



NSDL/NSTA Web Seminar

**Beyond Penguins and Polar Bears: Integrating
Science and Literacy in the K-5 Classroom--
Physical Science from the Poles**



Wednesday, October 29, 2008

Today's NSDL Experts



Jessica Fries-Gaither, *Beyond Penguins and Polar Bears* Project Director and Elementary Resource Specialist, Ohio State University



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<http://beyondpenguins.nsd.org>



Overview of Presentation

1. Physical properties of ice
2. Geography of ice
3. Teaching strategies and K-5 resources
from *Beyond Penguins and Polar Bears*

<http://beyondpenguins.nsd.org>



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SCIENCE AND LITERACY

ACROSS THE CURRICULUM

IN THE FIELD: SCIENTISTS
AT WORK

POLAR NEWS AND NOTES



WATER, ICE, AND SNOW - ISSUE 5, AUGUST 2008

Did you know that the water cycle includes ice and snow? Every elementary student learns about this cycle, yet water storage in glaciers, ice sheets, and snow is often excluded. In this issue, we'll examine what the polar regions can teach us about the water cycle and the states and changes of matter. We'll trace the water cycle through the many forms of water, ice, and snow found in the polar regions and will highlight lessons that provide hands-on experiences with these forms. Science notebooks - permanent records of learning and tools for integrated literacy and science - are the literacy focus of the issue.

Photo: Icebergs in McMurdo Sound, off the coast of Antarctica. Photo courtesy of Kris Kuenning, National Science Foundation.

Today's presentation: Featuring material related to Issue 5: Water, Ice, and Snow, August 2008



<http://nsdl.org>





States of matter: Solid, Liquid, Gas



Photo by Chris Linder,
Woods Hole Oceanographic Institution

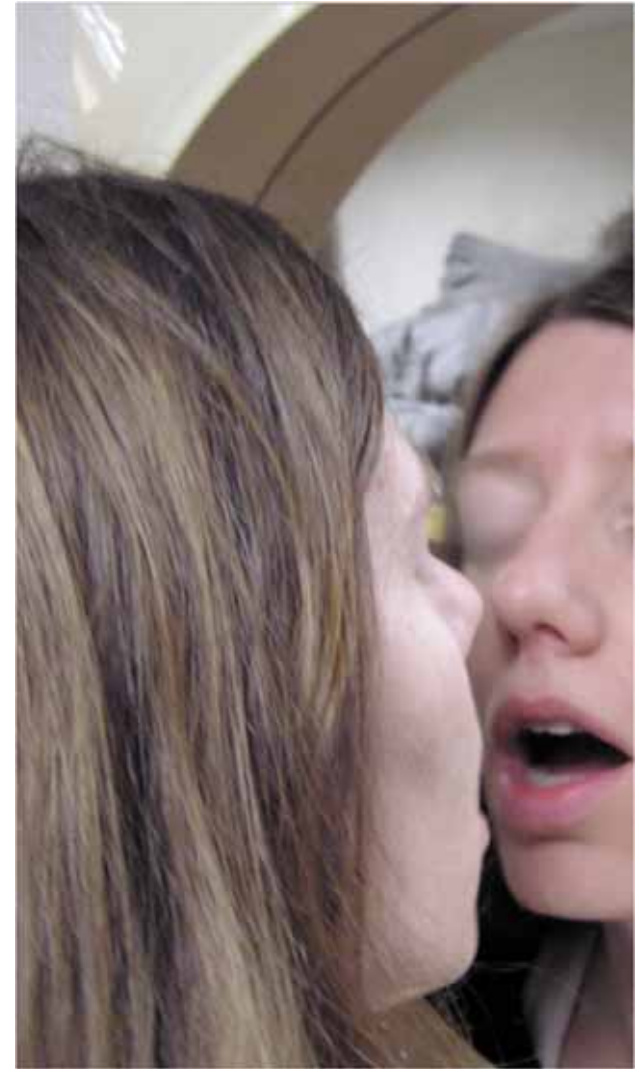
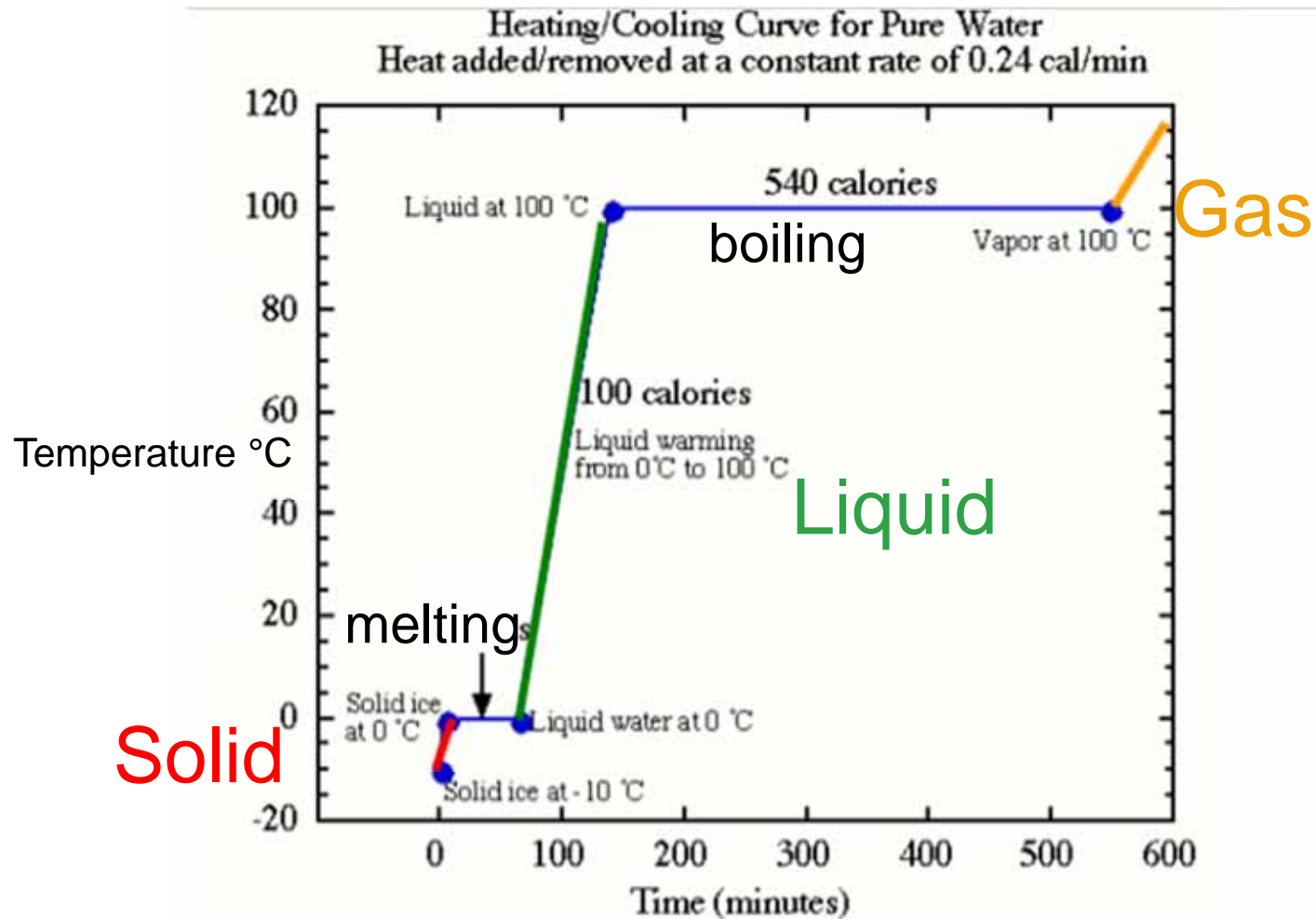


Photo by C. Landis,
Byrd Polar Research Center



Change in state (or phase) of water

Addition or loss of heat is required to change from one state to another.



http://www.geo.umn.edu/courses/1006/Fall00_night/H2O_heating_curve.JPG

States of matter

Stamp your answers.



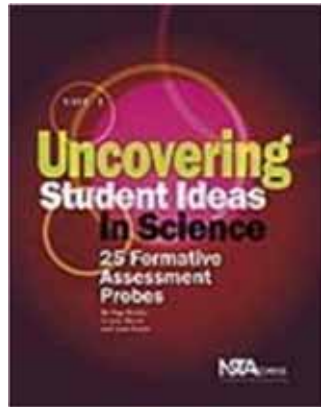
A change of state does not mean a change in mass.

True	False

Solids can only melt with heat.

True	False

Misconceptions: States and Changes of Matter



Formative Assessment: Mass conservation
“Ice Cubes in a Bag” (Vol. 1)



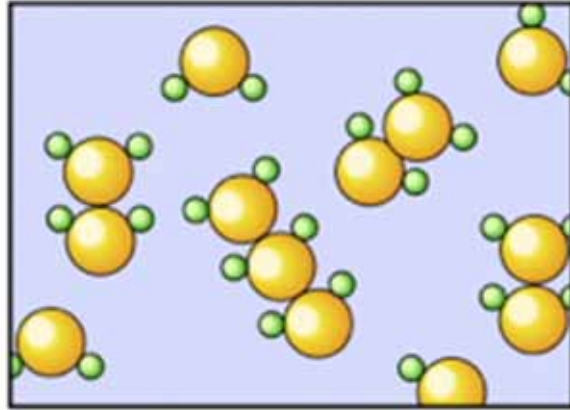
Blue Ice Melt:
Ice can melt with pressure.



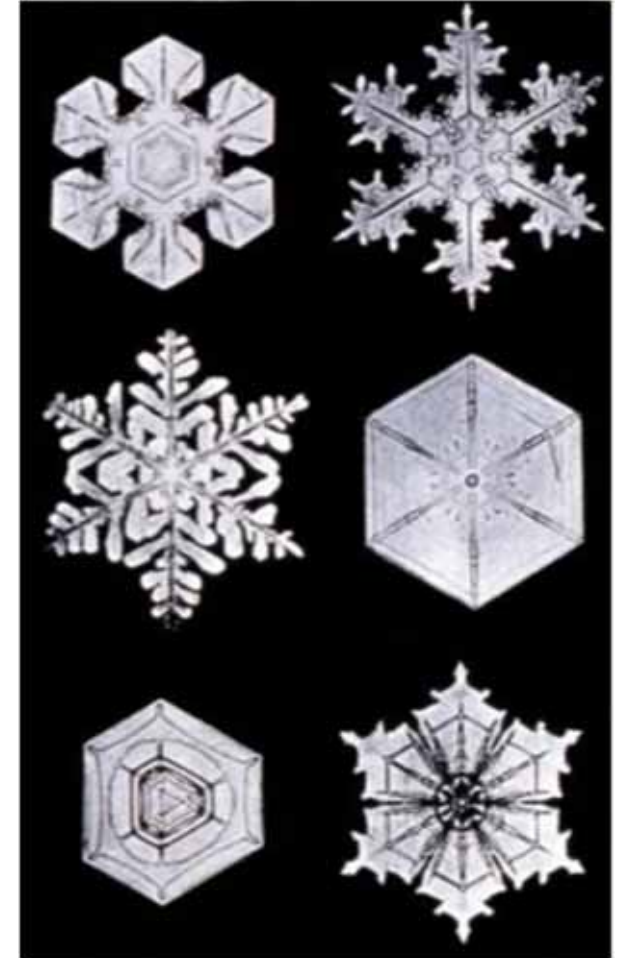
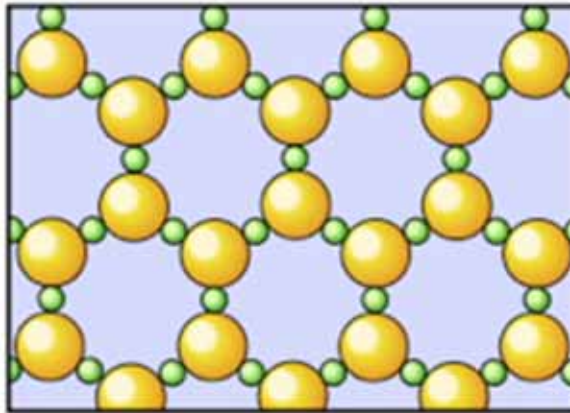
Admiring snowflakes



Liquid
water



Solid
water



<http://www.classzone.com>

Pidwirny, M. (2006). "Physical Properties of Water". *Fundamentals of Physical Geography, 2nd Edition*. Date viewed: October 16, 2008.
<http://www.physicalgeography.net/fundamentals/8a.html>



<http://nsdl.org>



Stamp your answer

Does the size of an ice cube affect the temperature at which it freezes?



Yes	No



Misconception: The more water there is to freeze, the lower the temperature is required to freeze it.



Formative Assessment: “Freezing Ice” (Vol. 2)

Instead: The temperature of the freezing point is independent of the amount of liquid.



Density is the mass per unit volume of a substance.



Buoyancy is the force of a liquid pushing up to keep something afloat.



Photo: www.dkimages.com



True or False: Stamp your answer

Water expands as it freezes because the molecules become larger.

True	False



Misconceptions about Density & Buoyancy

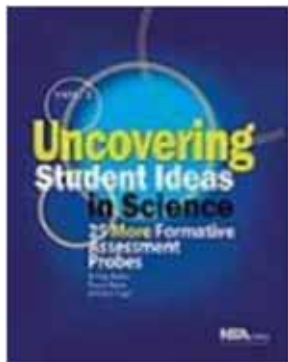


Floating or sinking is based on an object's weight.
Water expands as it freezes because the
molecules become larger.

Instead:

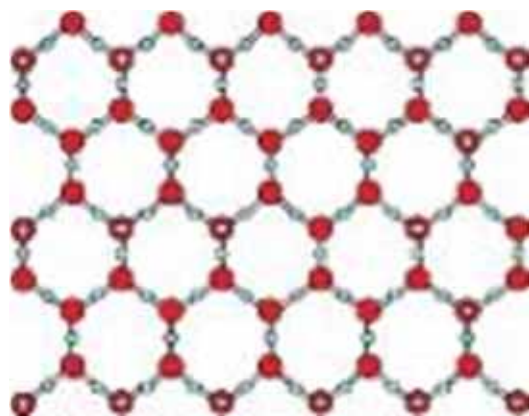
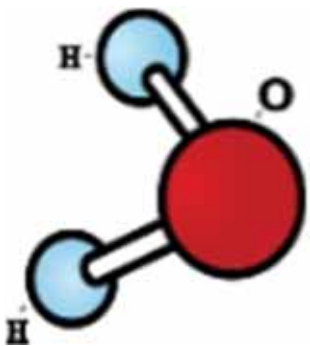
Floating or sinking is based on an object's
density.

Water expands as it freezes because the
molecules are locked into place in a crystalline
structure.



Formative Assessment: “Floating Logs” & “Floating High and Low” (Vol. 2)

Model and read about water and ice





Let's pause for
questions from
the audience....



Ice formation



Ice on land is usually from precipitation, unless it is freezing water that is present in saturated soil.



Ice forming on water develops at the liquid surface of the water...and therefore on the bottom of any ice layer at the surface.



Geography of Ice

Land-based ice:

- ice sheet
- ice field
- glacier
- ice stream



A glacier in the Transantarctic Mts.
<http://photolibrary.usap.gov/index2.htm>

Ice on/in the ocean:

- ice shelf
- ice floe
- sea ice
- iceberg



Ross Sea ice edge, 1957
<http://photolibrary.usap.gov/index2.htm>



Glaciers



Photo: Glenn Grant, NSF

Diagram: <http://www.answers.com/glacier>



Studying Ice Cores




Photo: Robert R Stewart, Texas A&M

<http://oceanworld.tamu.edu/resources/oceanography-book/evidenceforwarming.htm>

Ice Cores:

- Trap gases and wind blown materials
- Can show layering, especially dust layers in dry seasons
- Some date back to almost 800,000 years before present



Effects on sea level: Land ice vs. sea ice

Land-based ice is perched above sea level. If it melts, the water drains downward, potentially adding water into the ocean. The water that reaches the ocean will thereby raise sea level.



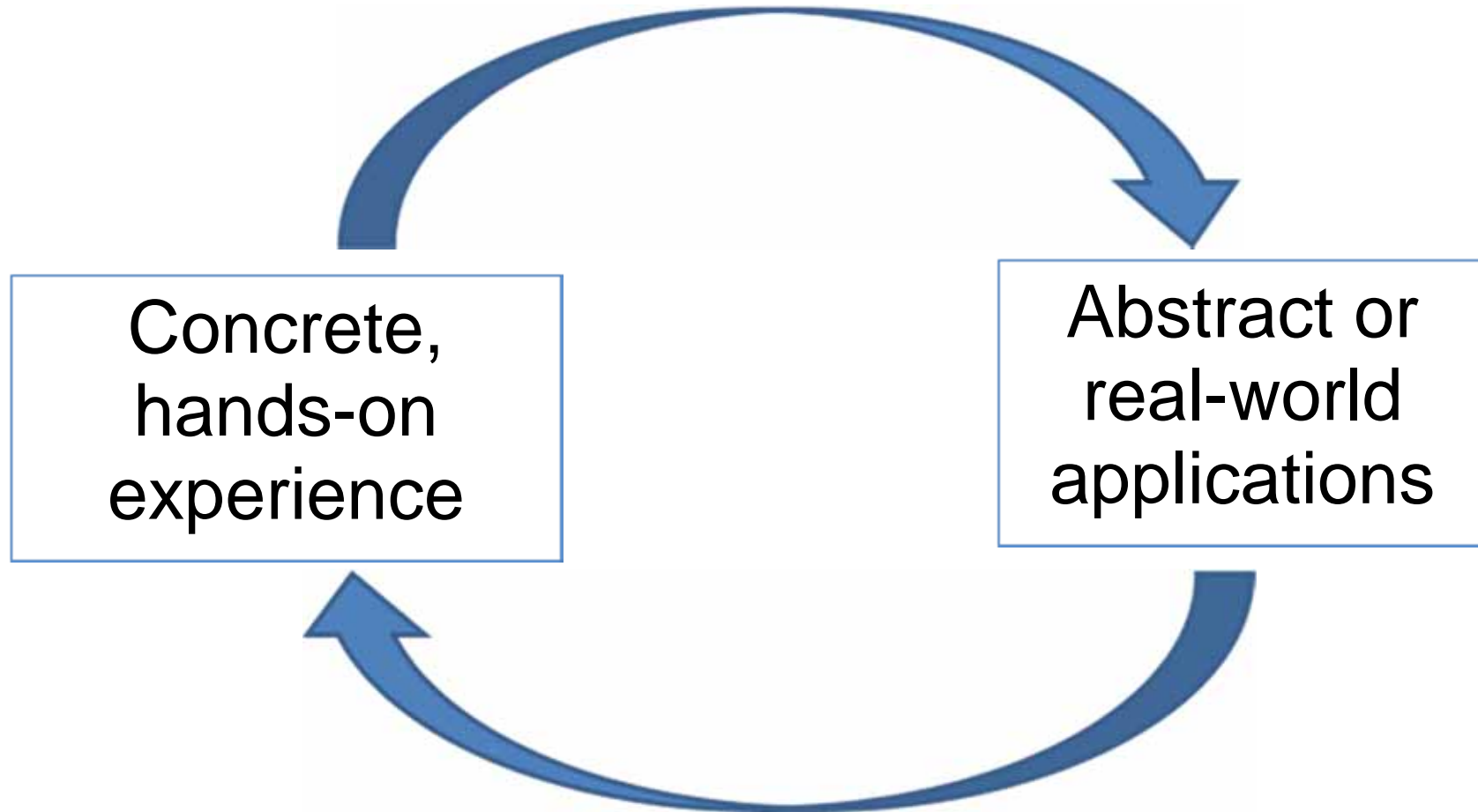
Photo: JasonBox, Byrd Polar Research Center



Photo: Zee Evans, NSF

Sea ice is already floating (displacing its mass) and it was formed from sea water. Melting of sea ice will not raise sea level appreciably.

Which comes first?

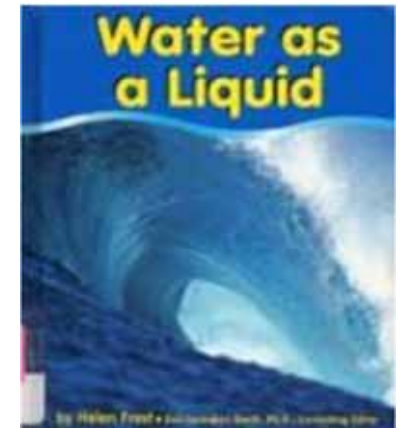
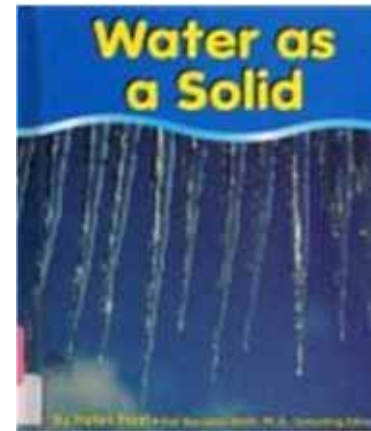


Stamp one of the boxes

Activities: States & Changes of Matter



Hands-on investigations
and content area reading

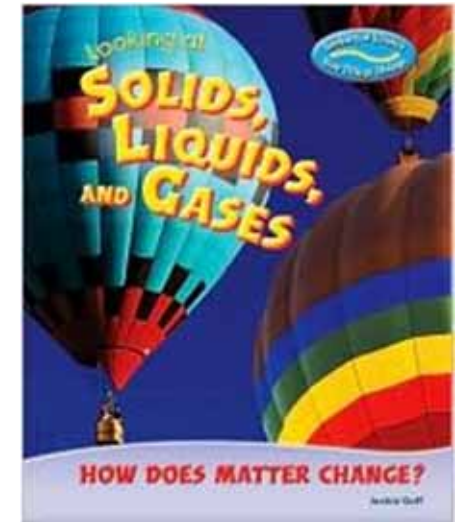


Water and Ice

Students in grades K-2 observe water as it changes states.

Heat Energy and Water

Students in grades 3-5 investigate heat's effect on water.



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Activities: States & Changes of Matter



Polar Connections:
glaciers, icebergs, sea ice

How Do Snowflakes Become Ice?

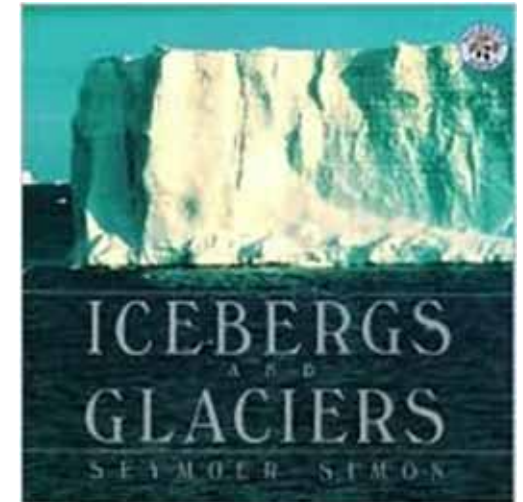
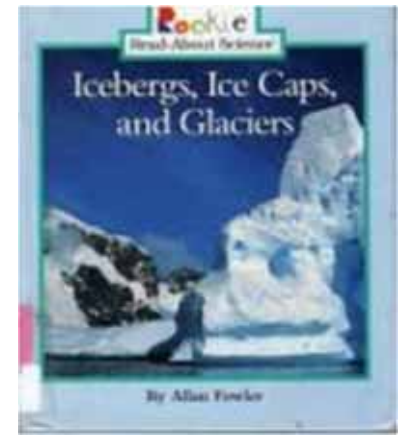
Model glacier formation with marshmallows.

Do It Yourself Iceberg Science

Create icebergs with film canisters.

Sea Ice Set

A collection of images and video.



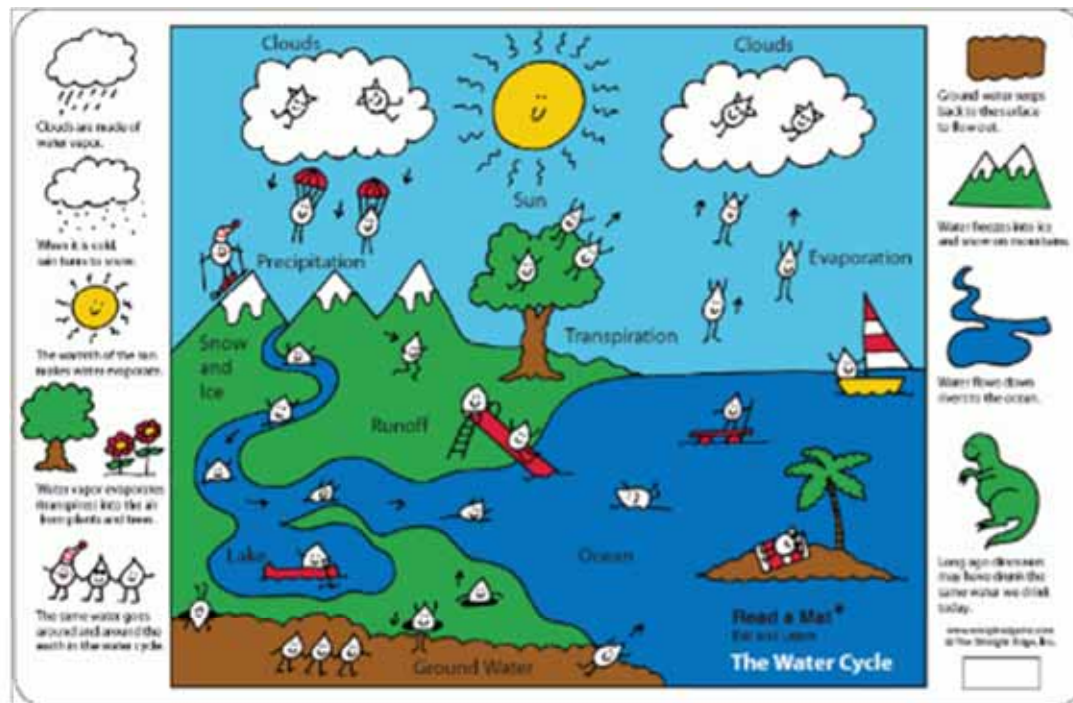
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Tie to the global Water Cycle

Don't forget about ice and snow!

Beyond Penguins and Polar Bears Issue 5
(August 2008): [Water, Ice, and Snow](#)



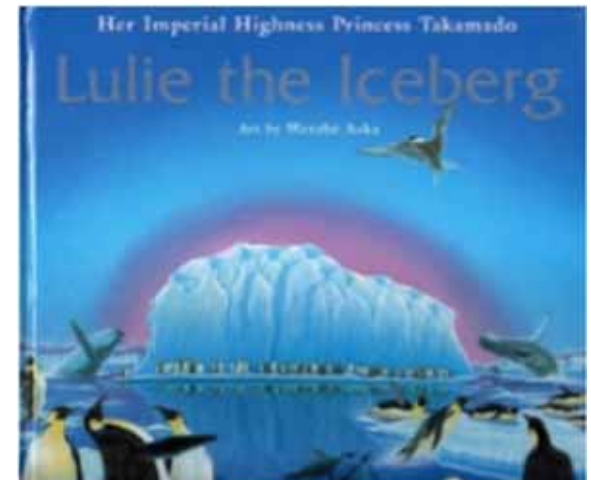
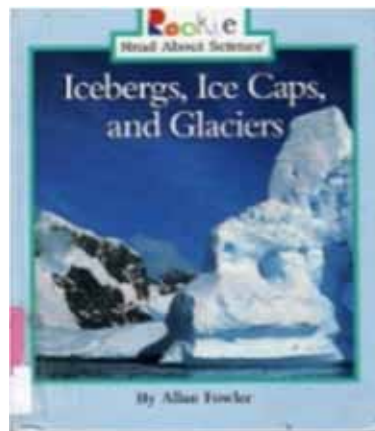
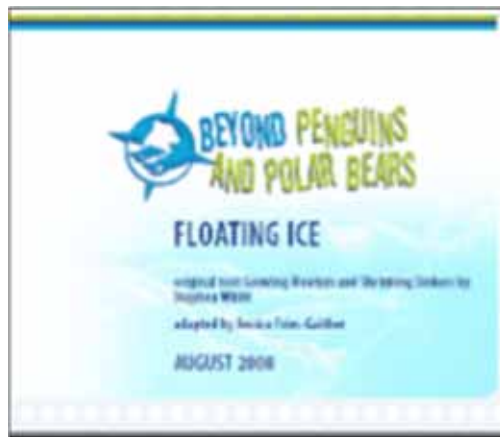
Density and Buoyancy: Grades K-2

Sink or Float?

Students determine whether objects sink or float in water. Include ice in various shapes and sizes!

Do It Yourself Iceberg Science

Create icebergs with film canisters, watch them float.



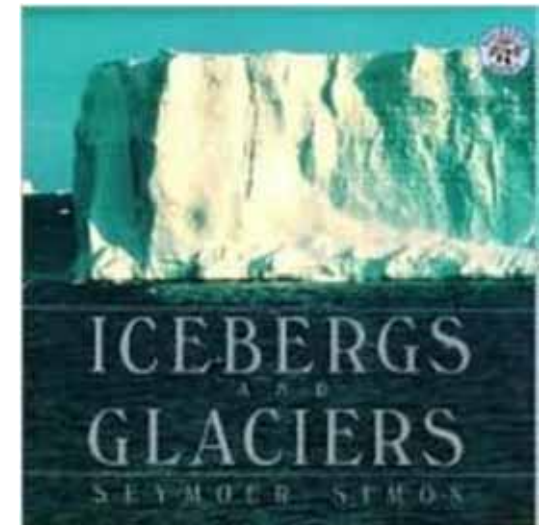
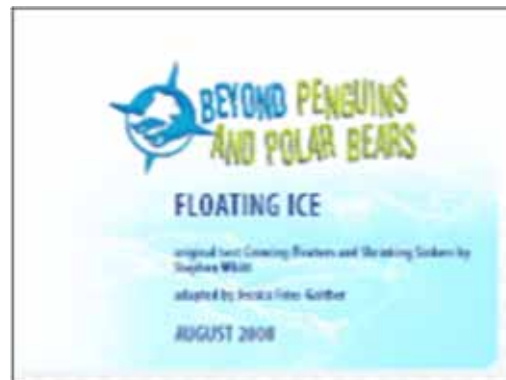
Density and Buoyancy: Grades 3-5

Water Molecule Pockets

Demonstrate liquid water's molecular structure with a discrepant event and a model.

The Magic Trick with Ice

A discrepant event – an ice cube floats in water but not rubbing alcohol.

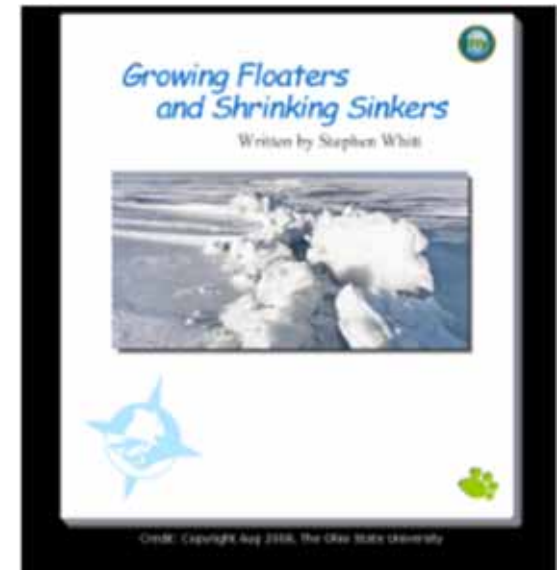
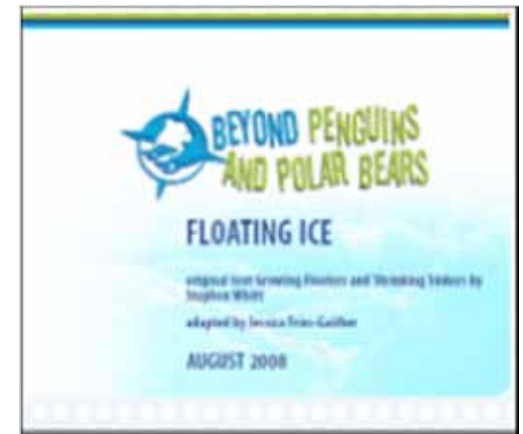


Nonfiction stories for students

Feature Story column of the magazine

Available at three grade levels (K-1, 2-3, and 4-5)

Available as text, illustrated book, and electronic book





Let's pause for
questions from
the audience....



Interested in learning more?



Beyond Penguins Web Seminar Series:
November 13th--Energy and the Polar
Environment



Beyond Penguins and Polar Bears Blog
[http://beyondpenguins.nsd.org/2008/10/29/
physical-science-from-the-poles/](http://beyondpenguins.nsd.org/2008/10/29/physical-science-from-the-poles/)



Beyond Penguins and Polar Bears,
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**THANK
YOU!**



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