

Investigation 1 - Exploring Air

Students explore properties of a common gas mixture—air. Using vials, syringes, and tubing, students experience air as matter, discovering that it takes up space and can be compressed, and that compressed air builds up pressure that can push objects around. They construct and compare parachutes and balloon rockets that use air



Standards - 2-PS1-1, K-2 ETS1-1, K-2 ETS1-2, K-2 ETS1-3

Investigation 1	Summary of Lesson	Priority
Part 1: Air is There	<p>Students work with a set of objects to see how objects can be moved by and through air.</p> <p><i>FQ - What can air do?</i></p>	<p>High</p> <p>Introduction to concepts of air and content vocabulary.</p>
Part 2: Parachutes	<p>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 contents.</p> <p><i>Video, "Parachutes". Read, "What is All Around Us?"</i></p> <p><i>FQ - How does a parachute interact with air?</i></p>	<p>High</p> <p>Helps reinforce the concept of air and air resistance. Strongly meets standard K-2 ETS1-1 and K-2 ETS1-2</p>
Part 3: Pushing on Air	<p>Students use syringes to investigate air. They discover that air can be compressed and that air under pressure can push objects around.</p> <p><i>FQ - What happens when air is pushed into a smaller space?</i></p>	<p>High</p> <p>This lesson teaches directly about compressed air with the syringes. This leads into Part 4.</p>
Part 4: Air and Water	<p>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.</p> <p><i>FQ - How can water be used to show that air takes up space?</i></p>	<p>High</p> <p>This lessons addresses well how air takes up space, but during the 2nd part of the lesson, the investigation with the "tube system", it might be easier to do this whole class, saving time and a huge amount of prep. This concept is difficult to understand and might be lost with pairs of students.</p>
Part 5: Balloon Rockets	<p>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.</p> <p><i>FQ - How can compressed air be used to make a balloon rocket?</i></p>	<p>High</p> <p>This activity strongly meets standard. K-2 ETS1-2 and 2-PS1-1.</p>
Assessment	i-Check	

Investigation 1 cont. - Exploring Air

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

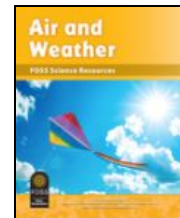
K-2 ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

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.

Investigation 2 - Observing the Sky

Students use instruments for 4–8 weeks to observe and record weather on a class calendar and in science notebooks. Students monitor temperature with a thermometer and (optionally) rainfall with a rain gauge. They learn to identify three basic cloud types by matching their observations with a cloud chart. They also monitor times of sunrise and sunset and record the number of daylight hours each day.



Standards - 1-ESS1-1, 1-ESS1-2, K-ESS2-1

Investigation 2	Summary of Lesson	Priority
Part 1: Weather Calendars	<p>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.</p> <p><i>FQ - What is the weather today?</i></p>	<p>Medium</p> <p>Students are exposed to vocabulary around weather. Instead of planning a separate trip outside to make observations, you could do this at the end of a recess. This could reduce the length of the lesson. (<i>Weather Calendars are also a review from kindergarten.</i>)</p> <p><i>**This could also be integrated into the daily calendar for 1st grade.</i></p>
Part 2: Measuring Temperature and Daylight	<p>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.</p> <p><i>Read, "What is the Weather Today?"</i></p> <p><i>FQ - What time of day is the air the warmest?</i></p>	<p>High</p> <p>Students are exposed to vocabulary around weather and reviews concept of how to use a thermometer. (<i>Reading a thermometer is also a review from kindergarten</i>). Students will be going outside at least 3 times during this lesson, so pairing the outings with recess times could help eliminate time needed for the lesson.</p>
Part 3: Watching Clouds	<p>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.</p> <p><i>Read, "Clouds" and "Water in the Air". Activity, "Cloud Catcher".</i></p> <p><i>FQ - What types of clouds are in the sky today?</i></p>	<p>Medium</p> <p>You could have students "watch clouds" and discuss types of clouds and position of the sun after their recess time. The important pieces will be the reading.</p>
Part 4: Observing the Moon	<p>Students discuss their observations of the day and night sky, and begin to make systematic observations of the Moon. The observations will continue during the daytime and nighttime for 4 weeks.</p> <p><i>Read, "Changes in the Sky"</i></p> <p><i>FQ - What time of day can we observe the Moon?</i></p>	<p>Medium</p> <p>This activity could be done at a separate time of the day than science. This ties in with standard, 1-ESS1-1 and leads into a more in depth exploration of the moon in 5th grade.</p>

Assessment	i-Check	
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Investigation 2 cont. - Observing the Sky

1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted.

1-ESS1-2 Make observations at different times of year to relate the amount of daylight to the time of year.

K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.

Investigation 3 - Wind Explorations

Students look for evidence of moving air. They observe and describe wind speed using pinwheels, an anemometer, and a wind scale. They observe bubbles and construct wind vanes to find the wind's direction. Students fly kites to feel the strength of the wind and the direction it is moving.



Standards - K-ESS2-1, K-ESS3-3

Investigation 3	Summary of Lesson	Priority
Part 1: Bubbles in the Wind	<p>Students use bubble wands to blow bubbles outdoors. They investigate how the air moves bubble in a variety of locations around the school building.</p> <p><i>FQ - How can bubbles be used to observe the wind?</i></p>	<p>High</p> <p>Students use bubbles to understand wind speed and wind direction. Important piece to the rest of the Investigation.</p>
Part 2: Wind Speed	<p>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.</p> <p><i>Activity, "Wind Speed".</i></p> <p><i>FQ - How strong is the wind today?</i></p>	<p>High</p> <p>Students learn a new scientific tool, an anemometer. They will compare other tools with this one later in the Investigation.</p>
Part 3: Pinwheels	<p>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.</p> <p><i>Read, "Weather and an Anemometer"</i></p> <p><i>FQ - How can pinwheels be used to observe the wind?</i></p>	<p>Medium</p> <p>You could have a classroom pinwheel. Instead of having students construct their own. Observing the direction of the wind and movement of clouds is important.</p> <p>*Another important piece of this lesson is the reading.</p>
Part 4: Wind Vanes	<p>Students learn about wind vanes, instruments used to indicate wind direction. Students compare the movements of the wind vanes to that of bubbles and clouds.</p> <p><i>Read, "Understanding the Weather".</i></p> <p><i>FQ - What does a wind vane tell us about the wind?</i></p>	<p>Medium</p> <p>You could have a classroom wind vane. Instead of having students construct their own. Observing the direction of the wind and movement of clouds is important.</p> <p>*Another important piece of this lesson is the reading</p>
Part 5: Kites	<p>Students construct kites. They use the anemometer and wind vane to determine the best location and direction for flying kites.</p> <p><i>Read, "Resources".</i></p> <p><i>FQ - What weather conditions are good for flying kites?</i></p>	<p>Medium</p> <p>You could have a classroom kite.. Instead of having students construct their own. Observing the direction of the wind and movement of clouds is important.</p> <p>*Another important piece of this lesson is the reading</p>

Assessment	i-Check	
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K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.

K-ESS3-3 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

Investigation 4 - Looking for Change

Students organize monthly weather data, using graphs to describe weather trends. They continue to monitor weather throughout the year, comparing the seasons and looking for weather patterns. Students use the observations they have recorded on the calendar to look for monthly patterns of the Moon and annual patterns of daylight hours.



Standards - 1-ESS1-1, 1-ESS1-2, K-ESS2-1

Investigation 4	Summary of Lesson	Priority
Part 1: Change Over a Month	<p>Students organize and graph the class weather data recorded over a period of 4 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.</p> <p><i>Activity, "What's the Weather".</i></p> <p><i>FQ - How can we describe the weather over a month? and What does the Moon look like at different times during a month?</i></p>	<p>High</p> <p>Looking at data is important for students to begin to make observations of weather and data and make predictions of weather over time. (1-ESS1-1)</p>
Part 2: Daylight through the Year	<p>The class looks at the amount of daylight on the same day of each month over the year. Students describe the pattern they 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.</p> <p><i>Read, "Changes in the Sky".</i></p> <p><i>FQ - How does the amount of daylight change over the year?</i></p>	<p>High</p> <p>This directly meets standard 1-ESS1-2, Make observations at different times of year to relate the amount of daylight to the time of year.</p>
Part 3: Comparing the Seasons	<p>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 graphs from the preceding seasons.</p> <p><i>Read, "Seasons" and "Getting through the Winter".</i></p> <p><i>FQ - How does the temperature and weather change over the seasons?</i></p>	<p>Low</p> <p>This is an activity that will need to continue throughout the year, and doesn't have to be done with this unit. Taking weather data could be part of calendar and/or math time. Although this lesson wraps up looking at weather patterns, it will need to be done at the end of the year.</p> <p><i>**This could also be integrated into the daily calendar for 1st grade.</i></p>
Assessment		

1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted.

1-ESS1-2 Make observations at different times of year to relate the amount of daylight to the time of year.

K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.