NSDL/NSTA Web Seminar
Beyond Penguins and Polar Bears: Energy and the Polar Environment

Thursday, November 13, 2008
6:30 p.m. to 8:00 p.m. Eastern time
Agenda:

1. Introductions
2. Tech-help info
3. Web Seminar tools
4. Presentation
5. Evaluation
6. Chat with the presenters
Supporting the NSDL Presenting Team is…

For additional Tech-help call:

Elluminate Support,
1-866-388-8674 (Option 2)

Jeff Layman
Tech Support
NSTA
jlayman@nsta.org
703-312-9384

http://nsdl.org
We would like to know more about you…

http://nsdl.org
How many NSTA web seminars have you attended?

A. 1-3
B. 4-5
C. More than 5
D. More than 10
E. This is my first NSTA web seminar

Use the letters A-E located at the top left of your actual screen to answer the poll.
How many NSTA web seminars have you attended?

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Where are you now?

Note:
Alaska & Hawaii
Not to scale

www.50states.com
What grade level do you teach?

A. Elementary School, K-5.
B. Middle School, 6-8.
C. High School, 9-12.
D. I teach college students.
E. I am an Informal Educator.
NSDL/NSTA Web Seminar
Beyond Penguins and Polar Bears: Energy and the Polar Environment

Thursday, November 13, 2008
Today’s NSDL Experts

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

Dr. Carol Landis, Education Outreach Specialist, Byrd Polar Research Center, Ohio State University

http://beyondpenguins.nsdl.org
Overview of Presentation

1. Seasons, a refresher
2. Earth’s energy balance
3. Albedo & sea ice, a climate feedback
4. Teaching strategies and K-5 resources from *Beyond Penguins and Polar Bears*

http://nsdl.org
Featuring material related to:
“Energy and the Polar Environment”
Issue 7, October, 2008

http://beyondpenguins.nsdl.org
Earth’s seasons: Stamp on the diagram where the Sun is overhead on the Equator

March 21

June 21

December 21

September 21

http://nsdl.org

http://beyondpenguins.nsdl.org
Earth’s seasons

Sun overhead on the Equator at the equinoxes

Sun overhead at 23.5 N or S at the solstices
Intensity of solar radiation

Most direct rays = most intense energy per unit of area

Less direct = less energy per unit of area on the Earth’s surface
Earth’s Energy Balance
(the global picture)
Regional Differences

Annual temperature change over the last 50 years, based on station data (NASA GISS)
Let’s pause for questions from the audience....
N & S Hemispheres are different in amounts of land vs. water

Image from: http://www.marinebio.net/marinescience/01intro/woocean.htm
Poll Question:
Why are the Polar Regions expected to warm more strongly in response to anthropogenic (human produced) climate change than the rest of the planet?

A. The atmosphere is colder so even a slight warming will be obvious.

B. The atmosphere there is colder and thus holds more water vapor, an important greenhouse gas. So the enhanced greenhouse effect is stronger there.

C. They are more prone to positive (amplifying) feedbacks due to their more extensive snow and ice cover.

D. The weather is usually more consistent there, so recent variations from the norm (average) are just more noticeable.
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Albedo - “Reflectivity” of a surface
Reflectivity of different surfaces

http://veimages.gsfc.nasa.gov/3411/modis_albedo.jpg
Lowered albedo in the Arctic—
a positive feedback to climate

As sea ice melts, the open ocean will absorb more of the Sun’s energy, and then re-radiate heat back to the atmosphere.

From: http://svs.gsfc.nasa.gov/goto?10021
Arctic sea ice age, at the end of the 2007 and 2008 melt seasons

Let’s pause for questions from the audience....
Let’s look at student misconceptions around these concepts and strategies for integrating science and literacy instruction...
**True or False: Stamp your answer**

Only shiny objects reflect light.

<table>
<thead>
<tr>
<th>True</th>
<th>False</th>
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Misconception: Only shiny objects reflect light.

Formative Assessment: “Can It Reflect Light?” (Vol. 1)

Instead: All visible objects reflect some amount of light. The amount of light reflected depends on the color and texture of the object. The albedo of an object is a measure of how much light it reflects.

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Target this misconception by...

Observing light reflecting off smooth and rough aluminum foil; compare to bouncing ball on smooth and rough pavement

List: What reflects light? Does not? Explain your answers

Use lessons that introduce vocabulary such as **transparent**, **translucent**, **opaque**, **reflection**, and **refraction**

Teach Engineering: Investigating Light (Grades 3-5)
Teach Engineering: Light Scavengers (Grades 3-5)

Avoid talking about reflection only in the context of mirrors

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The Earth does not receive heat from the Sun directly.

<table>
<thead>
<tr>
<th>True</th>
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http://beyondpenguins.nsdl.org
Misconception: The Sun directly heats the Earth.

Formative Assessment
Probe: “What Comes From the Sun?”

In Energy and the Polar Environment – Issue 7, October 2008 (Misconceptions article)

Instead: Absorbed solar radiation is converted to thermal energy.

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At the elementary level, this explanation of the Sun's role in warming the Earth is developmentally appropriate.

Instead of expecting conceptual change:

- Use a variety of objects and colors to show that objects absorb and reflect light differently.
- Use real world examples to help students connect light absorption and increase in temperature.
- Be mindful of your language and explanations.

Instead of "The Sun heats the Earth," say "The Sun's energy heats the Earth."

http://nsdl.org

www.psypress.com

nasa.gov

http://nsdl.org
Lessons about Solar Radiation

The Warmth of the Sun:
Students in grades K-2 are introduced to the Sun’s role in warming Earth’s land, air, and water.

Our Super Star:
Students in grades K-5 learn about the Sun and create solar ovens to cook s’mores.

Using Thermometers:
Students in grades K-2 learn to use thermometers to measure temperature. Pair with The Warmth of the Sun.

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http://beyondpenguins.nsdl.org
http://nasa.gov
http://nsdl.org
Absorption and Reflection: Light and Dark Colors

What Color Absorbs the Sun’s Energy Best?
Students in grades K-2 place ice cubes on different colors of construction paper, set them in the sun, and see which ice cubes melt fastest.

Investigating Radiation
Students in grades 3-5 investigate how different surfaces (light and dark colored soil, water) absorb heat.
How do you integrate science and literacy?

A. I introduce concepts with picture books
B. My students read from a textbook and answer questions.
C. My students use science notebooks.
D. I teach reading strategies while reading science text.
E. I don't integrate science and literacy.
Integrating Literacy

Content area reading: Virtual Bookshelf

Question-and-Answer books
- Gather information from nonfiction text and the Internet
- Organize with KWL charts, and create a book.

http://beyondpenguins.nsdl.org

http://nsdl.org
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

Now paired with a nonfiction reading strategy each month

http://nsdl.org
http://beyondpenguins.nsdl.org
Literacy Strategy: Note Taking

Teach students to take notes by recording key words, paraphrased definitions, and by creating graphic representations of information.

Template specifically designed for use with nonfiction stories for students

Content knowledge article available

http://nsdl.org
http://beyondpenguins.nsdl.org
Interested in learning more?

Beyond Penguins Web Seminar Series:
Next seminar: Spring 2009

Beyond Penguins and Polar Bears Blog

Beyond Penguins and Polar Bears, October 2008, Issue 7
http://beyondpenguins.nsdl.org

http://nsdl.org
Go to [http://nsdl.org](http://nsdl.org) and click on the K-12 audience page to:

- Download our Seminar Resource List
- Find resources from archived seminars

Learn about new tools and resources, discuss issues related to science education, find out about ways to enhance your teaching at: [http://expertvoices.nsdl.org/learningdigitalK12](http://expertvoices.nsdl.org/learningdigitalK12)
http://www.elluminate.com
Welcome to Your Professional Development

The Learning Center is NSTA's e-professional development portal to help you address your classroom needs and busy schedule. You can gain access to more than 2,600 different resources that cater to your preference for learning. Over 700 hundred resources, such as journal articles, science objects and web seminars are available for free. A suite of practical tools such as My Library, My Transcript, and My Professional Development Plan and Portfolio tool help you organize, personalize, and document your growth over time.

Explore Learning Opportunities

By Subject
- Earth & Space Science
- Life Science
- Physical Science

By Grade Level
- Elementary
- Middle School
- High School
- College

By State Standards

Many resources now permit you to select your grade, standard document, and state to view the standards that align to the resource you've selected.

Do-It-Yourself Learning

Learn at your own pace online with these 1-2 or 6-10 hour interactive activities.

See All DIY Learning Resources

Live Online Seminars & Classes

Learn online from certified instructors with your colleagues. 1-2 hour seminars, week and month long courses are available. Earn state and university credit.

See All Online Events

Books & Articles

Books
Book Chapters

In Person Experiences

Attend an NSTA workshop in person to learn hands-on techniques with other teachers. Earn state and university credit.

View Overview of the NSTA Learning Center

Multimedia Overview

http://learningcenter.nsta.org
• **AAAS: Intro to the Atlas of Science Literacy**
  
  November 18, 2008

• **FDA: Teach Science Concepts and Inquiry with Food**
  
  December 2, 2008

• **NSDL: Chemistry Comes Alive III: Water**
  
  December 9, 2008
National Science Teachers Association
Dr. Francis Q. Eberle, Executive Director
Zipporah Miller, Associate Executive Director
Conferences and Programs
Al Byers, Assistant Executive Director e-Learning

NSTA Web Seminars
Flavio Mendez, Senior Director
Jeff Layman, Technical Coordinator

LIVE INTERACTIVE LEARNING @ YOUR DESKTOP
Web Seminar Evaluation:

Click on the URL located on the Chat Window