



## ***Celebrating Science: Weather and Clouds*** **Grades: 5-8**

### **Description:**

In this Celebrating Science Passports students will investigate how clouds are formed and how clouds impact weather. Students will begin the exploration by watching a science experiment, engage in a discussion with a scientist, and extend the learning with an activity. The experiment will spark discussion of scientific principles, facilitated by a scientist. This Passports exploration satisfies the National Earth and Space Science Standard entitled Weather.

### **Preparation for the Excursion**

Students should be familiar with the basic concepts of phase changes. Before the activity, students may want to review the three states of water and how changes in these states occur. Discussion about how the states of water relate to clouds and weather should generate interesting questions.

### **Video Link:**

**Enjoy this experiment about weather and clouds:**

[http://easylink.playstream.com/21\\_CenturyLearning/science/weather\\_clouds\\_lesson\\_only.rm](http://easylink.playstream.com/21_CenturyLearning/science/weather_clouds_lesson_only.rm)

### **Challenge Questions:**

1. What are clouds made of? Have you ever seen anything similar to a cloud or made a cloud yourself? How? Describe what you might have done to make a cloud.
2. Have you ever noticed that the temperature is a bit different on a cloudy day? How have you experienced it to be different and why do you think that might be?
3. Try to observe the clouds around us. Describe the different shapes and sizes of the clouds you see. Draw pictures of the different types of clouds you see.

### **Responses/Prompts:**

1. Clouds are visible clusters of either tiny water droplets or ice particles that are in the atmosphere above the Earth's surface. They can form at various heights in the atmosphere and by different ways. We form clouds when we breathe out on cold days, or in side of a container when cold and warm air meets, like when we open a cold soda bottle quickly. This is because these actions cause the gaseous water vapor to enter liquid state through condensation. When water vapor cools quickly, like it does when air rises, meets a cold front, or compresses with higher pressure, it changes to its liquid state. *Conversation about weather and clouds can be prompted by this challenge question. Ask students to describe what weather is and discuss different weather phenomenon as a class.*
2. Clouds impact both the weather and the climate in very important ways. The same systems that cause clouds to form also cause the build up of precipitation within clouds and lead to weather events like rainfall, snow, hail, and sleet. Clouds also help to determine the amount of incoming solar radiation, the more clouds in the sky, the more

sunlight reflected back out to space, and the less entering the lower parts of the atmosphere. This means that cloudy days are generally cooler as less of the sun's radiation is entering.

3. There are three basic types of clouds cirrus, cumulus, and stratus. (For more info on cloud types, see: <http://www.theweatherprediction.com/clouds/>)

- **Cirrus** clouds are high-level clouds (16,000 feet or higher). These clouds are composed mainly of ice crystals and appear in the form of white, delicate filaments or white or mostly white patches or narrow bands of cloud. Cirrus clouds typically have a hair-like appearance, and often are semi-transparent. Thunderstorm anvils are a form of cirrus cloud, but most cirrus clouds are not associated with thunderstorms.
- **Cumulus** clouds are detached clouds that are generally dense and with sharp outlines. These clouds show vertical development in the form of domes, mounds, or towers. Normally, cumulus cloud tops are rounded while their bases are more horizontal. If these develop enough vertically, they can develop into thunderstorms.
- **Stratus** clouds are a low, generally gray cloud layer with a fairly uniform base. Stratus clouds may appear in the form of ragged patches, but otherwise do not exhibit individual cloud elements as do cumulus and stratocumulus clouds. Fog usually is a surface-based form of stratus.



### Lesson at a glance:

This activity is based on the five minute video of an experiment where a teacher and a student actually make clouds ([http://easylink.playstream.com/21\\_CenturyLearning/science/weather\\_clouds\\_lesson\\_only.rm](http://easylink.playstream.com/21_CenturyLearning/science/weather_clouds_lesson_only.rm)). The same general physical principle behind the experiment underlies cloud formation. Students can watch the video once or twice and list any questions they may have.

### Lesson Outcomes:

- Students will understand how clouds are formed from the condensation of water.
- Students will know about the different types of clouds created in the earth's atmosphere.
- Students will understand how different clouds can affect the earth's weather and climate.

### Discussion Questions:

After watching the experiment, ask students these questions to spark discussion.

1. What ways did the experiment show us that clouds form? How did clouds form in the jar? In the bottle?

*High and low pressure systems and hot and cold fronts combining.*

2. What does the match do to the air in the jar? What does this do in the atmosphere?

*The lighting of the match adds particles to the air. Cloud condensation nuclei are air borne particles, often coming from sources like pollution, dust, and sea spray. Water droplets form around these particulates.*

3. Why do clouds form in each of these cases?

*In the first experiment, the cloud forms when the colder air outside the jar (similar to a cold front) comes into contact with warmer air inside the jar. The water vapor condenses and forms water droplets around the particles in the air.*

*In the second experiment, the cloud forms inside the bottle as the student adds pressure to the bottle. The meeting of high and low pressures, forming compression of air and water vapor forms clouds of water droplets.*

4. How is what occurs in the beaker similar to what happens on earth?

*In the atmosphere, frontal systems meet and clouds often form on their boundaries. Particulates in the air act as condensation nuclei just as the match burning particulates do. In some cases, this can lead to the acidification of rain.*

**Activity:**

Bring in some newspapers and some measurement devices used to monitor the weather. Examples of such devices include thermometers, barometers, rain gauges, and satellite images. If your school does not have access to these, you can look at examples online at weather station sites (<http://www.biology.wustl.edu/tyson/archiveswea.html>). Describe the weather reports found in newspapers and how these reports are made. Show the students and have them try the weather measurement equipment. Talk about why weather reports are uncertain, and how important they are in our lives.

This lesson can also be used to generate a discussion on the differences between weather and climate and on what the climate change discussion is all about.