



### **Make-A-Cloud Research Activity**

<b>Teacher:</b>	<b>Lesson Topic:</b>
<b>Curriculum Standard:</b>	<p>Fifth grade:</p> <ul style="list-style-type: none"> <li>• ESS.5.1.4</li> </ul> <p>Seventh grade:</p> <ul style="list-style-type: none"> <li>• ESS.7.1.2</li> <li>• ESS.7.1.4</li> <li>• ESS.7.2.1</li> </ul> <p>Eighth grade:</p> <ul style="list-style-type: none"> <li>• ESS.8.3.2</li> </ul>
<b>STEM Categories</b>	<p>Use Models</p> <p>Construct Explanations</p>
<b>Essential Question:</b>	How does energy from the sun drive the water cycle and cloud formation?
<b>'So What' Factor</b>	Changes in temperature and increased pollution will affect how and where clouds form. Clouds are important indicators of weather so understanding how they are formed helps us better predict weather conditions.

<b>Investigation Goals</b>	
<b>What do Students need to know....</b>	<b>What do students need to do...</b>
<ul style="list-style-type: none"> <li>• Heating liquid water causes a phase change to gas</li> <li>• Loss of heat for gaseous water causes it to condense</li> <li>• Changes in temperature cause changes in density. Warm air is</li> </ul>	<ul style="list-style-type: none"> <li>• Identify the process of evaporation and condensation</li> <li>• Compare the behavior of water as it is heated and cooled</li> <li>• Construct a model of the water cycle including evaporation,</li> </ul>

less dense and rises. <ul style="list-style-type: none"> <li>• Clouds need particles in the air to condense on to.</li> <li>• These particles can be natural (dust) or human produced (aerosols and other pollution)</li> </ul>	condensation and precipitation. <ul style="list-style-type: none"> <li>• Analyze the role pollutants play in the water cycle</li> </ul>
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<b>Materials</b>	<ul style="list-style-type: none"> <li>• Beaker</li> <li>• Water</li> <li>• Hot plate</li> <li>• Matches</li> <li>• Ice</li> <li>• Metal tray/bag to place on top of beaker</li> </ul>
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<b>Investigation Procedure/Scientific Method</b>		
	<b>Description/Key Points</b>	<b>Points</b>
<b>Observation</b>	<ul style="list-style-type: none"> <li>• Bring students to an outdoor area.</li> <li>• Complete a nature journaling exercise for the sky.</li> <li>• Emphasize that students should observe the clouds, make note of the current weather and temperature and anything else they notice.</li> </ul>	
<b>Idea &amp; Questions</b>	<p>Inform students that today they will be making a cloud inside a beaker.</p> <p><b>Question:</b></p> <p><i>How does energy from the sun aid in cloud formation?</i></p> <ul style="list-style-type: none"> <li>• For older students, allow them to view the materials list and generate their own questions about the process of cloud formation</li> </ul>	

<b>Hypothesis</b>	<ul style="list-style-type: none"> <li>Students write an answer to the question that is <u>testable</u> using the materials available in this investigation.</li> <li>“I hypothesize that.....”</li> </ul>	
<b>Experiment/Test</b>	<ul style="list-style-type: none"> <li>Have students read through each step of the procedure on their guide before starting.</li> <li>Instruct students to draw a model of the set up just based on the procedure. This will reinforce the directions. <ul style="list-style-type: none"> <li>Fill the beaker with roughly 2 inches of water and place on the hot plate. Warm slowly, you will begin to see the water vapor condensing on the sides of the beaker.</li> <li>Fill the metal tin with ice and set on top.</li> <li>Light a match, (or several for a larger beaker) blow it out, and quickly drop it into the beaker.</li> <li>Immediately cover the top of the beaker with the metal tin. Watch the cloud form.</li> <li>Remove the metal tin from on top of the beaker. Watch the cloud disappear.</li> </ul> </li> <li>Before starting the investigation have students think through what they will be observing based on their variables, will it be qualitative or quantitative or a mix of both?</li> <li>Complete the investigation</li> </ul>	
<b>Results &amp; Analysis</b>	<p><b>Share Observations</b> Collect on the board.</p> <ul style="list-style-type: none"> <li><i>Look for:</i> <ul style="list-style-type: none"> <li><i>Heat source caused water to evaporate and rise</i></li> </ul> </li> </ul>	

	<ul style="list-style-type: none"> <li>○ <i>Before we dropped the match, we began to see condensation on the sides of the beaker</i></li> <li>○ <i>Match produces smoke when dropped into the beaker</i></li> <li>○ <i>When we lift the ice lid off, the cloud disappears</i></li> </ul> <p><b>Discussion questions:</b></p> <ul style="list-style-type: none"> <li>● What happens to water when it is heated?</li> <li>● Where did the condensation on the side of the beaker come from?</li> <li>● Why do you think there was ice at the top?</li> <li>● What change did the match introduce to the system?</li> <li>● What do you think smoke is made out of?</li> </ul> <p><i>These questions are designed for students to begin breaking down the phenomena, at this point we are just gathering information, not looking for correct answers.</i></p> <p><b>Create/Modify the model</b></p> <ul style="list-style-type: none"> <li>● Have students add in arrows and explanations of what is occurring to the drawing of the experiment set up</li> </ul>	
<b>Science Communication &amp; Assessment Options</b>		
<b>Make a model:</b> Make a presentable model of the experiment to explain the role that energy from the sun has in cloud formation.		
<p><b>Extensions:</b></p> <p>Design the next experiment based on the question, “how will increasing pollution affect cloud formation”</p> <p><b>Optional Readings:</b>  <a href="#">Dirty clouds change rainfall</a>  <a href="#">Super-tiny pollutants may help fire up fierce storms</a></p>		

## Make-A-Cloud Lab Sheet

**Question:** \_\_\_\_\_  
\_\_\_\_\_

**Notes from Observations:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Hypothesis:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Model of the experiment:**

**Observations** *(separate into qualitative and quantitative)*

**Analysis Questions:** *(answer in the space below or on a separate piece of paper)*

- What happens to water when it is heated?
- Where did the condensation on the side of the beaker come from?
- Why do you think there was ice at the top?
- What change did the match introduce to the system?
- What do you think smoke is made out of?

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