Cloud in a Jar

Summary
A simple experiment that ties in the water cycle with weather/cloud formation. Kids can see an actual cloud up close and personal.

Main Core Tie
Science - 4th Grade
Standard 1 Objective 1

Time Frame
1 class periods of 45 minutes each

Group Size
Small Groups

Life Skills
Thinking & Reasoning, Systems Thinking

Materials
1 bag of ice (no more than 7 lbs)
glass jar (for each group, 4 kids max)
ziploc bags
matches
hot water
black construction paper

Background for Teachers
Should know the water cycle and general cloud formation. Basic principles of fog, smog, mist, and if in a city like Salt Lake City, the definition of an inversion.

Student Prior Knowledge
Like teachers, should already know the water cycle.

Intended Learning Outcomes
1. Use Science Process and Thinking Skills
   a. Observe simple objects and patterns and report their observations.
   c. Make simple predictions and inferences based upon observations.
   f. Conduct a simple investigation when given directions.
   h. Use observations to construct a reasonable explanation.

Instructional Procedures
Have ziploc bags no more than 1/2 full of ice ready, enough to cover the top of the glass jar, and warm water ready. Line 3/4 of your jars with black construction paper, ask the students why that is important (clouds are white, so creating a black background will make the cloud easier to see). Ask the students to name as many things as they can that are associated with weather (tornadoes, hurricanes, hail, rain, fog, clouds, wind, blizzards, rainbows, etc.) Mention that without clouds,
weather would not exist. 
Go over the water cycle, that water evaporates, and then condenses to form a cloud. Tell the students that you are putting that part of the cycle in a jar. They will be given a glass jar 1/3 full with warm water and a bag of ice.

Before handing the materials out, explain the procedure:

You will be handing out a jar filled with warm water and a bag of ice.

Then (only the teacher) will be lighting a match and holding it inside the jar for 5 seconds, then dropping it into the jar (don't tell them why the match is important, not yet).

Immediately after, the students will cover their jar with the ice and watch through the clear opening to see what happens.

Next pass out the materials and go around lighting the match for each group. After about 1-2 minutes, tell the students to remove the ice, as the cloud will be released from the jar.

***NOTE: Even if the ice is not removed, the cloud will dissipate on its own. To avoid disappointment, once the cloud is really white, tell the students to remove the ice and watch the cloud leave the jar.

Now ask them if you used boiling water, how would that influence the cloud? The hotter the water, the larger the temperature gradient, therefore the thicker and whiter the cloud should be. So, ask the students to dump out their water, so you can do it again.

Now go into why the match was important, first ask to get some of their thoughts, then explain. When dust or ash is in the air, water vapor now has more surface area to condense on, therefore accelerating the cloud formation, and making a thicker cloud. Clouds will be thicker if dust or ash is in the air, from dust storms, wild fires, volcanic eruptions, etc.

Once you have done it twice, ask the students what a cloud is that exists on the ground? The answer is fog. Now, go into discussion about an inversion, why it exists in Salt Lake vs. Denver, why is doesn't occur during the summer, and how weather corrects this to normal conditions (temporarily).

If time permits, can talk about why Salt Lake doesn't see certain weather, like hurricanes, why Salt Lake rarely sees tornadoes, and why it's always colder in the mountains.

**Bibliography**
http://www.crh.noaa.gov/abr/?n=cloudjar.php

**Authors**
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