

JSD 3D Learning Activity Template

Grade: 6th

Title: Effect of Cold Air Meeting Warm Air—Lake Effect Precipitation

Utah Science with Engineering Education Standard (SEEd): Develop and use a model to show how unequal heating of the Earth's systems causes patterns of atmospheric and oceanic circulation that determine regional climates. Emphasize how warm water and air move from the equator to the poles. Examples of modes could include Utah regional weather patterns such as lake-effect snow and wintertime temperature inversions.

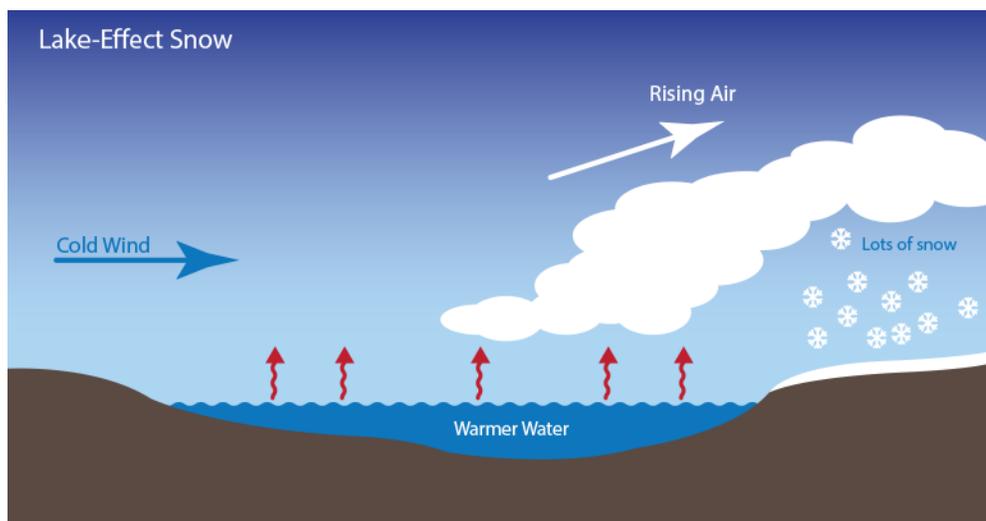
Key crosscutting concept(s) (CCC): Systems and Patterns

Key science and engineering practice(s) (SEP): Develop and Use a Model

Materials: Clear, plastic food carry-home container with a clear lid; Plaster of Paris; ice; sandwich Baggie; warm water; Exacto Knife, meat thermometer

Time: 2 days; 50 minutes each

Teacher background, key content information and hints:



<https://weather.com/science/weather-explainers/news/lake-effect-snow-great-lakes-explainer>

<http://scijinks.gov/lake-snow/>

Lake-effect rain or snow is a weather phenomenon created when cold, dry air picks up moisture and heat by passing over a relatively warmer lake, such as one of the Great Lakes or the Great Salt Lake. The greater the temperature difference the more water the air will take in. This warmer, wetter air rises and cools as it moves away from the lake over the land. When it cools over the land, it dumps all that moisture on the ground. If it is cold enough, that moisture becomes snow. The most likely time of year to get organized lake-effect snow bands is from late fall into early winter when lake temperatures are at their warmest, relative to the colder air spilling over them. Once the lakes freeze over, or the lake gets cold, the moisture and heat source is lost and lake-effect snow has a very hard time developing.

Prior knowledge that students need:

Students need to know the water cycle process and words, to read a thermometer, and

Learning Activity Plan

These three aspects of a lesson should be identified in your learning activity.

Gathering:

Students will ask questions as to why after a snow storm over the Wasatch Front that even when the storm has passed, why does land to the east of the Great Salt Lake and the Wasatch Mountains get more snow? Students will build a model to show why this happens. They will gather information to explain what happens.

Reasoning:

Students will analyze the data collected and construct an explanation and develop an argument to show what happens when cold air flows over a warm body of water.

Communicating:

Students will communicate their findings and present an argument from the evidence why this happened.

Phenomenon: As cold air passes over a large warm body of water, it later precipitates on the land in the direction the air is blowing.

Learning Activity:

1. Talk to the students about the lake-effect phenomenon. During the fall and beginning of winter when a low-pressure air mass passes over the Wasatch Front, it will drop a lot of snow. When the low-pressure air mass passes over and the air is still cold and the cold wind is blowing over the Great Salt Lake, it will produce moisture in the air and move over land and then rain or snow on the land the wind is blowing over.
2. With a clear, larger take-home container with a lid, the students will use Plaster of Paris, warm water, and ice to create a model to show how this phenomenon happens.
3. The students will use the Plaster of Paris to create a land mass of sorts (flat, hilly, slope or mountain) with in one-half of the container. The other half will be where warm water can be to represent a lake or ocean by the mountain.
4. When it is dry the next day, the students will develop a model and develop their own experiment by using ice and water to show how this phenomenon works.
5. The students can use different temperatures of water, weigh out different amounts of ice to produces the warm and cold air.

Assessment of student learning

The teacher will accept any model that shows how the lake effect works. The students will need to have data they have collected to explain their phenomenon and how it works. They need to use words that have to do with the water cycle. They will develop an argument with their data to show how the lake effect works.

Student Sheet

Title: Lake Effect Precipitation

Introduction: Phenomenon: When cold air is blown over a large, warm lake, the cold air that finally reaches the land will receive rain or snow.

Explanation: Lake-effect rain or snow is a weather phenomenon created when cold, dry air picks up moisture and heat by passing over a relatively warmer lake, such as one of the Great Lakes or the Great Salt Lake. The greater the temperature difference the more water the air will take in. This warmer, wetter air rises and cools as it moves away from the lake over the land. When it cools over the land, it dumps all that moisture on the ground. If it is cold enough, that moisture becomes snow. The most likely time of year to get organized lake-effect snow bands is from late fall into early winter when lake temperatures are at their warmest, relative to the colder air spilling over them. Once the lakes freeze over, or the lake gets cold, the moisture and heat source is lost and lake-effect snow has a very hard time developing.

Materials:

Clear, plastic food carry-home container with a clear lid; Plaster of Paris; ice; sandwich baggies; warm water; 2 or 3 meat thermometers

Procedures:

1. You are to develop and use a model to show the weather pattern of lake-effect precipitation.
2. This will take 2 days.
 - a. One day to make your land of sorts (flat, sloping, hilly, hills, or mountain) in half of the tray. (The other half will be the bottom of the tray for the water.)
 - b. One day for the experiment showing lake-effect precipitation.
3. With the materials that have been given to you, design ways to put these materials together to cause lake-effect precipitation. Decide on a final design. If you need anything of the plastic tray cut, the teacher will make the slit in the plastic and then the student can finish by cutting it out with scissors.
4. Day 1: build the land with the Plaster of Paris.
5. Day 2: Set up the experiment with the water, ice, baggies, and thermometer.
6. Begin the experiment. Record data of anything that you can observe for about 45 minutes. Think of creative ways for obtaining data.

Data tables or graphs:

Design a table with your data and then create graphs.

Analysis:

Answer these questions:

1. What did you notice during your experiment about the water in the lake?
2. What did you notice during your experiment about the purpose of the ice?
3. What did you notice during the experiment about where the water fell?

4. What did you notice during the experiment about the temperature of the air in different places?
5. Explain how the temperatures of the thermometers in different places were significant to the outcome of the experiment.
6. Explain how this model shows how the lake-effect precipitation works.
7. Explain why this is a pattern.
8. Explain how meteorologists can predict that the lake-effect precipitation will happen.

Conclusion:

Present to the class your argument as to how the lake-effect precipitation works according to your model using your data and graphs.