



**Grades  
3-5**

# Glacier Gak

Teacher Guide



**Seaworthy STEM™ in a Box Series**



# Glacier Gak

## Teacher Guide for 3–5



### Seaworthy STEM™ in a Box Educator Kit description:

**Seaworthy STEM™ in a Box** activities are a Navy initiative to provide enhanced Naval-relevant, standards aligned, hands-on activities to K-12 teachers and students. Components of this program include, curated sets of classroom activities that aim to build deep conceptual understanding in Naval-relevant content areas. The kits also includes comprehensive lesson plans, material lists, scientific background information, STEM related literacy books, and student activity sheets. The **Seaworthy STEM™ in a Box** program is designed to support teachers as they select content, acquire materials, and implement more hands-on STEM activities in their classrooms. Increasing student access to hands-on STEM activities, also increases awareness of STEM career paths, engage students in STEM, and support development of student's abilities in STEM content.

The **Seaworthy STEM™ in a Box** kits were designed to guide students through the scientific inquiry-based theory and the engineering design process. The content and Naval-relevant activities are aligned with the Next Generation Science Standards. The topics and content covered within the lessons are connected and scaffolded based on distinct grade bands (K-2nd, 3rd-5th, 6th-8th, and 9th-12th).

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# Lesson Title: Glacier Gak



## Time:

1 Class period (45–60 minutes)

## Student Objectives:



Students will gain knowledge about glaciers and the importance of research on the formation of glaciers. Students will make a kitchen recipe of gak and place the gak on a downward slope to recreate the formation of glaciers. Students will gain visual observations of how glaciers move.

## Lesson Overview:

Students will learn about glaciers and use this background information to recreate a glacier using household items. Students will be in teams to make glacier gak from water, color dye, and cornstarch. Students will then layer the two colors, (Blue & white) by stacking them on top creating a pattern. The gak will slowly move down the slope and this recreation will demonstrate how glaciers form. The final product will be layers of white and blue gak spreading out over the foil pan. This represents the hundreds of years of annual precipitation that has layered on top of each other within the formed glacier.

## Next Gen Science Standards:

3-ESS2-2  
3-LS4-4  
3-LS4-1  
4-ESS2-1  
5-PS1-3  
5-PS1-4



## Notes

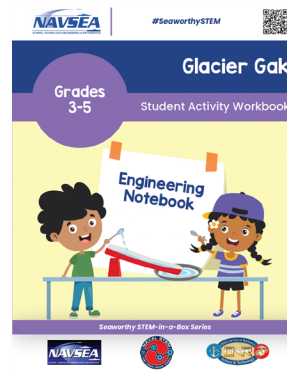


### Materials and Equipment List (Per Team):

- ✓ Washable paint, (blue)
- ✓ Foil pan
- ✓ Scissors
- ✓ Tape
- ✓ 2 bowls
- ✓ 2 plastic cups
- ✓ ½ cup of Water
- ✓ 1 cup of Corn starch
- ✓ 2 spoons
- ✓ Stopwatch
- ✓ Camera

### Student Activity Sheets/Handouts:

Glacier Gak Student Activity Workbook



#### Warning!

This lesson could get messy! For best results, have students use their hands to make the gak!"

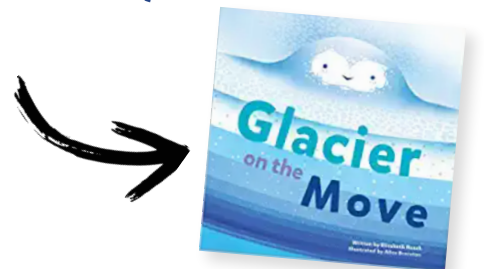


### Technology Tools:

- Stopwatch
- Camera (Extension Activity)
  - Have students use cameras to take photos or video of their glacier going down the slope.

### Suggested STEM Related Literacy Book:

*Glacier on the Move*  
by Elizabeth Rusch



## Procedure:

- 1 The teacher will start the lesson by going over basic science content about glaciers. (The teacher will introduce the lesson with whole group questions to create classroom dialogue).
- 2 The teacher will then model how the students should construct their glacier.
- 3 Students will be given materials and split into small groups.



- 4 Give students 10–15 minutes to make the kitchen gak. Use the following recipe and divide half of the finished gak into one bowl. Then pour the remaining gak into another bowl. Finally, add the blue paint to only 1 bowl to create a blue gak. Each team should have 1 bowl of blue gak and 1 bowl of white gak.

### Gak Recipe per group:

1 cup corn starch mix with  $\frac{1}{2}$  cup of water.

Add 1-2 drops of washable blue paint to create desired color.

- 5 Have students set aside the gak, and create a slope using two plastic cups that are cut and taped together to build a slope. Place the slope at a tilted incline angle. Place the bottom of the slope inside the center of the foil pan. Use tape to secure the bottom and top of the slope.

**Teams can use other classroom materials to create an incline slope.**



The teacher can guide students through the following questions:

“What is a glacier and where can you find one?”

“Do you need an incline plane or slope for a glacier to form? Examples?”

“Why do you think scientists would collect data and observe glaciers?”



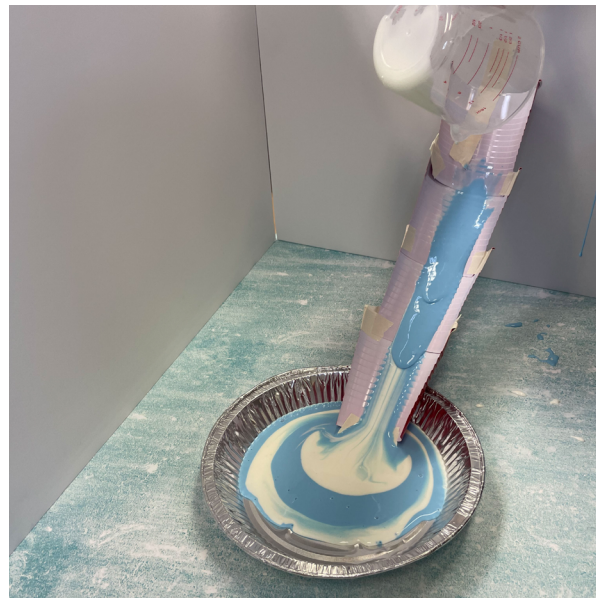
### Helpful tip:

To add another element to the design process, have students use inquiry learning to collaborate on the tilt of the incline plane.

- 6 The students should work together to create “layers” of ice crystals by pouring gak colors at the top of the slope. Start with the white gak. Have the students record the time it takes for the majority of the gak to flow down the ramp into the pan. Have them record their time in the student activity workbook.



- 7 Then the other teammates will pour blue gak directly above where the white gak was poured. Repeat this by pouring every other color to create a pattern of blue and white. Have the students record the time it takes for the majority of their 2nd gak mixture to flow down the ramp into the pan. Have them record their time in the student activity workbook.



#### Bonus:

Want to add an element of technology to this activity?! Have students take pictures of their glacier moving down the slope. Students can then make a timelapse with the photos they made.



**Helpful tip:** This is a great time to remind students that “pouring the gak” is similar to a yearly amount of precipitation falling onto the glacier. For example, a big pour would be similar to a year full of heavy rain or snowfall.



- 8 Have students observe how the glacier gak moves down the pipe. Have students collect observation notes on the glacier observation worksheet.
- 9 When the glacier is done moving down the slope, have students observe the “pooling” that has formed at the bottom of the slope. Students will observe that the gak colors do not blend but rather create rings.



- 10 Then have students help clean up their station.
- 11 To conclude this activity, create a whole group discussion using the following concluding questions.
  - A. “What did you observe about the movement of the gak?” (Slow or fast?)
  - B. “Do you think glaciers move at the same speed or form slower/faster?”

## Extension:

Make slime from Borax (A special kind of laundry detergent) and glue then compare its flow rate with the gak. This fun addition will encourage the class to do a comparative mathematical analysis involving different substances as well as providing an opportunity to learn more about polymers.

### Fun Fact!

Your students will be intrigued by the glacier gak they have created! This gak is a great representative of a polymer. Certain substances act like a liquid until pressure is applied. Then they appear to be a solid. Other great examples of polymers are slime or flubber!



### Slime Recipe:

Slime has two components: a borax and water solution and a glue, water, and food coloring solution. Prepare them separately:

1. Mix 1 teaspoon of borax in 1 cup of water. Stir until the borax is dissolved.
2. In a separate container, mix 1/2 cup (4 oz.) white glue with 1/2 cup water. Add food coloring, if desired.
3. Combine the two mixtures using a bowl and a spoon.

### Vocabulary Terms:

- **Atmosphere:** The layer of gas that surrounds Earth.
- **Atom:** The basic building block of matter.
- **Climate:** The weather found in a certain place over a long period of time.
- **Erosion:** Where land is worn away by different forces. These forces can be water, wind, and ice. It can change the shape and texture of mountains and many other things too.
- **Glacier:** A large area of thick ice that remains frozen from one year to the next. Glaciers also slowly flow over the land.
- **Landforms:** The natural features of the surface of Earth.
- **Molecules:** A molecule is two or more atoms joined (or "bonded") tightly together.
- **Polymer:** Very big molecules made up of many smaller molecules layered together in a repeating pattern.

### Scientific Background:

Glaciers are found throughout the world but mostly found around the poles of the Earth. A glacier usually starts to form where snow remains in the same area year-round. A glacier is a large mass formed from ice, rock, snow, and water that has accumulated over time from moving down a slope, for example within a valley or land that has a downward slope towards a body of water. A glacier is a body of dense ice that is constantly moving under its own mass. Glaciers are a

great resource for scientists to research and collect data on the Earth's formation from over thousands of years ago. Scientists collect data from drilling into the glacier and collecting samples of the glacier. Scientists then examine the ice crystal formation and minerals within the ice sample. Gathering this data can inform scientists what the Earth's climate was like during the time period a glacier was formed. A glacier's formation can take as long as 100 to 150 years to be fully formed. Glaciers that are located around the poles tend to stay in contact due to the climate staying at a freezing point. Many glaciers in the Antarctic have dated to be millions of years old! The data collected from these glaciers help scientists discover the climate during this primitive era on Earth.

## STEM Related Career:

- Glaciologist
- Environmental Scientist
- Geologist

## Reference Photos:



### Fun Fact!

Did you know that Sailors on the Navy's polar research have found enormous Antarctic glaciers vanishing at an alarming rate? For example, the Sunshine Glacier has shrunk by one seventh in 20 years - an area the size of more than 130 football pitches has melted away. The Navy crew members have recorded the worrying changes when annually visiting the glacier on Coronation Island.





### Fun Fact!

Scientists are able to take test samples of a glacier by drilling into the core using a machine called an ice corer. The ice corer is designed very similar to a drill. It has a thread which runs around the outside of the hollow central tube which, when turned, draws the corner into the ground. The sample is forced into the central chamber so that once the ice corer is pulled back up from the ground, the sample can be removed ready for storage and the journey home.

### Fun Fact!

Did you know that glaciers are similar to trees? As ice in the glacier lays down in successive layers from previous years, the glacier is similar to the same formation in tree rings. These layers record the weather patterns and circulation as Earth cycles through colder and warmer periods. Just like the inside of a tree, glacier samples look very similar and tell us the history of that glacier's life!











The Seaworthy STEM™ in a Box curricula was developed through collaborative efforts of a team of individuals at the Naval Surface Warfare Center Carderock Division and Albert Einstein Distinguished Educator Fellows via an inter-agency agreement with the U.S. Department of Energy for the Albert Einstein Distinguished Educator Fellowship (AEF) Program. We are grateful to the following Content Specialists who contributed their knowledge and expertise by researching and writing on selected topics: Suzanne Otto, Stephanie Klixbull, and Thomas Jenkins. We'd also like to acknowledge the contributions of AEF participant Ms. Deborah Reynolds, the inaugural AEF Educator at Carderock that helped inspire the design of Seaworthy STEM™ in a Box content. With the help of Albert Einstein Fellow, Melissa Thompson, and Carderock Outreach Specialist, Ashlee Floyd, special additions to the curriculum such as career portfolios, workforce trading cards, and in-house short story publications are included that reflect the diversity of NAVSEA Sites.

It is the goal of the SeaWorthy Curriculum to embrace NAVSEA technologies from sites nationwide to empower the youth of our nation to pursue STEM-centric career pathways. The views and opinions of the Content Specialists expressed herein do not necessarily state or reflect those of the AEF Program, the U.S. Department of Energy, or the U.S. Government. Reference herein to any specific commercial product, process, or service by trade name, trademark, service mark, manufacturer, or otherwise does not constitute or imply endorsement, recommendation, or favoring by the AEF Program, the U.S. Department of Energy, or the U.S. Government.



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