

Irene Florio

Lesson Plan: Glaciers and Global Sea Rise

Background:

Global climate change is becoming a threat to our current way of life on Earth. One consequence of climate change is the melting of ice caps, glaciers, and sea ice, including polar ice in Greenland and Antarctica. Substantial melt of these massive glaciers will cause a rise in sea level along coastlines throughout the globe. This activity will explore how melting ice impacts sea level. Water is an unusual liquid because it expands when it freezes. This expansion occurs at the point that freezing begins (around 4°C). At this temperature water molecules arrange themselves into a crystal lattice structure that is significantly **less dense** than the liquid form. Because of this **decrease in density** at the point of freezing, ice always floats on water. One of the greatest threats to the environment from Global Warming is the effect that an increased global temperature will have on sea level. Many scientists believe that low-lying countries, such as Bangladesh will be flooded because of an increase in the Earth's sea level as a result of melting ice. This activity looks at what effect melting sea ice, or icebergs will have on the sea level. In Melting Sheet Ice, you will investigate what effect melting land ice will have on the sea level.

Objectives:

In this lesson, students will:

1. Observe that ice formations on land will cause sea levels to rise and ice formations on water will not cause a rise in sea level when they melt.
2. Learn that ice is less dense than water.
3. Learn that ice displaces water equal to the mass of the ice.

Vocabulary:

Global climate change-
Greenhouse gases-
Density
Displacement
Climate
Global warming
Thermal Expansion

Materials:

2 Large bowls
Ice cubes (colored blue)
Cold Water
Food coloring
Ruler
12 ice cubes
Clay

Method: ICEBERGS

****When making the ice cubes add blue food coloring to represent then freshwater****

1. Place the ice cubes in bottom of the bowl and place the bowl out into the sunlight (or under a lamp for warmth)
2. Carefully fill the bowl with cold water until the water is level with the top of the bowl. Add 3 tablespoons of salt to the water. (Salinity)
3. Measure the amount of water in the bowl
4. Note the amount of ice floating in the bowl (add ice cubes so that water reaches the rim of the bowl, but does not overflow)
4. Check the water level and the amount of ice remaining every ten minutes. Record your answers.

Use the chart below to fill in your answers: ICE FORMATIONS ON THE SEA

	START	5 MIN	10MIN	15 MIN	20 MIN	25 MIN	30 MIN
WATER LEVEL							
AMOUNT OF ICE							

Method: GLACIERS

1. Add a heap of clay into one side of the bowl.
2. Form the clay to represent land rising out of the ocean. Form a level place at the highest part of the clay. Make rivers on the land if you like.
3. Place as many ice cubes as possible on the level place formed with the clay
4. Pour water into the bowl with the ice resting on the clay (be careful not to disturb the ice cubes) also add 3 tablespoons of salt to the water for salinity effect.
5. Record initial measurements of water height (in mm) using a ruler draw a line in the clay where the water height begins.
6. Place in sunlight or under a lamp for warmth.
7. Take measurements every 5 minutes and record the results on their worksheets. You can also leave the setup for several hours or overnight and just record the final measurement after the ice has melted.

Use the chart below to fill in your answers: ICE FORMATIONS ON LAND

	START	5 MIN	10MIN	15 MIN	20 MIN	25 MIN	30 MIN
WATER LEVEL							
AMOUNT OF ICE							

Conclusion: Answer in Complete sentences.

1. Did the water level in the bowls change as the ice melted?
2. How can you explain your observation in question 1?
3. Allow the ice to melt and watch where the fresh water (blue color) accumulates.
Where does it accumulate?
4. In your own word: why did the blue colored water float on the clear water?
5. If global sea level rises as it has been predicted, what will be the effects on human life and property?
6. How are glaciers, climate, and sea level rise possibly related?

Graph your results: Can be done for homework

Lab Report: Glaciers and Global Sea Rise

Teacher Name: **Ms. Florio**

Student Name: _____

CATEGORY	4	3	2	1
Calculations	All calculations are shown and the results are correct and labeled appropriately.	Some calculations are shown and the results are correct and labeled appropriately.	Some calculations are shown and the results labeled appropriately.	No calculations are shown OR results are inaccurate or mislabeled.
Conclusion	Conclusion includes whether the findings supported the hypothesis, possible sources of error, and what was learned from the experiment.	Conclusion includes whether the findings supported the hypothesis and what was learned from the experiment.	Conclusion includes what was learned from the experiment.	No conclusion was included in the report OR shows little effort and reflection.
Analysis	The relationship between the variables is discussed and trends/patterns logically analyzed. Predictions are made about what might happen if part of the lab were changed or how the experimental design could be changed.	The relationship between the variables is discussed and trends/patterns logically analyzed.	The relationship between the variables is discussed but no patterns, trends or predictions are made based on the data.	The relationship between the variables is not discussed.
Data	Professional looking and accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in written form, but no graphs or tables are presented.	Data are not shown OR are inaccurate.

New York State Standards:

Science Standard 1:

Intermediate

SCIENTIFIC INQUIRY:

Key idea 1: The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing creative process.

- ❖ Explanation is rated on clarity, plausibility, and appropriateness for study using research methods

Standard 4-Science

Intermediate

PHYSICAL SETTING:

Key idea 2: Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

- ❖ Graph sea level rise on land and sea

Key idea 4: Energy exists in many forms, and when these forms change energy is conserved.

- ❖ Design and construct devices to transform/transfer energy
- ❖ Understand displacement

LIVING ENVIRONMENT:

Key idea 7: Human decisions and activities have had a profound impact on the physical and living environment.

- ❖ Investigate the environment affected by human actions and natural causes

Mathematics, Science, and Technology

Standard 1: Analysis, Inquiry, and Design

Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

Standard 2: Information Systems

Students will access, generate, process, and transfer information using appropriate technologies.

Standard 3: Mathematics

Students will understand mathematics and become mathematically confident by communicating and reasoning mathematically, by applying mathematics in real-world settings, and by solving problems through the integrated study of number systems, geometry, algebra, data analysis, probability, and trigonometry.

Standard 4: Science

Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Standard 5: Technology

Students will apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs.

Standard 6: Interconnectedness: Common Themes

Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.

Standard 7: Interdisciplinary Problem Solving

Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.