

## ***Kindergarten: Weather***

**Objective:** Students will learn and demonstrate how clouds rain and how dew and frost are formed.

Next Gen Science Standards: Use and share observations of local weather conditions to describe patterns over time.(K-ESS2-1) Use a model to represent relationships in the natural world. (K-ESS3-1)

### **Docent Lab Guidelines:**

Schedule a date and time with your teacher to have the students come into the lab.

Estimated time for this lab: 30 minutes

Input the day and time into the Science Lab Master Schedule. Please make sure you include 30 minutes set up and clean up time, and add your name.

### **MATERIALS:**

2 tin cans without a lid (condensed soup cans work well, but peel the labels off) per group

rock salt or table salt

crushed ice (buy on the day of the lab)

clear containers

water

food coloring in dropper bottles, or in a cup with a separate dropper

shaving cream (old fashioned white stuff, not gel)

Note: This lab will be done in small groups at the tables. Arrange for 1-2 sets of materials per table.

### **INTRODUCTION:**

Briefly review the water cycle with the class, using the poster or video

Water cycle video: <https://www.youtube.com/watch?v=zBnKgwnn7i4>

Explain to the students that they will be creating condensation and precipitation when they make dew, frost, and rain. Give an overview of the instructions, then ask for predictions about what will happen. Help the groups conduct the experiments at the tables. Make sure the kids take turns. End with a class discussion of the results. Ask: What happened? Why?

# Demonstration: Sun Safety- Sun Protection & Sunscreen

*Estimated hands-on time: 5-10 minutes*

## Materials:

- Pre-made paper with sunscreen, sun protection & not with sunscreen

In this demonstration, the construction paper acts as our skin. The side with sunscreen is protected from the sun's UV rays and stays the original vibrant color. The other side without sunscreen is unprotected, shows fading and is affected by the UV rays. The paper with items of sun protection show both affected and not affected by the sun.

## Instructions:

1. Show the sample "Before."
2. Discuss the differences of each (Sun protection item, sunscreen or nothing)
3. Discuss what the sun does to our skin and what we can do to protect it.
4. Ask what would happen if the "Before" paper were to be in the sun.
5. Show the sample "After" & discuss what happened and why they think that happened.

## Experiment 1: Make dew and frost (from weatherwizkids.com):

In one tin can put a mixture of crushed ice about half full and about 4 tablespoons of salt. Mix it well for about 30 seconds and then let sit.

In the other can put only crushed ice and cool tap water. Fill the can about half way full of ice and then put just enough tap water in the can to cover the ice.

Set in the center of the table to observe while doing the Cloud in a Bottle.

## Experiment 2: Cloud in a Bottle

Fill your chosen vessel (glass beaker or mason jar) about two-thirds full of water. Add a puffy layer of shaving cream on top (done by adult). Explain that the water represents air and the shaving cream represents a cloud, which is made up of lots of tiny droplets of water or ice.

Mix some of the blue (or any color) food coloring with water and add it, a few drops at a time, to the top of the shaving cream. Make sure everyone has a turn to add some. The result will be blue rain. For faster rain, try non-diluted food coloring.

Tell the students NOT to touch the shaving cream and food coloring—ONLY OBSERVE.

Ask the children to think about why clouds are able to float. (The short answer is that the water and ice droplets are very light.) Why do clouds sometimes make rain? You can keep the answer to this one simple, too. The bigger the cloud gets, the more the water droplets bang together and grow. Eventually they get so heavy, they fall to the ground.

Challenge older kids to flex their critical thinking skills a bit more. The truth is, nobody knows exactly how clouds make rain. Scientists think it has to do with the water droplets freezing onto tiny particles of dust or bacteria inside the cloud, called cloud seeds, causing them to become heavy and fall to the ground. If you really want to blow your kiddos' minds, mention that people sometimes try to make it rain by sending planes to shoot dust into clouds, a process known as cloud seeding.

(Read more : [http://www.ehow.com/ehow-mom/blog/diy-rain-clouds/cloud in a bottle](http://www.ehow.com/ehow-mom/blog/diy-rain-clouds/cloud%20in%20a%20bottle))

Return to observing the cans. Note the frost forming on the outside of the can with the ice and salt mixture. Compare this with the liquid moisture on the outside of the can which contains ice only.

Why does this happen? The salt wants to absorb water to make a salt solution. To do that, the salt has to melt the ice into water. The heat required to melt the ice comes from the ice itself. The strange effect is caused by the chemical reaction between the salt and the ice. Strange as it seems, melting the ice actually makes the mixture cooler. The salt water mixture inside the can gets below freezing, so the moisture from the air that collects on the outside of the can will freeze. This is why frost forms!

On the other can, dew forms because the mixture of the melting ice and water is just at freezing and the temperature outside the can is warmer causing the dew to form.

## General Docent Information about the Subject Matter --for Reference

Dew is the moisture that forms as a result of condensation. Condensation is the process a material undergoes as it changes from a gas to a liquid. Dew is the result of water changing from a vapor to a liquid.

Dew forms as temperatures drop and objects cool down. If the object becomes cool enough, the air around the object will also cool. Colder air is less able to hold water vapor than warm air. This forces water vapor in the air around cooling objects to condense. When condensation happens, small water droplets form—dew.

The temperature at which dew forms is called the dew point. The dew point varies widely, depending on location, weather, and time of day.

Humid locations, such as the warm, coastal tropics, are more likely to experience dew than arid areas. Humidity measures the amount of water vapor in the air. Warm, humid air is full of moisture that can condense during calm, cool nights.

Weather conditions can also influence an area's dew point. Strong winds, for instance, mix different layers of air, containing different amounts of water vapor. This reduces the atmosphere's ability to form dew.

Cold weather can also prevent the formation of dew. As temperatures drop below freezing (0°Celsius, 32°Fahrenheit), a region may reach its frost point. At a frost point, water vapor does not condense. It sublimates, or changes directly from a gas to a solid. Moisture changes from water vapor to ice.

Dew is most likely to form at night, as temperatures drop and objects cool. However, dew can form whenever a dew point is reached. (from [education.nationalgeographic.com](http://education.nationalgeographic.com))

### What Are Clouds And Why Does It Rain?

Almost all the air around us is moist. That means that it contains water in the form of vapour. You can't see it because water vapour is a gas, but it's still water. Water can exist in three states; liquid (water), solid(ice) and gas(water vapour). Obviously, you can see and touch water and ice, but water vapour has no smell, you can't pick it up, and it's invisible. That doesn't mean that you can't feel it though.

Perhaps you can remember a hot and sticky day in summer, or a cold foggy day in winter, or even being in a hot shower full of steam? In each of those situations you will have felt water vapour all around you. If you stopped and really looked at that fog or steam you would have spotted millions and millions of tiny water droplets floating in the air. What you saw was the same process that makes clouds - millions of tiny water droplets condensing out of the air to form liquid water.

We've all seen fog and steam, but why does water condense out of air and become visible? Well, warm air can hold more water vapour than cool air, so if warm air starts to cool, it can no longer hold as much water vapour. The extra water vapour has to go somewhere, so it condenses out as water. So... cooling the air reduces its ability to hold water vapour, and triggers the formation of water droplets. Remember that bit, 'cos it's very important.

Go outside and stare up at a cloud (not one right next to the Sun though - you don't want to go blind!).

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Watch that cloud for a while, especially its edges. As you watch it, the edges will change, either growing larger or getting smaller. What you are seeing is cloud formation in action. As the cloud grows you are seeing more of those water droplets condensing out of the air, and as it shrinks, you are witnessing the droplets evaporating - changing from visible liquid water into invisible water vapour.

Now, it doesn't take a genius to point out that the clouds are usually a long way up, and not every cloud has rain pouring out of it. So, how does the formation of a cloud lead to actual rain?

To get rain, the water condensing in the clouds has to become heavy enough to fall to Earth. The tiny droplets just aren't heavy enough to fall. Just like fog or in the shower, they go whichever way the wind and eddy currents blow them, or they just hang there, suspended in the air.

To become heavier, the droplets need to grow into drops. To do this they have to acquire more water and become larger. Some will collide with other droplets and become larger, and others will grow as water condenses out the air directly into the droplet. Others will grow by both methods. It's a bit like watching drops of rain water on a window - small drops fall, they join with other small drops, become larger drops, and so on. In the right clouds, this process will be happening to millions of tiny droplets, all growing at the same time, but at different speeds.

Eventually, if the droplets keep growing, they will reach a mass where they can't stay floating in the cloud because they are too heavy - and will start to fall. Some may get caught in upward blowing winds and get blown back into the clouds for a while, but once they are heavy enough

to overcome the force of the wind, they will fall to earth - as rain! It will keep raining as long as the conditions are right to make the clouds and let the water droplets grow heavy enough to fall.

So, there you go - now you know what a cloud is, and how it creates rain. (from [geographysite.co.uk](http://geographysite.co.uk))

## K supply list for Weather

### **MATERIALS:**

2 tin cans without a lid (condensed soup cans work well, but peel the labels off) --per group (about 15)

1 box rock salt or table salt

10 lb. crushed ice (buy on the day of the lab)

clear containers /jars for each group

water

food coloring in dropper bottles, or in a cup with a separate dropper

2-3 cans per class of shaving cream (old fashioned white stuff, not gel)

Note: This lab will be done in small groups at the tables. Arrange for 2 sets of materials per table, with four students per group.