

Grade 3 Science, Quarter 1, Unit 1.1
Weather and the Water Cycle

Overview

Number of instructional days: 8 (1 day = 45 minutes)

Content to be learned

- Use scientific tools to gather weather data.
- Explain how scientific tools extend the senses.
- Observe and record data on daily weather.
- Compare weather data to find patterns in the data.
- Use data to describe weather changes and patterns.
- Describe water as it changes into vapor and reappears as a liquid when cooled.
- Explain how the water cycle relates to weather and the formation of clouds.

Processes to be used

- Use tools to measure and gather data.
- Observe, record, and compare data to find patterns.
- Demonstrate safe practices during classroom and field investigations.
- Use scientific processes to conduct investigations, make observations, collect, organize, and compare data, cite evidence, and build explanations.

Essential questions

- Where does the water that we use come from?
- How does water change as it goes through the water cycle?
- How do scientists gather data and use it to predict the weather?
- What kinds of changes can be observed in our weather over time?

Written Curriculum

Grade Span Expectations

ESS 1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.

ESS 1 (K-4) NOS –3

Explain how the use of scientific tools helps to extend senses and gather data about weather. (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).

ESS1 (3-4)–3 Students demonstrate an understanding of how the use of scientific tools helps to extend senses and gather data by...

3a explaining how the use of scientific tools helps to extend senses and gather data about weather (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).

ESS1 (K-4) POC –5

Based on data collected from daily weather observations, describe weather changes or weather patterns.

ESS1 (3-4) –5 Students demonstrate an understanding of processes and change over time within earth systems by ...

5a observing, recording, comparing, and analyzing weather data to describe weather changes or weather patterns.

5c explaining how this cycle of water relates to weather and the formation of clouds.

5b describing water as it changes into vapor in the air and reappears as a liquid when it's cooled.

Clarifying the Standards

Prior Learning

In grades K–2, students used scientific tools to extend the senses and gather data. Students used the weather/wind vane to measure wind direction, the windsock to measure wind intensity, the anemometer to measure wind speed, thermometers to measure temperature, a meter stick/ruler to measure snow depth, and a rain gauge to measure rain amounts in inches. Students also observed, recorded, and summarized local weather data and observed how clouds relate to different forms of precipitation (e.g., rain, sleet, snow).

Current Learning

In third grade, students continue to use weather/wind vanes, windsocks, anemometers, thermometers, meter sticks/rulers, and rain gauges to gather data on a regular basis.

At the developmental level of instruction, students in grade 3 explain how tools extend the senses and help in gathering data about the weather. They also demonstrate an understanding of change in earth systems by comparing weather data collected over time in order to describe weather changes or weather

patterns. Third-graders describe water as it changes into vapor in the air and reappears as a liquid when it cools, and they explain how the water cycle relates to weather and the formation of clouds.

Future Learning

In grade 4, students demonstrate an understanding of how scientific tools help to extend senses and gather data about weather. They explain how a weather/wind vane is used to measure wind direction, a windsock to measure wind intensity, an anemometer to measure wind speed, a thermometer to measure temperature, a meter stick/ruler to measure snow depth, and a rain gauge to measure rain amounts in inches. They select the appropriate tools for a given task and describe the information these tools will provide.

Students in grade 4 demonstrate an understanding of processes and change over time within the earth by analyzing weather data to describe weather changes or weather patterns. They describe water as it changes into vapor in the air when it is heated and reappears as a liquid when it cools. Students explain how this cycle of water relates to weather and the formation of clouds.

Additional Research Findings

According to *Benchmarks for Science Literacy*, weather is always changing and can be described by measureable quantities such as temperature, wind direction, wind speed, and precipitation. As large masses of air move across the surface of the earth, the movement and interaction of these air masses is used to forecast the weather (4B, The Earth).

When liquid water disappears, it turns into a gas (vapor) and can reappear as a liquid when cooled, or as a solid if cooled below water's freezing point. Clouds and fog are made of tiny droplets or frozen crystals of water (*Benchmarks for Science Literacy*, p. 68). Before students understand the process by which water is converted to an invisible form, they may initially believe that water ceases to exist when it evaporates, that it changes location but remains a liquid, or that it is transformed into some other perceptible form, such as fog, steam, or droplets (*Atlas of Science Literacy* p. 20).

The processes of evaporation and condensation are difficult for students to conceptualize. It is developmentally difficult for students to understand that water exists in the air in the form of vapor. Students can conduct investigations that go beyond the observations made in the earlier grades to learn the connection between the liquid and solid forms of water, but recognizing that water can also be a gas, while much more difficult, is still accessible to students in grades 3–5. The main thrust for students at this age is to try to figure out where water in an open container goes. This is neither self-evident nor easy to detect. However, the water cycle is of such profound importance to life on earth that students should have experiences that will in time contribute to their understanding of evaporation, condensation, and the conservation of matter (*Benchmarks for Science Literacy*, p. 68). One strategy teachers may use to overcome this challenge is to give students multiple opportunities to conduct experiments with heating and cooling water. Observing working models of the water cycle in both open and closed containers may also assist in helping students develop an understanding of how water changes state.

Notes About Resources and Materials

General Resources

- www.ReadingA-Z.com
Severe Weather, Level T, grade 3
<http://www.readinga-z.com/book.php?id=131>
- *Math Investigations*. Unit: Line Plots and Surveys
- Up-to-date weather information for your local area:
www.weather.com
- Talley, C. *Measuring the Weather*. Scott Foresman Reading Street Strategic Intervention Leveled Reader, Unit 4, Week 2.
<http://www.perucsd.org/thoward/leveled%20readers/Green%20Level%20Readers/Leveled%20Reader/Unit%204/Measuring%20The%20Weather%204.2.pdf>

Related to ESS1 (3-4)–3, 3a

- Miami Science Museum weather tools
www.miamisci.org
- History of weather tools
www.weathershack.com
- Tools for gathering and viewing daily weather
http://teacher.scholastic.com/activities/wwatch/gather_data/

Related to ESS1 (3-4) –5, 5a

- Water cycle video—Watch Know
<http://www.watchknow.org/SearchResults.aspx?SearchText=water+cycle>
- Water cycle video —Scholastic.com / Study Jams
<http://teacher.scholastic.com/activities/studyjams>
- The Water Cycle Game—National Oceanic and Atmospheric Administration
http://response.restoration.noaa.gov/audience_subtopic_entry.php?entry_id=447&subtopic_id=27&audience_id=2
- *Houghton Mifflin Science: Discovery Works*—Grade 4, Unit E, pp. E84–E85

Related to ESS1 (3-4) –5, 5b

- *Houghton Mifflin Science: Discovery Works*—Grade 3, Unit D, pp. D28–D30
- *Houghton Mifflin Science: Discovery Works*—Grade 4, Unit E, p. E46

Related to ESS1 (3-4) –5, 5c

- *Houghton Mifflin Science: Discovery Works*—Grade 4, Unit E, p. E46

Grade 3 Science, Quarter 1, Unit 1.2

Objects in the Sky

Overview

Number of instructional days: 6 (1 day = 45 minutes)

Content to be learned

- Observe that the sun, moon, and stars appear to move slowly across the sky.
- Observe that the moon looks slightly different from day to day, but looks the same in about four weeks.
- Observe that changes in the moon's appearance follow a pattern.
- Recognize that the earth rotates on its axis every 24 hours, producing day and night.
- Recognize that the sun is the center of our solar system.
- Build models to understand the relationship between the sun, the moon, and the earth.

Essential questions

- What patterns of change are caused by the rotation of the earth?
- How does the sun appear to change throughout the day?

Processes to be used

- Observe and record changes in the appearance of objects.
- Build models to understand the relationships between the parts of a system.
- Demonstrate safe practices during field investigations.
- Use scientific processes to make observations, record data, communicate findings, and build explanations.

- How does the moon appear to change over time?

Written Curriculum

Grade Span Expectations

ESS2 - The earth is part of a solar system, made up of distinct parts that have temporal and spatial interrelationships.

No further targets for EK ESS2 at the K-4 Grade Span

ESS2 (3-4)-7 Students demonstrate an understanding of temporal or positional relationships between or among the Earth, sun, and moon by ...

7a observing that the sun, moon, and stars appear to move slowly across the sky.

7b observing that the moon looks slightly different from day to day, but looks the same again in about 4 weeks.

7c recognizing that the rotation of the Earth on its axis every 24 hours produces the day/night cycle.

No further targets for EK ESS2 at the K-4 Grade Span

ESS2 (3-4)-8 Students demonstrate an understanding of characteristics of the solar system by ...

8a recognizing that: the sun is the center of our solar system; the Earth is one of several planets that orbits the sun; and the moon orbits the Earth.

Clarifying the Standards

Prior Learning

In grades K–2, students observed that the sun can only be seen in the daytime, but the moon can be seen sometimes at night and sometimes during the day. They observed that the sun and moon appear to move slowly across the sky and the moon looks slightly different from day to day.

Current Learning

In grade 3, students continue to observe that the sun can only be seen in the daytime, but the moon can be seen sometimes at night and sometimes during the day. They also continue to observe that the sun and moon appear to move slowly across the sky, and that the moon looks slightly different from day to day. Since these concepts have been addressed in previous grade levels, they should be taught at the reinforcement level of instruction.

New concepts to this grade level include observing that the stars appear to move slowly across the sky, and that even though the moon looks slightly different from day to day, it looks the same again in about four weeks. Students also learn that the sun is the center of our solar system and that the earth rotates on its axis every 24 hours, causing the day–night cycle. These concepts are taught at a developmental level of instruction.

Students will need time in class and at home in order to observe the sun, moon, and stars. Their observations should happen over a period of time that is sufficient for students to see patterns of change in the appearance of the objects in the sky.

Future Learning

Fourth-graders will understand that it takes 365 days for the earth to orbit the sun. Students will discover that star patterns and constellations have been observed and identified throughout history.

Additional Research Findings

According to *Benchmarks for Science Literacy*, it is difficult for elementary-aged students to grasp the idea that the earth orbits the sun, which is actually a star. Even with good teaching, elementary students may not be able to understand these concepts. It is more important to expose children to the fixed patterns of stars than to teach the names of constellations. Students should know that star patterns stay the same as they move across the sky, but no particular value comes from memorizing the names of constellations, even though some students may enjoy doing so (4A, The Universe).

According to *Benchmarks for Science Literacy*, by the end of grade 2, students should know that the moon looks a little different every day, but looks the same again about every four weeks (4A, The Universe, p.62). This is noted because this concept is addressed in the grade 3 GSEs, rather than in grade 2.

Additionally, the day–night cycle is very challenging for students. They should first master the idea that the earth is not flat, but spherical. It is difficult for students to understand the relative size, motion, and distance of the sun, the moon, and the earth. (*Designing Curricula for Conceptual Restructuring Lessons From the Study of Knowledge Acquisition in Astronomy*, Journal of Curriculum Studies, vol. 23, pp. 219–237).

Third-graders need to be able to document observable patterns of change. No emphasis should be placed upon phases of the moon, only the daily and monthly changes in its appearance. Ideally, students should observe the stars and moon in the night sky prior to using photos and video images.

Notes About Resources and Materials

General Resources

- Monthly moon calendar
http://www.sciencenetlinks.com/interactives/moon/moon_worksheet/moon_worksheet.html
- Daily pictures of the moon’s phases
http://aa.usno.navy.mil/idltemp/current_moon.php
- Lunar cycle challenge
<http://www.sciencenetlinks.com>
- Star patterns
<http://www.kidsastronomy.com>
- *Houghton Mifflin Science: Discovery Works*—Grade 2, Unit B
Sundial Activity, pp. B34–B35
Making a Star Clock Activity, pp. B36–B37
Science Notebook, p. C22

Sun, Moon, and Earth, Chapter 2, p.70 (Note: *Use with p. B41 to address movement of stars, the day/night cycle, and the North Star.*)

Related to ESS2 (3-4)-7, 7a

- *Houghton Mifflin Science: Discovery Works*—Grade 2, Unit C, pp. C58–59, C62–64
Background Information, pp. C66–C67, C70–C72

Related to ESS2 (3-4)-7, 7b

- *Houghton Mifflin Science: Discovery Works*—Grade 2, Unit B
Moon Phases: Observing Moon Phases, p. C73
Background Information, pp. C66–C67, C70–C72

Related to ESS2 (3-4)-7, 7c

- *Houghton Mifflin Science: Discovery Works*—Grade 2, Unit C, pp. C58–59, C62–64
Using a Model of the Earth, pp. C60–C61

Grade 3 Science, Quarter 1, Unit 1.3
Earth Materials

Overview

Number of instructional days: 7 (1 day = 45 minutes)

Content to be learned

- Identify rocks, soil, water, and air as basic earth materials.
- Describe, compare, and sort rocks and soil using physical properties, including color, texture, hardness, and composition.
- Record and analyze observations and data about physical properties of earth materials.
- Cite evidence to support why rocks and soils are classified in groups.
- Select appropriate tools and describe the information they provide.

Processes to be used

- Describe, compare, and sort earth materials using physical properties.
- Record and analyze data about physical properties.
- Cite evidence to support classification of objects.
- Select appropriate tools for measuring and gathering data.
- Demonstrate safe practices during classroom and field investigations.
- Use scientific processes to conduct investigations, make observations, organize and compare data, communicate results, cite evidence, and build explanations.

Essential questions

- In what ways can rocks and soil be classified?
- How do tools help us collect data about earth materials?

Written Curriculum

Grade Span Expectations

ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.

ESS1 (K-4) INQ –1

Given certain earth materials (soils, rocks or minerals) use physical properties to sort, classify, and describe them.

ESS1 (3-4) –1 Students demonstrate an understanding of earth materials by ...

1d identifying the four basic materials of the earth (water, soil, rocks, air).

1a describing, comparing, and sorting rocks, soils, ~~and minerals~~ by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, hardness, composition).

1b recording and analyzing observations/data about physical properties (e.g., within a grouping, which characteristics are the same and which are different).

1c citing evidence (e.g., prior knowledge, data) to support why rocks, soils, ~~or minerals~~ are classified/not classified together.

ESS 1 (K-4) NOS –3

Explain how the use of scientific tools helps to extend senses and gather data about weather. (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).

ESS 1(3-4) –3 Students demonstrate an understanding of how the use of scientific tools helps to extend senses and gather data by...

3b selecting appropriate tools for a given task and describing the information they will provide.

Clarifying the Standards

Prior Learning

In grades K–2, students described, compared, and sorted rocks and soils by similar or different physical properties (e.g., size, shape, texture, smell, weight), and they recorded their observations and data about physical properties. They also used properties to state why objects are grouped together (e.g., rocks that are shiny or not shiny). Primary students conducted tests on how different soils retain water (e.g., how fast does the water drain through), and they identified which materials are best for different uses (e.g., best soils for growing plants and sand for sandboxes).

Current Learning

In grade 3, at a developmental level of instruction, students identify the four basic materials of the earth (water, soil, rocks, and air). Students describe, compare, and sort rocks and soils by physical properties. Some physical properties that are new to this grade level include temperature, hardness, and composition. Students record, analyze and cite evidence to support why rocks and soils are or are not classified within a group based on

physical properties. They analyze and cite evidence within a grouping. In addition, students select appropriate tools for a given task and describe the information they will provide (e.g., tape measure, ruler, magnifying lens, nails).

Future Learning

In grade 4, students will describe, compare, and will sort rocks, soils, and minerals by physical properties such as hardness and composition. They will record and analyze observations and data about physical properties within a group, and they will cite evidence to explain why rocks, soils, and minerals are or are not classified together.

Additional Research Findings

The focus in grade 3 is on classifying and sorting rocks according to their size, hardness, mass, shape, color, and texture. At this level, students are not required to classify rocks as sedimentary, metamorphic, or igneous. Students also describe, sort, and compare different types of soil using such characteristics as color and texture.

Third-graders observe that rocks and soils are made of many components. They observe the variety of components using a magnifying lens and then describe these components using physical properties.

In addition to magnifying lenses, students should gather data using tape measures and balances. They should have frequent opportunities to use these tools. If young children do not have the opportunity to mass objects, they may think those objects do not have mass at all. Students must have frequent practice with bucket or pan balances.

Students may incorrectly believe that bricks and cement are rocks. They may also hold the misconception that buildings, statues, or a polished piece of marble are not made from rock. Some students may also believe that rocks are untouched by man.

Notes About Resources and Materials

Websites

- Interactive online game
<http://www.sciencekids.co.nz/gamesactivities/rockssouls.html>
- Soil Textures
<http://www.watchknow.org/SearchResults.aspx?SearchText=soil>

Books

- *Houghton Mifflin Science: Discovery Works, Grade 3*
Be Resourceful, p. D6 (Earth's basic materials)
*Teacher note: It is recommended that you modify the "land" column to read "soil" and add a column labeled "rocks." Read pp. D8–D9.
Science Notebook, p.155
Hard Rock Activity, How Hard Are Rocks? p. D48
Science Notebook Activity, p. 181

Uses of Rocks, p. D56 (*Teacher note: Eliminate sections about minerals.)

Soils, pp. D56–57 (*Teacher note: Eliminate soil names and focus on physical properties.)