is on developing an understanding of the dynamic nature of the earth system, its evolution, and its relationship to the solar system.
9-12	The focus of instruction in earth and space science at the high school level is on providing all students an opportunity to develop an understanding of the role of cycles in structuring the earth system, the use of evidence to develop an understanding of deep space and deep time, and apply their understandings in a variety of situations.	The focus of instruction for students pursuing further study in earth/space science is on increasing students' knowledge and understanding of the origin and evolution of the earth system and the universe and apply their understandings in a variety of situations.

Close-up K-4

The focus of instruction early in this grade range is on providing opportunities for all students to observe earth materials, their properties, and how they change over time.

The properties of earth materials are studied by observing local soils and rocks. Students sort the rocks by properties of their choosing. The teacher helps them label properties such as color, texture, or luster. Students make observations around their school to see what earth materials are located there. Teachers set up outdoor study sites and arrange for students to visit these study sites regularly, under varied conditions, so they can begin to develop an understanding that the earth's surface is constantly changing. They observe a variety of cyclic changes such as night and day, the seasons, and growth and decay. Students also observe changes in the daily weather. Teachers encourage students to communicate their learning through drawings, class stories, and peer discussion. Students and teachers observe established science safety procedures.

The focus of instruction later in this grade range is on providing opportunities for all students to observe and describe objects in the sky and changes in the earth and sky as they identify sequences, look for patterns, and develop possible explanations of phenomena in the earth system.

Students extend their study of earth materials by using scratch tests, vinegar tests, streak tests, and magnetism to sort and classify rocks according to their properties. The origins and types of rocks such as sedimentary, igneous, and metamorphic rock have little meaning for students at this age and should be left for older grades. Students note sequential changes such as the movement of an object's shadow during the course of the day. They observe the day and night sky for patterns and use these patterns to make predictions. The concept of the positions of the moon, with respect to the earth and sun, are beyond students' abilities at this age. During the year, students keep weather journals and make charts and graphs from the data they collect from school weather stations, the newspaper, daily newscasts, and Internet postings. When appropriate, teachers use available technology to facilitate contact with other schools to compare weather patterns. Students research effects and precautions needed for violent weather such as tornadoes and blizzards. Students and teachers observe established science safety procedures.

On Location K-4

This vignette illustrates students learning about changes in the earth and sky. The teacher has embedded several content threads within this unit in order to make it more interesting and to place it within a real world context. Notice that Ms. J uses several teaching techniques and aids to learning. First, she assures herself that her students know fundamental skills related to record keeping. Second, she gives them specific assignments.

Ms. J's students are participating in a yearlong systematic study of weather and phenology. As the year begins, students learn to use the weather instruments and they learn observation and recording techniques. To heighten students' observation skills, Ms. J gives them sight/memory challenges, asks them to find differences between pairs of pictures and sends them on scavenger hunts which include hints involving sight, sound, and smell.

Every morning, students in Ms. J's third grade class check the wind gauge, barometer, precipitation gauge, and thermometer and they record weather conditions in their science notebooks. At the end of recess, three days each week, students pick up their phenology buckets which contain thermometers, an anemometer, hand lenses, field guides, and field microscopes, and they visit their study sites in a nearby park.

Teams of two to three students select a plot of ground and regularly observe the phenomena occurring within that plot over, on, and below ground. They record observations on animal activity, plant changes and human influences. After each observation session, students gather to discuss what they have observed. Ms. J leads the discussions in which students relate their observations to the current weather conditions. By graphing high and low temperatures, cloud types, wind direction, and sunrise/sunset times, students begin to see patterns in their data.

National Science Education Content Standards

K-4 Content Standard D

Properties of Earth Matter	• Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties which make them useful in different ways, for example, as building materials, as sources of fuel, or for growing the plants we use as food. Earth materials provide many of the resources that humans use. • Soils have properties of color and texture, capacity to retain water, and ability to support the growth of many kinds of plants, including those in our food supply. • Fossils provide evidence about the plants and animals that lived long ago and the nature of the environment at that time.
Objects in the Sky	• The sun, moon, stars, clouds, birds, and airplanes all have properties, locations, and movements that can be observed and described. • The sun provides the light and heat necessary to maintain the temperature of the earth.
Changes in the Earth and Sky	• The surface of the earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes. • Weather changes from day to day and over the seasons. Weather can be described by measurable quantities, such as temperature, wind direction and speed, and precipitation. • Objects in the sky have patterns of movement. The sun, for example, appears to move across the sky in the same way every day, but its path changes slowly over the seasons. The moon moves across the sky on a daily basis much like the sun. The observable shape of the moon changes from day to day in a cycle that lasts about a month.

Minnesota Graduation Standards

Primary Level

Direct Science Experience:

Understand basic science concepts through direct experience.

What students should know:

1. Understand concepts related to everyday life:
   a. characteristic properties of objects (e.g., rocks, water, air, soil)
   b. patterns and how they repeat (e.g., phenology, motion of the sun across the sky)
   c. cycles (e.g., water, plant, life)
   d. how basic needs of organisms are met (e.g., space, food, light)
   e. response of organisms to changes in the environment (e.g., space, food, light)
2. Know how personal use of materials, energy and water impact the environment

What students should do:

1. Observe and describe characteristics of objects or phenomena
2. Measure changes that occur in objects or phenomena as a result of interaction
3. Sort and classify objects based on one or two properties
4. Display information using graphs (e.g., histograms, charts, pictures, narratives)
5. Describe how previously learned concepts apply to new situations

In addition:

Performance package should include tasks from earth, life and physical science.