

<p>This startup segment will allow students to begin the data collection of weather and moon phases. This segment will have students begin the process of collecting and analyzing weather data in order to predict the weather for their local area. Students will also begin collecting and recording observations of the moon phases to recognize the repeating pattern.</p>	
<p><b>Student Science Performance</b></p>	
<p><b>Grade:</b> Fourth</p>	<p><b>Title:</b></p>
<p><b>Topic:</b> Earth science: weather/space</p>	<p>Weather &amp; Moon Phases: Collecting Data through the Year</p>
<p><b>Performance Expectation for GSE:</b></p> <p><b>S4E4. Obtain, evaluate, and communicate information to predict weather events and infer weather patterns using weather charts/maps and collected weather data.</b></p> <p>a. Construct an explanation of how weather instruments (thermometer, rain gauge, barometer, wind vane, and anemometer) are used in gathering weather data and making forecasts.</p> <p>c. Ask questions and use observations of cloud types (cirrus, stratus, and cumulus) and data of weather conditions to predict weather events.</p> <p><b>S4E2. Obtain, evaluate, and communicate information to model the effects of the position and motion of the Earth and the moon in relation to the sun as observed from the Earth.</b></p> <p>b. Develop a model based on observations to describe the repeating pattern of the phases of the moon (new, crescent, quarter, gibbous, and full).</p>	
<p><b>Performance Expectations for Instruction:</b></p> <p>Students will</p> <ul style="list-style-type: none"> <li>● Get an introduction to the theme of the year: Life on the International Space Station and Its Mission.</li> <li>● Collect, record, and analyze data on cloud observations.</li> <li>● Collect, record, and analyze data using weather instruments.</li> <li>● Collect, record, and analyze data on moon phase observations.</li> <li>● Use the data throughout the year as students become familiar with patterns and cause and effect relationships.</li> </ul> <p><a href="#">Additional notes on student supports</a></p>	
<p><b>Materials</b></p> <p>Weather instruments for data collection and/or access to a computer for data collection. Journal or chart for data collection. Calendar or journal for recording moon phase information.</p>	
<p><i>Students will continuously obtain, evaluate, and communicate information. This is not a linear process. Students will communicate through writing and discussions to allow for formative assessment. This benefits the teacher, student, and whole group to guide instruction to clarify misconceptions or extend content.</i></p>	

<p><b>Engaging Learners</b></p>	<p><i>Obtaining, Communicating, and Evaluating</i></p> <p><b>Phenomenon:</b> <a href="#">International Space Station</a> The audio portion of this video uses a mechanized voice that is sometimes difficult to understand. The script is found here: <a href="#">Script for the video of the International Space Station</a> You can show any portion of the video and read the script or have it available for questions.</p> <p>Have students read the following reading selection: <a href="#">What is the International Space Station?</a></p> <p><i>Explain that the year is based on the work of the astronauts on the International Space Station and their life in microgravity conditions. This is the theme of each of the year’s segments.</i></p> <p>This introduction will give students time to think about questions they have, what they want to know, and the possibilities of the future of space travel.</p>
<p><b>Exploring</b></p>	<p>The teacher should show the <a href="#">video from NASA that show hurricane Florence from the International Space Station</a></p> <p><i>Teacher note: the video is 3 minutes and has no sound but it is a good view of how the ISS astronauts see weather from space. The teacher can point out the clouds that appear in the images.</i></p> <p>Ask students: Why might the ISS take images of weather events like hurricanes? What is the first thing that astronauts see when they look at earth from the ISS?</p> <p>The teacher can have students observe other images of earth from the ISS and note the clouds.</p>
<p><b>Explaining</b></p>	<p>Obtaining, evaluating, communicating</p> <p><u>Part 1 and 2: Clouds</u></p> <p>The science of forecasting the weather takes careful observation and time to recognize patterns. Begin students with observing clouds for a period of time. Have them notice the clouds and the weather associated with those clouds. Have students use the names of the basic cloud types: cirrus, cumulus, nimbus, and stratus. A summary information sheet and charts for collecting data is included: <a href="#">Clouds</a></p> <p>Have students collect data for several days since weather sometimes stays the same over several days. That is okay. It</p>

helps students recognize patterns in seasonal weather. After students are proficient at recognizing basic cloud types and have seen examples of each, it is time to continue with more data.

### Part 3-- Charting Weather Data

Have groups of students in charge of the weather data each day.

#### Data Chart-Weather

Groups can change weekly or as time permits. These readings are available in local news media and weather reports on television, internet or radio.

*Teacher hint: Students have collected this data in first grade and are familiar with temperature, wind speed and precipitation. Air pressure (barometer readings) is a new one for some students. Introduce the term barometric pressure as students become proficient at collecting that data. During the actual weather segment, students can use the weather instruments to gather, record, and analyze data. During this introduction, students are just collecting reported data.*

### Part 4: Weather Forecasting

After students are proficient and all students have had a chance to collect data, have students use the data to try their hand at forecasting while looking for patterns.

#### Data Chart-Forecasting

Once the actual lesson about “weather” occurs the students will already have ample data for making informed predictions and a better understanding of weather patterns (fronts, highs and lows) and weather instruments for using weather maps to collect and read data.

#### Cloud Identification Chart

A good resource is the Take a Cloud Walk booklet by Jane Kirkland, talkawalk.com. It is a free download: [Take a Cloud Walk](#).

<p><b><i>Elaborating</i></b></p>	<p>Students will also begin making observations of the moon nightly and recording this information in a calendar. As the weeks progress, discuss noticeable patterns. Models of the phases are developed and explanations of how these phases occur are after several months of recording to see patterns.</p> <p>Show students a sample lunar calendar of what will happen in upcoming year. <a href="#">Lunar Calendar for United States</a></p> <p>Ask: How do we know what the phase of the moon is without having seen it? Is this the same for all over the world? Explain.</p> <p><a href="#">Blank Calendar for Moon Phases</a></p>
<p><b><i>Evaluation</i></b></p>	<p><b><i>Assessment of Student Learning</i></b></p> <p>Rotating student teams can check calendars and charts to make sure everyone is up to date with their recording and drawing. Provide them with a checklist for ease in checking and let you know of any problems.</p> <p>Allowing students to see other student’s data can help them in revising their work.</p>
<p><b><i>SEP, CCC, DCI</i></b></p>	<p><b>Science Essentials</b></p>
<p>Science and Engineering Practices</p>	<ul style="list-style-type: none"> <li>● Asking questions and constructing an explanation about weather instruments and function</li> <li>● Analyzing and interpreting data from charts, maps, and weather instruments</li> <li>● Constructing explanations about weather and weather patterns.</li> <li>● Obtaining, evaluating, and communicating information to predict weather events and infer weather patterns</li> <li>● Developing and using models</li> </ul>
<p>Crosscutting Concepts</p>	<ul style="list-style-type: none"> <li>● Patterns</li> <li>● Cause and Effect</li> <li>● Systems and System Models</li> </ul>
<p>Disciplinary Core Ideas</p>	<ul style="list-style-type: none"> <li>● ESS2.D: WEATHER AND CLIMATE <ul style="list-style-type: none"> <li>● Cloud formations</li> <li>● Weather instruments</li> </ul> </li> <li>● ESS1.B: EARTH AND THE SOLAR SYSTEM <ul style="list-style-type: none"> <li>● Moon phases</li> </ul> </li> </ul>

**Additional Supports for struggling learners:**

**The following supports are suggestions for this lesson and are not the only options to support students in the classroom. These supports target students that struggle with science material, this lesson or a previous lesson. These are generalized supports and do not take the place of IEP accommodations as required by each student’s Individualized Education Program.**

**General supports for the following categories:**

<u>Reading:</u>	<u>Writing:</u>	<u>Math:</u>
<ol style="list-style-type: none"> <li>1. The teacher can have students match letters prior to reading to remind them of the alphabet.</li> <li>2. The teacher can have students identify words that they know in the text as the class reads.</li> <li>3. The teacher should remind students to use strategies when they are reading.</li> </ol>	<ol style="list-style-type: none"> <li>1. The teacher can provide practice for students in the area of writing both in context and practicing just letters.</li> <li>2. The teacher can provide a sentence starter for the students.</li> <li>3. The teacher should continually give encouragement to the students.</li> <li>4. The teacher can provide constructive positive feedback during the writing process to help students understand the expectations.</li> </ol>	<ol style="list-style-type: none"> <li>1. Provide students with opportunities to interact with numbers.</li> <li>2. The teacher can provide manipulatives to allow the students to count and interact with materials.</li> </ol>

**Supports for this specific lesson if needed:**

**Performance expectations for instruction:**

1. The teacher should provide information to students in various formats to reach as many students as possible.
2. The students should be given adequate time to complete each part of the lesson.
3. The students should be allowed to express their knowledge in various formats.
4. The teacher should be sure to provide multiple ways for the students to communicate their knowledge of the material.

**Engage:**

1. The teacher should show the video multiple times as needed to allow students to make observations.
2. The teacher should consider increasing the student's ability to access the information in the script by facilitating a read aloud, utilizing text-to-speech or group reading.
3. The teacher should consider providing students with a copy of the transcript so that they may refer to it.
4. The teacher should consider assisting student's ability to access the information in the text by facilitating a read aloud, utilizing text-to-speech or showing a video.
5. The teacher should consider providing students with question stems to assist students in generating questions.
6. The teacher should ask students to record the questions on an anchor chart or other means to allow them to refer to the questions all year.

**Exploring:**

1. The teacher should consider showing the video more than once as needed for students to make observations.
2. The teacher should have clear and consistent guidelines for discussions. These guidelines should help students feel more comfortable and be more likely to participate in the discussion.
3. The teacher should increase wait time when asking students for observations.

**Explaining:**

1. The teacher should consider how to get students to observe the clouds. This could be done by using videos of clouds or going outside to observe clouds.
2. The teacher should consider providing students an organizer to draw or write observations made while cloud gazing.
3. The teacher should use intentional and flexible grouping to group students. Best practice is to use data to drive student groupings.
4. The teacher should consider providing students with a data sheet to record observations and data.
5. The teacher should consider providing data or sources to find data. This should assist students in charting data and analyzing for patterns.
6. The teacher may need to remind students what patterns are and discuss where they see patterns to help students be in the mind frame to find patterns in the weather data.
7. The teacher should be sure to provide multiple ways for the students to communicate their knowledge of the material. These formats could include writing, drawing, labeling images or designing a presentation.
8. Students may need additional time to complete their assignment.
9. The teacher should consider having multiple options for sharing student work. These formats could include using technology, gallery walk or giving a presentation.

**Elaborating:**

1. The teacher should consider providing students with a source to find the moon phase if they miss out on recording it at night.

2. The teacher should be sure to provide multiple ways for the students to communicate their knowledge of the material. These formats could include writing, drawing, labeling images or designing a presentation.
3. Students may need additional time to complete their assignment.
4. The teacher should consider having multiple options for sharing student work. These formats could include using technology, gallery walk or giving a presentation.
5. The teacher should consider providing students with sentence starters to help with starting the explanation.

**Evaluating:**

1. Students may need additional time to complete their assignment.
2. The teacher should be sure to provide multiple ways for the students to communicate their knowledge of the material. This could include labeling images, drawing pictures, writing or verbally explaining.



## **Script for the video of the International Space Station**

The "International Space Station" is a space station, or a habitable artificial satellite, in low Earth orbit. Its first component launched into orbit in 1998, and the ISS is now the largest artificial body in orbit and can often be seen with the naked eye from Earth. The ISS consists of pressurized modules, external trusses, solar arrays and other components. ISS components have been launched by Russian Proton and Soyuz rockets as well as American Space Shuttles.

The ISS serves as a microgravity and space environment research laboratory in which crew members conduct experiments in biology, human biology, physics, astronomy, meteorology and other fields. The station is suited for the testing of spacecraft systems and equipment required for missions to the Moon and Mars. The ISS maintains an orbit with an altitude of between 330 and by means of reboost maneuvers using the engines of the Zvezda module or visiting spacecraft. It completes orbits per day.

ISS is the ninth space station to be inhabited by crews, following the Soviet and later Russian Salyut, Almaz, and Mir stations as well as Skylab from the US. The station has been continuously occupied since the arrival of Expedition 1 on 2 November 2000. This is the longest continuous human presence in space, having surpassed the previous record held by Mir. The station is serviced by a variety of visiting spacecraft: Soyuz, Progress, the Automated Transfer Vehicle, the H-II Transfer Vehicle, Dragon, and Cygnus. It has been visited by astronauts, cosmonauts and space tourists from 15 different nations. The "International Space Station" is a space station, or a habitable artificial satellite, in low Earth orbit. Its first component launched into orbit in 1998, and the ISS is now the largest artificial body in orbit and can often be seen with the naked eye from Earth. The ISS consists of pressurized modules, external trusses, solar arrays and other components. ISS components have been launched by Russian Proton and Soyuz rockets as well as American Space Shuttles.

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## Clouds

There are three main forms of clouds: cirrus, cumulus, and stratus. All other cloud names are combinations of these basic names. These names came from weather studies conducted by Luke Howard. He used these names to describe the main forms of clouds and presented his names and writings to the science community before other scientists.

Cirrus clouds are the high wispy clouds that are formed of ice crystals. They usually signal a change in the weather. Cumulus clouds are the fluffy clouds we see during fair weather. Sometimes they look like animal shapes in the sky. When they become flat on the bottom and dark, they signal rain or storms. We call storm clouds cumulonimbus. They can build into massive mountains of dark clouds. Stratus clouds are low and gray. They form a layer of cloud cover that sometimes sits on the ground as fog.

Scientists can use clouds to forecast the weather since some clouds are only seen during certain conditions. Become a Cloud Watcher and see if you can find the patterns of clouds giving clues to the weather that follows.

### Part 1: Cloud Journal

Date	Cloud type	Location	Current Weather	Next Day's Weather

What did you notice about the clouds you saw during this week?

Did you notice a pattern of weather and clouds?

**Part 2 Forecasting with Clouds**

Now try your hand at watching the clouds and see if you can notice the pattern of the cloud formation and the weather you see the next day or so.

Date	Cloud type	Location	Current Weather	Prediction of Next Day's Weather	How did you do?

What did you find out as you watched the clouds and predicted the weather?

Are cloud observations enough to accurately predict weather conditions? What would help your accuracy?

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### Moon Phase Calendar

Draw the current moon phase for each day of the month. You can use news media or direct observation for this information. First fill in the month, year, and date. If the drawing is from a direct observation, put a checkmark in the box.

MONTH \_\_\_\_\_

YEAR \_\_\_\_\_

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY

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