Unit 1: Air and Weather

Content Area: **Science**
Course(s): **Science**
Time Period: **Marking Period 1**
Length: **10 Weeks**
Status: **Published**

Unit Overview

In this unit students will focus their studies on the sky and make observations of the Earth's atmosphere and observable patterns in the sky. Students will explore the natural world by using self-made and given instruments and calendars to observe and monitor changes. Students will build on their existing knowledge, from kindergarten, of weather and the Sun's effect on the Earth's surface. Throughout the unit students will engage in science and engineering practices by collecting data, designing and using simple tools to answer questions, and observing changes seen during investigations.

Standards

Disciplinary Core Ideas (DCI's)

2-PS1-1	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
K-2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
K-2-ETS1-3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
K-ESS2-1	Use and share observations of local weather conditions to describe patterns over time.
1-ESS1-1	Use observations of the sun, moon, and stars to describe patterns that can be predicted.
K-ESS3-1	Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
1-ESS1-2	Make observations at different times of year to relate the amount of daylight to the time of year.

Crosscutting Concepts (CC's)

CCC.1.1	children recognize that patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.
CCC.2.1	students learn that events have causes that generate observable patterns. They design

	simple tests to gather evidence to support or refute their own ideas about causes.
CCC.3.1	students use relative scales (e.g., bigger and smaller; hotter and colder; faster and slower) to describe objects. They use standard units to measure length.
CCC.6.1	students observe the shape and stability of structures of natural and designed objects are related to their function(s).
CCC.7.1	students observe some things stay the same while other things change, and things may change slowly or rapidly.
SCI.K-2.4.2	Systems in the natural and designed world have parts that work together.

Science and Engineering Practices (SEP's)

SEP.1	Asking Questions and Defining Problems
SEP.3	Planning and Carrying Out Investigations
SEP.4	Analyzing and Interpreting Data
SEP.5	Using Mathematics and Computational Thinking
SEP.6	Constructing Explanations and Designing Solutions
SEP.8	Obtaining, Evaluating, and Communicating Information

Essential Questions

Investigation 1- Exploring Air

- What can air do?
- How does a parachute interact with air?
- What happens when air is pushed into a smaller space?
- How can water be used to show that air takes up space?
- How can compressed air be used to make a balloon rocket?

Investigation 2- Observing the Sky

- What is the weather today?
- What time of the day is the air the warmest?
- What types of clouds are in the sky today?
- What time of day can we observe the Moon?

Investigation 3- Wind Explorations

- How can bubbles be used to observe the wind?
- How strong is the wind today?
- How can pinwheels be used to observe the wind?
- What does a wind vane tell us about the wind?
- What weather conditions are good for kite flying?

Investigation 4- Looking for a Change

- How can we describe the weather over a month?
- What does the Moon look like at different times during the month?
- How does the amount of daylight change over the year?
- How does the temperature and weather change over the season?

Application of Knowledge: Students will know that…

- A wind vane points in the direction the wind is coming.
- Air can be compressed.
- Air is gas and is all around us.
- Air is matter and takes up space.
- Air makes objects move.
- Air moves from place to place. Moving air is wind.
- Air resistance affects how things move.
- Clouds are made of liquid water drops that fall to Earth as rain; water is also in the air as a gas that we can't see.
- Daily changes in temperature and weather type can be observed, compares, and predicted over a month.
- Each season has a typical weather pattern that can be observed, compared, and predicted. The number of hours of daylight changes predictably through the seasons.
- Meteorologists use anemometers to measure the speed of the wind.
- Meteorologists use wind scales (models) to describe the strength of the wind.
- Temperature describes how hot or cold the air is.
- Temperature is measured with a thermometer.
- The Moon can be observed moving across the sky; we see it at different locations in the sky, depending on the time of day or night.
- The pressure from compressed air can move things, including water.
- The Sun and Moon can be observed moving across the sky; we see them at different locations in the sky, depending on the time of day and night.
- The sun rises in the east, moves across the sky, and sets each day at predictable times.
- The Sun warms the Earth.
- Weather describes conditions in the air outside.
- Wind is moving air.
- Wind lifts lites up into the sky.
- Wind moves clouds in the sky.

Application of Skills: Students will be able to…

- Apply understanding of wind to construct and fly a kite.
- Demonstrate that compressed air can be used to make things move.
- Design and engineer parachutes and observe how they interact with air to solve a problem.
- Discover properties of air by observing interactions of air with objects.
- Graph weather observations taken over a period of a month.
- Look for patterns in local weather conditions and temperature throughout the seasons.
- Monitor and record the changing appearance of the Moon over a month.
- Monitor and record the changing number of daylight hours during the year.
- Monitor weather, and hours of daylight to look for patterns.
- Observe and describe evidence of wind speed and direction, using bubbles and pinwheels.
- Record Moon observations to look for patterns.
- Use a simple model of wind speed to describe relative wind length.
- Use different weather instruments, including an anemometer and a wind vane.
- Use weather instruments to measure air conditions; record observations using pictures, words, and data.

Assessments

Pre-Assessment/Survey

Investigation 1:

- Formative Assessments: Science Notebook entry, Embedded Assessment, and Performance Assessment
- Benchmark Assessments: Survey, Investigation 1 I-Check

Investigation 2 - Landforms:

- Formative Assessments: Science Notebook entry and Embedded Assessment
- Benchmark Assessments: Investigation 2 I-Check

Investigation 3 - Mapping Earth's Surface:

- Formative Assessments: Science Notebook entry, Embedded Assessment, and Performance Assessment
- Benchmark Assessments: Investigation 3 I-Check

Investigation 4 - Natural Resources:

- Formative Assessments: Science Notebook entry, Embedded Assessment, and Performance Assessment
- Benchmark Assessments: Posttest

Suggested Activities

Investigation 1

- Part 1- Air Is There
  - Students work with a set of objects to see how objects can be moved by and through air.
  - Investigation time- 1 session
  - Writing/Reading- Science notebook entry "Air is There"
- Part 2- Parachutes
  - Students construct and observe parachutes dropping through air. They think about how air slows the descent of the parachute. They design and test a parachute to land a cargo container gently without spilling the content.
  - Investigation time- 2 sessions
  - Reading time (done in between the two investigation sessions)- 1 session
  - Writing/Reading- Science Notebook Entry "Parachutes".
  - Science Resource Book "What is All around Us?".
  - Video "Friction and Air resistance. https://www.fossweb.com/video?videoID=G3723098
- Part 3- Pushing on Air
  - Students use syringes to investigate air. They discover that air can be compressed and that air under pressure can push objects around.
  - Investigation time- 1 session
  - Reading/Writing:Science Notebook Entry "Pushing on Air"
- Part 4- Air and Water
  - Students put together tubes, a bottle, water, a rubber stopper, and two syringes to create a system They add water and use air pressure to push the water around the system.
  - Investigation time- 2 sessions
  - Reading/writing: Science Notebook Entry "Air and Water"
- Part 5- Balloon Rockets
  - Students set up a balloon-rocket system and find out how far the air in the balloon will propel the system along a flight line.
  - Investigation time- 1 sessions
  - Assessment time- 1 session
  - Reading/Writing: Science Notebook Entry "Balloon Rockets"

Investigation 2

- Part 1- Weather Calendars
  - Students share what they know about weather and how it relates to air. Rotating class meteorologists begin recording daily weather observations on a class calendar. Students use symbols to indicate five basic types of weather.
  - Investigation time: 1-2 sessions
  - Reading/Writing: Science Notebook Entry- Answer the focus question.

- Part 2- Measuring Temperature and Daylight
  - Students learn to use a thermometer and take turns measuring and recording the temperature. They construct a model thermometer and practice reading various temperatures. They monitor sunrise and sunset and record the total number of daylight hours each day. They collect data on temperature changes during the day.
  - Investigation time: 2-3 sessions
  - Reading time: 1 session

    - Writing/Reading: Science Notebook Entry “Thermometer Picture °C or Thermometer Picture °F”.
    - Science Resources Book “What is the Weather Today?”
- Part 3- Watching Clouds
    - Students observe and compare several types of clouds and discuss how they move across the sky. The class discusses the kinds of clouds that bring rain or snow. Students can use a rain gauge to measure rain or snowfall.
    - Investigation time: 1-2 sessions
    - Reading time: 1 session
    - Writing/Reading: Science Notebook Entry: Answer the focus question.
    - Science Resources Book “Clouds” “Water in the Air”
    - Online Activity “Cloud Catcher” https://www.fossweb.com/delegate/ssi-wdf-ucm-webContent/Contribution%20Folders/FOSS/multimedia/HTML5_Assets/Tutorials/CloudCatcher/index.html

- Part 4- Observing the Moon
    - Students discuss their observations of the day and night sky, and begin to systematic observations of the Moon. The observations will continue during the daytime and nighttime for four week.
    - Investigation Time: 3 sessions
    - Reading time: 1 session
    - Writing/Reading: Science Notebook Entry: Answer the focus question.
    - Science Resources book: “Changes in the Sky”Guide discussion during with provided questions in Foss Teacher Manual

Investigation 3

- Part 1 Bubbles in the Wind
    - Students use bubble wands to blow bubbles outdoors. They investigate how the air moves bubbles in a variety of locations around the school building.
    - Investigation time: 1 session
    - Writing/Reading: Science notebook entry- describe observations.

- Part 2 Wind Speed
    - Students go outdoors to feel and observe the wind. They are introduced to a descriptive wind scale (an adaptation of the Beaufort Scale) and an anemometer, an instrument used to measure wind speed.
    - Investigation time: 1 session
    - Writing/Reading: Science notebook entry- weather and an anemometer.
    - Online Activity: “Wind Speed” https://www.fossweb.com/delegate/ssi-wdf-ucm-webContent/Contribution%20Folders/FOSS/multimedia/HTML5_Assets/Tutorials/FOSS_WindActivity/index.html

- Part 3 Pinwheels
    - Students construct a pinwheel and observe how it operates when they blow on it, move it through air, and take it outdoors in the wind. They compare the action of the pinwheels to the

class anemometer.
    - Investigation time: 2 sessions
    - Writing/Reading: Science notebook entry- answer the focus question.

- Part 4 Wind Vanes
    - Students learn about wind vanes, instruments used to indicate wind direction. Students compare the movement of the wind vanes to that of bubbles and clouds.
    - Investigation time: 1-2 sessions
    - Reading time: 1 session
    - Writing/Reading: Science notebook entry- "Weather and a Wind Vane".
    - Science Resources Book- "Understanding the Weather".

- Part 5 Kites
    - Students construct kites. They use the anemometer and wind vane to determine the best location and direction for flying kites.
    - Investigation time: 2 sessions
    - Reading time: 1 session
    - Assessment: 1 session
    - Writing/Reading: Science Resources Book- "Resources"

Investigation 4

- Part 1: Changes over a Month
    - Students organize and graph the class weather data recorded over a period of four weeks. The class can continue recording the weather on the calendar and then graph the following month. Students also revisit the Moon calendar and look for patterns over the month.
    - Investigation time: 2 sessions plus daily observations
    - Writing/Reading: Science notebook entry- answer the focus question.
    - Online activity: "What's the Weather?" https://www.fossweb.com/delegate/ssi-wdf-ucm-webContent/Contribution%20Folders/FOSS/multimedia_2E/AirWeather_MM_2E/activities/what_is_the_weather_html5/index.html

- Part 2: Daylight through the Year
    - The class looks at the amount of daylight on the same day of each month over the year. Students describe the pattern the observe and predict the number of hours of daylight on their birthday that year. They compare the actual hours to their predicted number of hours.
    - Investigation time: 1 session
    - Reading: 1 session
    - Writing/Reading: Science notebook entry- Hours of Daylight.
    - Science resources book- "Changes in the Sky" (reread).

- Part 3: Comparing the Seasons
    - The class moves from recording weather data on a calendar to creating seasonal graphs of the

weather and temperature. Each season, the class creates new graphs and compares them with grades from the preceding seasons.
    - Investigation time: 1 session
    - Reading time: 2 sessions
    - Assessment: 1 session
    - Writing/Reading: Science resources book- “Seasons” and “Getting through the Winter”

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
    - Modifications & accommodations as listed in the student’s IEP
    - Assign a peer to help keep student on task
    - Modified or reduced assignments
    - Reduce length of assignment for different mode of delivery
    - Increase one-to-one time
    - Working contract between you and student at risk
    - Prioritize tasks
    - Think in concrete terms and provide hands-on-tasks
    - Position student near helping peer or have quick access to teacher
    - Anticipate where needs will be
    - Break tests down in smaller increments
- Content specific modifications may include:
    - Provide equipment photo cards for each object with the object name
    - Use a graphic of the syringe system on the word wall to illustrate compressed air and pressure
    - Add words to the word wall as needed
    - Provide students with rounded times for sunrise and sunset (I2 P2)
    - Provide multiple opportunities with supports for counting anemometer rotations (I3 P2)
    - Scaffolding thinking through graphic organizers
    - Design individual projects or small-group investigations

Differentiation for ELL's:

- General modifications may include:
    - Strategy groups
    - Teacher conferences
    - Graphic organizers
    - Modification plan
    - Collaboration with ELL Teacher
    - Model and encourage the use of new vocabulary

    - Project the equipment photo card for each object and write the object's name on the word wall.
    - Use a graphic of the syringe system on the word wall to illustrate compressed air and pressure
    - Activate prior knowledge by showing pictures of different weather conditions. Turn and talk with peer to describe and make connections to what they observe.
    - Provide sentence frames for students who need them
    - Use Spanish provided resources if applicable
- **Content specific vocabulary for ELL students may include:** air, air resistance, barrel, blow, bubble, compress, distance, engineer, gas, matter, move, parachute, plunger, pressure, push, rocket, submerge, syringe, system, tube, wind, change, cirrus, cloud, cold, cool, cumulus, day, degrees Celsius, degrees Fahrenheit, describe, hot, measure, meteorologist, moon, night overcast, partly cloudy, pattern, rain gauge, rainy, record, snowy,star, stratus, sun, sunny, sunrise, sunset, symbol, temperature, thermometer, warm, water vapor, weather, weather conditions, weather instruments, anemometer, calm, direction, East, gentle breeze, kite, moderate breeze, North, pinwheel, South, strong breeze, West, wind speed, wind vane, Fall, graph, hibernate, migrate, season, Spring, Summer, Winter

Differentiation to extend learning for gifted students may include:

- Plan a kite festival
- Try new kite designs and materials
- Create wind chimes with different materials
- Utilize the Math extension problems and Science extensions provided in Foss Teacher Manual

Integrated/Cross-Disciplinary Instruction

Language Extensions found on FOSSweb with list of trade books

Art extensions

- Create foggy-day or cloud pictures
- Go outdoors to watch clouds
- Make spilt-milk images after reading It Look like Spilt Milk by Charles G. Shaw
- Construct a wind catcher

Music extension

- Listen to weather music such as "Cloudburst" from the Grand Canyon Suite, Storm Sequence from William Tell overture, "Raindrops Keep Falling on My Head", "Singin' in the Rain", "On the Sunny Side of the Street", "Good Day, Sunshine".

Social Studies Extension

- Research kite culture- history of kites, association of kites to times of the year, and display around the world.

MA.1.OA.A	Represent and solve problems involving addition and subtraction.
MA.1.OA.C	Add and subtract within 20.
MA.1.OA.D	Work with addition and subtraction equations.
LA.RI.1.1	Ask and answer questions about key details in a text.
LA.RI.1.10	With prompting and support, read informational texts at grade level text complexity or above.
MA.1.MD.C.4	Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
SOC.6.1.4.D.CS5	Cultures include traditions, popular beliefs, and commonly held values, ideas, and assumptions that are generally accepted by a particular group of people.

Resources

- URL: FOSSWEB.com
  - Description: This site will lead you to the additional resources for non-fiction books to share with your students.
- URL: https://www.fossweb.com/foss-content?htmlContentID=G3723440
  - Description: This site will lead you to the Smartboard documents to use during your lessons.
- URL: www.weather.com
  - Description: Another site that gives recent weather reports around the world.
- URL: www.wunderground.com
  - Description: Get the latest weather and historical weather data from around the world. See the static and moving satellite maps of regions all over the world. View the weather forecast to help plan night sky viewing.
- URL: www.seametrics.com
  - Description: A list of various teaching tools including lesson plans, web quests, activities, and handouts to help teach students all about water. Materials from a variety of sources are included in a list by categories, such as lesson plans, web quests, activities, projects and handouts.
- URL: www.wrh.noaa.gov
  - Description: Find out how rainbows form on this colorful website from NOAA.
- URL: www.photolib.noaa.gov
  - Description: The National Severe Storms Laboratory is one of NOAA's internationally known research laboratories, leading the way in investigations of all aspects of severe weather. Headquartered in Norman OK, the people of NSSL, in partnership with the National Weather Service, are dedicated to improving severe weather warnings and forecasts in order to save lives and reduce property damage. This site has an impressive collection of photos of tornadoes, weather instruments, hail, clouds, and lightning.
- URL: www.nws.noaa.gov
  - Description: The home page for the National Weather Service.
- URL: www.lightningsafety.noaa.gov
  - Description: Check this site for handouts, indoor and outdoor safety tips, medical facts, history, survivor stories, photos, teacher tools and more.
- URL: www.parachutehistory.com
  - Description: Although the Historical Review page is written for adult readers, it includes a variety of parachute designs that fascinate young students, from the earliest attempts to cutting-edge parachute designs.
- URL: www.cloudappreciationsociety.org
  - Description: The folks who belong to the Cloud Appreciation Society love clouds and want to

help you to love them, too. The society is based in the United Kingdom, and their website includes an abundant amount of information about clouds, as well as an amazing gallery of cloud photographs. Make sure you check the link to "clouds that look like things."

- URL: www.weather.com
  - Description: Another site that gives recent weather reports around the world.
- URL: www.tryscience.org
  - Description: Find out about more than 400 science and technology centers and museums worldwide. Use an interactive map of the world to find and explore a science and technology center or museum near you. You can also find online adventures and field trips, ideas for experiments at home, plus live webcams. TryScience.org is your gateway to experience the excitement of contemporary science and technology through on and offline interactivity with science and technology centers worldwide. TryScience is brought to you through a partnership between IBM Corporation, the New York Hall of Science (NYHOS), the Association of Science-Technology Centers (ASTC), and science centers worldwide.
- URL: www.usatoday.com
  - Description: This USA Today site provides weather forecasts and a variety of information about weather and how it works.
- URL: www.wunderground.com
  - Description: Get the latest weather and historical weather data from around the world. See the static and moving satellite maps of regions all over the world. View the weather forecast to help plan night sky viewing.
- URL: www.tryscience.org
  - Description: This activity from the Fort Worth Museum of Science and History describes how to use bubbles to map your local winds! This activity is part of the Tryscience.org collection from the Association of Science and Technology Centers (ASTC).

21st Century Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.