Making Hail
4th Grade

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1. References:

- "Water Affects the Weather" lesson plan from 4th grade curriculum guide

2. Benchmarks:

ES-2 & ES-3 (Benchmark D): Identify how water exists in the air in different forms.

3. Objectives:

Understand that once water condenses into clouds, it returns back to the Earth in many different forms, called precipitation, because of temperature and wind. Learn how to properly read a thermometer for determining temperature.

4. Materials:

- One large cup of crushed ice
- One large **very clean** test tube
- 400-600 mL beaker
- Salt
- Water
- Thermometer (Alcohol-filled)
- Stirring Rod
- Lab Sheet – Making Hail

5. Initial Demonstration:

Remind the students that we left off previously discussing the formation of clouds. Once the clouds get too heavy, the water begins to fall back to the Earth. Write all four types of precipitation on the chalkboard. Show the students the four overheads that depict the different types of precipitation and ask them to identify the different types of precipitation. Have the students record these in their science journal by numbering 1-4 as you change the slides on the projector. Then ask the students as a class to identify the different slides.

6. Target Observations:

- Rain and snow will be familiar to the students as forms of precipitation, while hail and sleet are seen less in this particular geographic region.

- Snow and sleet look extremely similar; however, sleet begins as rain and freezes on its way back to the Earth.

7. Target Model:

- Temperature greatly affects the way in which water returns back to the Earth as precipitation to continue the water cycle.

8. Procedure:

As you read through the overhead "What are the Main Types of Precipitation" prepared from the weather journal, have the students enter and define the following terms in their science journals: *precipitation, raindrops, percolate, run-off, snow, sleet and hail*. Review the definitions of the vocabulary words with the class to ensure their understanding.

While covering raindrops, explain to the students that most rain that falls in the United States begins as snow. The water begins as ice crystals, and as it passes through the warm air, it begins to melt to form rain. Ask the class if they have seen any news coverage about the hurricane flood damage in the South. The rains came very fast, so the water could not drain off fast enough, or percolate into the ground. Because it cannot be absorbed fast enough, we get run-off into rivers and lakes, which can cause flooding. As the water runs-off and soaks into the ground, the water begins to evaporate, thus starting the water cycle all over again.

Introduce the concept of snow and that the water in a cloud is changed into ice crystals because the temperature is below the freezing point. Present the overhead the shows different snowflakes, and explain that meteorologists say that no two snowflakes look alike. Also introduce sleet, but be sure to differentiate it from snow by stating that it begins as rain but freezes in the air as it falls. Lastly bring up the formation of hail. Explain that it begins by rain, but because of wind, the rain gets blown back into the clouds. The small droplets get coated with more and more ice, until they get so heavy they fall.

Place students into small groups and give each student a copy of the lab sheet provided in the 4th grade curriculum guide regarding the making of hail. Each group should also receive one of each of the materials listed above. Have each group follow the procedure on the handout: Fill the beaker about ¾ full with equal amounts of water and ice. Pour in enough salt so that even after stirring with the stirring rod, salt can still be seen at the bottom of the beaker. Fill a very clean test tube with cold water so that the level of the water in the test tube is the same as the level of water in the beaker when the test tube is placed in the beaker. Carefully place the thermometer in the beaker, then put the test tube in the beaker so the it is slanted up against the side of the beaker. Allow this to sit for ten minutes, stir gently inside the beaker several times. This is the opportunity to explain to the students the proper use of a thermometer and how to read the temperature. Explain that there are two different scales for recording temperature, depending on where you are in the world. During this time the students should record observations on their lab sheet and take turns stirring. Students can also predict what will happen. At the end of ten minutes, take the thermometer out and record the temperature

on the lab sheet in the table. Remove the test tube and immediately drop a small piece of crushed ice into the test tube. Record these observations in the table. Empty the test tube and repeat the test tube steps again.

9. Target Observations:

- In order for water to freeze, there must be a specific particle present on which the can crystallize.
- The water in the beaker should be below freezing after 10 minutes.
- When the piece of ice was dropped into the test tube, the top portion of the water immediately freezes.
- If the test tube was not clean, the water would have frozen before the piece of ice was added. Particles could act as ice crystals to start the crystallization process.

10. Target Model:

- The two conditions required for hail to form are that the water needs to be super cooled and there needs to be something that the ice can crystallize on.