

## Lesson Plan Template

Topic: Weather

Date: October 22, 2012

NSES: Content K-4 D: As a result of their activities in K-4, all students should develop an understanding of changes in earth and sky.

Content K-4 A: As a result of their activities in K-4, all students should develop abilities necessary to do scientific inquiry.

Grade level: 4th grade

SOL: 4.6 The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include

- a) weather phenomena;
- b) weather measurements and meteorological tools; and
- c) use of weather measurements and weather phenomena to make weather predictions.

4.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which

- a) distinctions are made among observations, conclusions, inferences, and predictions;
- b) objects or events are classified and arranged according to characteristics or properties;
- e) predictions and inferences are made, and conclusions are drawn based on data from a variety of sources;
- k) data are communicated with simple graphs, pictures, written statements, and numbers;
- l) models are constructed to clarify explanations, demonstrate relationships, and solve needs; and
- m) current applications are used to reinforce science concepts.

**Daily Question:** What causes weather; how and why do scientists measure weather?

**Subject:** How weather occurs and is predicted

Procedures for Learning Experience	Guiding Questions	Materials Needed	Evaluation (Assessment)	Approximate Time Needed
<p><b>Engagement:</b> Gather the students close to but keep them at an arm's length from the demonstration station. Prepare a clean jar and pour a little bit of hot water. Then, cover and shake it a little to warm the jar. Ask the students what they see in the jar and what they think is needed to make a cloud while waiting. Place a cold piece of foil over the jar and put ice cubes on the foil. Poke two holes in the foil. Put the nozzle of the aerosol into the hole. Spray aerosol in the jar. Discuss the process of making the clouds with the students.</p>	<p>Do you think it is possible to make clouds? What do think you need to make a cloud? Do we need only water? Are clouds solids, liquid, or gas? What are clouds made of? Now do you know what you need to make a cloud? Do you need to add or remove heat energy to evaporate water? What state of matter does water become when it evaporates? What is a gas form of water? Do you need to add or remove heat energy to condense water vapor? What state of matter does water vapor become when it condenses? What does water vapor stick to? Have you ever seen a cloud that looks like this? Do you always see the same looking clouds? When you find clouds in the sky, does it always rain soon? Can you predict weather by looking at clouds? Do you know different clouds' names?</p>	<p>A glass jar and its lid, Hot water, A piece of aluminum foil, A rubber band, Two ice cubes, A needle, Aerosol spray</p>	<p>Formative: Student participation, student cooperation, student engagement.</p>	<p>10 minutes</p>

<p><b>Exploration:</b> Place students into 5 groups. Each group will go to each station. Assign each group to an initial station. Students will read the directions at each station and participate in the activity. If necessary, students will complete the worksheet in their packet that coincides to a specific station. Once 6 minutes has passed, students will proceed to the next station. The teacher will use a timer to signal when time is up and when students should move to the next station. The five stations are : 1) What was the weather like that day 2) How fast does the wind blow 3) Updrafts in Action 4) Tumultuous thunderstorms and 5) Cloud cotton balls.</p>	<p>See student cards</p>	<p>See teacher cards Timer</p>	<p>Formative: Student participation, student cooperation, student engagement.</p> <p>Summative: answers to the questions in the worksheet packet.</p>	<p>30 minutes: 6 minutes at each station</p>
<p><b>Explanation:</b> Bring the students back to the front of the classroom to discuss what they did in each station, and what they learned. To begin the forum, ask the students what they thought were the main ideas of the activities. Then, use questioning to check for comprehension of ideas and concepts of activities. Address any</p>	<p>See teacher/activity cards for guiding questions, as well as more detailed forum questions.</p>	<p>Worksheet for references</p>	<p>Participation in the forum discussion.</p> <p>Answers to questions will indicate comprehension of ideas and</p>	<p>10 minutes</p>

<p>lingering misconceptions. Help the students to draw connections between the stations, build a more complete image of the forces that influence weather, and understand how and why scientists measure weather.</p> <p>1) What was the weather like that day: Ask the students to describe the clouds they observed in the photos, their weather predictions, and what they found out on the website. Ask them how much the clouds spotter helped them predict the weather and which is more accurate between the clouds spotter and the weather report website. Ask them when they would need clouds spotting skills when many people can simply carry smart phones.</p> <p>2) How fast does the wind blow? Have students build their own anemometer following directions and model. Using their breath and a hair dryer to simulate wind, have them calculate the revolutions per minute (RPM). Using the RPM, the provided formula, and a calculator, have students calculate the “wind” speed in MPH.</p>			concepts.	
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<p>3) Updrafts in Action: Have the students simulate suspending hail in an updraft, leading to a thunderstorm. Have students point a hair dryer at the ceiling to simulate an updraft, then suspend PingPong balls in the air current. The PingPong balls represent hail and water droplets that are suspended as a thunderstorm builds. Have the students explore the effects of changing the wind speed on the amount of “hail and rain” that can be suspended.</p> <p>4) Tumultuous Thunderstorms: Ask the students what ingredients cause a thunderstorm. Ask them to describe what they saw in the activity. Explain to students that thunderstorms occur because of a shift in the air. Cold air lifts warm, unstable air which is caused by convection. When the cold air of the higher elevation meets the water vapor in the warm air, the vapor condenses to water. This water becomes rain and fuels the storm. A cumulous cloud forms and rain begins to fall.</p> <p>5) Cotton Ball Clouds: Ask students to</p>				
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<p>describe how a cotton ball is like a cloud. After they have described different ways that they are alike, ask the students to think about the thunderstorm activity. Ask the students how the two activities connect. Explain that the condensing air fills the cloud with water. Once the cloud reaches a certain point rain begins to fall. The same occurs with the cotton ball. Students are simulating the condensing water in the cloud by using the eyedropper. Then once the cotton ball is full, water, which represents to the rain, falls out of the cotton ball.</p>				
<p><b>Extension:</b> Prepare small beakers of fruit punch at different temperatures in advance. Put them in the big beakers and cover them with plastic wrap. After the explanation, present the beakers and explain what they are. Ask the students where they think water droplets on the surface of plastic wrap came from. Pass around the beakers and tell the students to uncover the wrap and investigate it using the sense of sight, smell, and</p>	<p>What do you see on the surface of the plastic wrap? Are they solids, liquid, or gas? Where do they come from? How do we know if they are from the air in the beaker or fruit juice? How did you know the water droplets came from fruit punch? Do you need to add or remove heat energy to help evaporate fruit punch? What state of matter does fruit punch become when it evaporates? Do you need to add or remove heat energy to condense water</p>	<p>Three sets of small beakers and big beakers Hot fruit punch, warm fruit punch, and cold fruit punch. Three pieces of plastic wrap. Three rubber bands. Six ice cubes.</p>	<p>Summative: Sentences on exit card will indicate whether students can connect what they learned in the circus to a new activity.</p>	<p>10 minutes</p>

touch. Discuss concepts such as evaporation, condensation, heat energy, and molecules with the students. Have them fill out exit card.	vapor? What state of matter does water vapor become when it condenses?			
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**Notes:** Each station should be clearly labeled with a number to facilitate a smooth progression from one station to the next. Explain to the students that the time to change stations will be signaled with a timer. A one minute warning will be given, signaling time to wrap up and cleanup as necessary. When the timer sounds it is time to move to the next station in the rotation. Adults will be keeping watch over the circus as a whole to assist as needed, rather than being assigned to a particular station. Particular care will be given to monitor the anemometer station to ensure safe behavior with the straight pins. The thunderstorm activity will be positioned by a sink to facilitate changing out the water and minimize any subsequent mess. The updraft and the anemometer stations will be positioned near electrical outlets to allow plugging in the hair dryers without use of excessive cords. The weather predicting activity will be established near the computers for the students' access to the internet.

Students will be working in 5 groups. Groups will already be made before the science circus begins. Heterogeneous groups will be created. This should prevent extra accommodations for lower performing students. However, students should be encouraged to always seek adult help if needed. In addition, the circus facilitators should circulate the room to ensure that the students are properly behaving. Since they are older students, there is an expectation that they know how to behave. However, before the students participate in the circus, all of the expectations will be clearly stated and the circus will be explained.

**Rubric for the Science Circus Lesson**

<b>Link to Objective</b>	<b>Exceptional</b>	<b>Satisfactory</b>	<b>Needs Improvement</b>
<b>Engagement</b>	Actively engaged in the demonstration and investigates contents in the jar throughout the demonstration. Frequently raises hand and answers to questions. <b>25 to 20 pts.</b>	Engaged in the demonstration and investigates contents in the jar most of the time. Raises hand at least three times to give answers to questions. <b>19 to 15 pts.</b>	Not fully engaged in the demonstration and pays little attention to contents in the jar. Never voluntarily raises hand to give answers to questions. <b>14 to 0 pts.</b>
<b>Exploration</b>	Is a team player who actively participates in all activities and shares responsibilities and opportunities equally with group members. Completes lab notes and worksheets at all stations. Reflects on the questions posed at each station. Stays focused on activities without being distracted. <b>25 to 20 pts.</b>	Completes the notes and worksheets at at least two stations. Slow in transitions but actively engaged once settled. Focus is on doing activity rather than understanding what is happening. Needs a reminder to share equipment. <b>19 to 15 pts.</b>	Does not actively participate in activities. Does not complete lab notes and worksheets or reflect on questions. If does do activities, does not share time with other group members. Does not transition between stations at required times. <b>14 to 0 pts.</b>
<b>Explanation</b>	Follows the directions to stop the activities and to quickly gather in the front of the classroom. Actively participates in the forum to	Follows the directions to stop the activities and to gather in the front of the classroom. Participates in the forum to offer ideas at least once.	Does not stop the activities and gathers in the front of the classroom immediately as directed. Does not attempt to participate in the forum. Does



	offer ideas. Frequently raises hand to answer to questions. <b>25 to 20 pts.</b>	Raises hand to answer to question at least three times <b>19 to 15 pts.</b>	not voluntarily raise hand to answer questions. <b>14 to 0 pts.</b>
<b>Extension</b>	Actively participates in the discussion, raising hand to offer ideas to explain observations. Exit card uses at least one word from the bank and refers it to both the extension activity and one of the circus stations. <b>25 to 20 pts.</b>	Raises hand to report observations. Exit card uses one of the words from the bank but only applies it to what was seen in the extension activity <u>or</u> a circus station. <b>19 to 15 pts.</b>	Does not participate in discussion. Exit card does not use words from the bank and refers to only the extension activity <u>or</u> a circus station. <b>14 to 0 pts.</b>