



Glaciers

Giant mountains of ice! Create glacier goo that models glacial movement and explore how the greenhouse effect warms Earth's atmosphere.

TEKS:

SCI 8.10: The student knows that climatic interactions exist among Earth, ocean, and weather systems.

SCI 8.11 B: The student is expected to explore how short- and long-term environmental changes affect organisms and traits in subsequent populations.

SCI 8.11 C: The student expected to recognize human dependence on ocean systems and explain how human activities such as runoff, artificial reefs, or use of resources have modified these systems.

Materials:

- Books, bins, blocks, or similar to elevate the ramp at a 45-degree angle
- Cooking spray
- 1 cup warm water
- 1.5 cups warm water
- 2 cups white glue
- 8 drops blue food coloring
- Large mixing bowl
- Large piece of cardboard (at least 12" x 15") to be used as a ramp
- Mixing spoon
- Protractor
- Sandpaper
- Sharpie
- 2 small mixing bowls or cups
- Stopwatch
- 4 tsp Borax powder

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How To:

1. Stir together 1.5 cups warm water, 2 cups of glue, and 8 drops of blue food coloring in a small mixing bowl or cup.
2. In a second mixing bowl or cup, stir together 1 cup warm water and 4 teaspoons of Borax powder until the Borax is dissolved.
3. Combine the contents of both cups in a mixing bowl and stir until a glob forms. Knead the mixture for 2-3 minutes until all of the water is incorporated. This is your "glacier goo."
4. Use a Sharpie to draw a line ~3 inches from the bottom of the large piece of cardboard.
5. Use books, bins, or blocks to create a ramp with the cardboard that is approximately at a 45-degree angle, with the line you drew at the bottom of the ramp.
6. Place your glacier goo at the top of the cardboard ramp and use a stopwatch to time how long it takes for the glacier goo to reach the line that you drew at the bottom of the ramp.
7. Next, modify your ramp and record the time it takes your glacier goo to reach the line in each of the following conditions:
 - o Steeper ramp: use extra books, bins, or blocks so that your ramp is at a steeper angle. This represents a steeper landscape/terrain.
 - o Cover the ramp in sandpaper. This represents a rocky/rough terrain.
 - o Cover the ramp in a thin layer of cooking spray. This represents a surface with lots of glacier melt/water.
8. Did your glacier goo move differently on your modified ramps? Read through the STEM Connection below to learn more about glacial movement!

STEM Explanation:

The glacier goo you created is designed to mimic the movement of real glaciers! Glaciers are massive bodies of ice that form in areas that get lots of snow. As the snow accumulates over time, it gets super heavy. As the weight of snow builds, gravity begins to cause glaciers to flow outwards and downwards under the pressure of their own weight. Because glaciers can get to be so gigantic, when they move, they can change the surface of the Earth. As they move, glaciers scrape against rocks and carve out valleys. Many beautiful landscapes, including lakes, have been shaped by moving glaciers!

You might have noticed that the ramp with a higher angle and cooking spray caused the glacier goo to move more quickly, while the ramp with the sandpaper caused the glacier goo to move more slowly. The movement of glaciers can also depend on climate conditions! If snow accumulation is greater than glacier melt, glaciers grow! However, if glacier melt outweighs snow accumulation, the glacier begins to shrink, or retreat. When glaciers and sea ice melt, sea levels rise, and this can cause a variety of effects. Higher sea levels can cause coastlines to erode, wetlands and coastal cities to flood, and a loss of habitat for fish, birds, and plants.

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Read below for some more glacier trivia!

- **What is the difference between a glacier and an iceberg?** Glaciers cover approximately 10% of Earth's surface and are made of ice. Glaciers can range in size from the size of a football field to more than 100 miles! Icebergs are small pieces of glaciers that break off and float in the ocean.
- Glacier formation relies on compacted snowfall. Because of this, some of our largest glaciers (like the ones that are 100 miles long) are also *super* old. The oldest glaciers in Antarctica may be almost one million years old!
- **If glaciers have been around for millions of years (34 million years, to be exact), why is almost all of the ice in glaciers less than 100 years old?** Glaciers are always on the move! Glaciers have existed for millions of years, but their flow causes them to move the entire length of the glacier in much less time... normally just 100 years or so! This can be kind of confusing, so think of it this way: it takes a few weeks for water to travel the full length of the Mississippi river, but the Mississippi River itself has been around for thousands of years. Same with glaciers and glacier ice: it takes only 100 years for the ice to move the entire length of the glacier, but the glacier itself is millions of years old (new snow adds on to the glacier to replace the ice that moves away).

Career Connection:

Glaciologists are scientists who study snow and ice. A glaciologist's research involves collecting ice, studying it, and designing experiments. This work relates to weather and climate change, to Earth sciences and exploration, and to the research of Earth's history.

Resources:

<https://study.com/academy/lesson/glacier-movement-definition-process.html>

<https://nsidc.org/cryosphere/glaciers/questions/move.html>

<https://nsidc.org/cryosphere/glaciers/life-glacier.html>

<https://climatekids.nasa.gov/greenhouse-effect/>

https://www.usgs.gov/faqs/how-old-glacier-ice?qt-news_science_products=0#qt-news_science_products

<https://www.sciencebuddies.org/science-fair-projects/science-fair/variables>

<https://www.epa.gov/ghgemissions/overview-greenhouse-gases>

<https://www.nationalgeographic.com/environment/global-warming/sea-level-rise/>

<https://www.livescience.com/7992-top-10-craziest-solutions-global-warming.html>

<https://www.cbsnews.com/news/planting-a-trillion-trees-could-be-the-most-effective-solution-to-climate-change/>

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