NSDL/NSTA Web Seminar:
Selecting and Using Digital Phenomena and Representations for Middle School Science Instruction

Tuesday, June 19, 2007
6:30 p.m. to 8:00 p.m. Eastern time
Agenda:

1. Introductions
2. Tec-help info
3. Web Seminar training
4. Presentation
5. Evaluation
6. Chat with the presenter
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Web Seminars Program Manager
NSTA

Susan Hurstcalderone
Science Teacher
Volunteer Chat Moderator
We would like to know more about you…
How many web seminars have you attended?

A. 1-3  
B. 4-5  
C. More than 5  
D. This is my first web seminar.  
E. I don’t know what is a web seminar.

Use the letters A-E located at the top left of your actual screen to answer the poll.
Where are you now?
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 (undergrad and/or grad students).
E. I am an Informal Educator
NSDL/NSTA Web Seminar:

Selecting and Using Digital Phenomena and Representations for Middle School Science Instruction

Tuesday, June 19, 2007
7:00 p.m. to 8:00 p.m. Eastern time
Welcome!

Chad Dorsey
Science and Education Technology Specialist

Maine Mathematics and Science Alliance

PRISMS Project:
Phenomena and Representations for the Instruction of Science in Middle Schools
How often do you use digital resources with students?

A. At least once a week
B. A few times a month
C. Once a month
D. A few times a year
An entire new world of exciting online resources is open to teachers today
Teachers must seek out these resources and then determine which will be useful.
Resources that are available or attractive may not support learning effectively.
Using the right resources in appropriate ways can bring students to great places.
Use the PRISMS collection and analyses to plot a route to effective student learning.
Addressing an Intended Learning Goal
(Content Alignment)

Conveying a Learning Goal

The PRISMS Collection

PRISMS reviews relate resources to learning goals and are part of the NSDL

http://nsdl.org
A resource should address the intended content in order to be useful
Quick Poll: Standards Documents

<table>
<thead>
<tr>
<th>I’ve seen this book before</th>
<th>I use this book</th>
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Useful resources address the intended learning goal or sub-idea.

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**BENCHMARKS FOR SCIENCE LITERACY**

- Energy of motion, so most substances expand when heated. In solids, the atoms are closely located in position and can only vibrate. In liquids, the atoms or molecules have higher energy of motion, are more loosely connected, and can slide past one another; some molecules may get enough energy to escape into a gas. In gases, the atoms or molecules have still more energy of motion and are free of one another except during occasional collisions.

- The temperature and liquidity of a substance influence reaction rates. Many substances dissolve in water, which may greatly facilitate reactions between them.

- Scientific ideas about elements were borrowed from some Greek philosophers of 2,000 years earlier, who believed that everything was made from four basic substances: air, earth, fire, and water. It was the combinations of these “elements” in different proportions that gave other substances their observable properties. The Greeks were wrong about those four, but no other different elements have been identified, some rare and some plentiful, out of which everything is made. Because most elements tend to combine with others, few elements are found in their pure form.

- There are groups of elements that have similar properties, including highly reactive metals, less-reactive metals, highly reactive nonmetals (such as chlorine, fluorine, and oxygen), and some almost completely nonreactive gases (such as helium and neon). An especially important kind of reaction between substances involves combination of objects and is linked to motion. In addition, scientists view energy as a fuel or something that is stored, ready to use, and gets used up. The intent at this level is for students to improve their understanding of energy by experiencing many kinds of energy transfer.

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**GUIDE TO THE CONTENT STANDARD**

- Fundamental concepts and principles that underlie this standard include:
  - **PROPERTY AND CHANGES OF PROPERTIES IN MATTER**
    - A substance has characteristic properties, such as density, a boiling point, and solubility, all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties.
    - Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is conserved. Substances often are placed in categories or groups if they react in similar ways; metals are an example of such a group.
    - Chemical elements do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. There are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for the living and nonliving substances that we encounter.

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**MOTIONS AND FORCES**

- The motion of an object can be described by its position, direction of motion, and speed. Motion can be represented on a graph.

- An object that is not being subjected to a force will continue to move at a constant speed and in a straight line.

- If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object’s motion.

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http://nsdl.org
Learning goals may be broken into key ideas, which are clarified further.
Resources may address an entire key idea or only part of one.
Above is a drawing of the crystalline structure of a diamond. The spheres represent carbon atoms; the lines connecting the atoms represent chemical bonds. Each carbon atom is at the center of a four-sided pyramid, or tetrahedron, formed by the neighboring carbon atoms to which it is bonded.

Above is a drawing of a graphite crystal. A few carbon atoms are bonded vertically to those above and below, but most are only attached to neighbors in the same horizontal plane.

Is this example aligned to the key idea?

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Does it address the entire idea or just a part of it?

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<th>Entire Idea</th>
<th>Just a Part</th>
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Which Part?

Atoms of any element are alike but are different from atoms of other elements. Atoms may stick together in well-defined molecules or may be packed together in large arrays. Different arrangements of atoms into groups compose all substances.
Atoms of any element are alike but are different from atoms of other elements. Atoms may stick together in well-defined molecules or may be packed together in large arrays. Different arrangements of atoms into groups compose all substances.
Useful resources reflect a grade-appropriate level of sophistication.

http://nsdl.org
Resources may include detail that raises their sophistication above grade level.

"...During a partial solar eclipse, only the penumbra touches our planet. The umbra passes either just above the North Pole or just below the South Pole..."

"A third type of solar eclipse...is called an annular eclipse..."

http://www.earthview.com/tutorial/causes.htm
Resources may include entire topics that exceed grade-level sophistication

Liquid Water

Molecules remain close together but can move and interact. In water, hydrogen bonds (- - -) impart special properties.

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Modifying a resource can sometimes improve its content alignment
Removing or de-emphasizing vocabulary can improve content alignment.

**Sophistication**

The resource reflects a higher level of sophistication than the learning goal does.

**Notes for Teachers**

The level of sophistication can be reduced by highlighting the areas of the text that are appropriate for middle school students.
Atoms and molecules are perpetually in motion. Increased temperature means greater average energy of motion, so most substances can be heated. In solids, the atoms are closely packed in position and can only vibrate. In liquids, or molecules have higher energy of motion and are more loosely connected and can slide past one another; some molecules may get enough energy to escape into a gas. In gases, the atoms or molecules have still more energy of motion and are free of one another except during occasional collisions.

Imagine you were using the clip shown to help students reach this learning goal.

What could you do as a teacher to improve the content alignment of this resource when presenting it to students?

Write your answers on the chat.
Definitions:

Phenomena and Representations
Phenomena are *real-world* objects, systems, and events that *provide* evidence for key ideas.

Representations are “non-real” examples that *help* clarify key ideas.

(e.g. pictures, video clips, graphs, simulations)
Resources should convey the targeted learning goal to students effectively.

Source: Flickr--Dano
A resource’s connection to the learning goal should be clear and accurate.
The relationship between a phenomenon and the learning goal should be clear.
Representations should represent the learning goal accurately

How does this do?

http://www.usoe.k12.ut.us/curr/science/sciber00/7th/classify/sciber/clmatter.htm

http://nsdl.org
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Comments:
Resources should make the learning goal comprehensible to students
The number of steps from a phenomenon to the learning goal should be small
Reasoning skills and additional ideas required should be reasonable.
Sometimes the path the moon takes around the Earth and the path that the Earth takes around the Sun line up in such a way that the moon is directly between the Sun and the Earth. When this happens, the moon's shadow may block the Sun's light from striking a small area of the Earth, causing a solar eclipse.

How well does the presentation of this phenomenon do?

- The resource is aligned to the stated key idea
- Additional ideas are not required to connect the phenomenon and key idea
Resources should be efficient to use and express simplifications properly.

Animation of a Total Solar Eclipse

(Distances not to scale)

http://nsdl.org
The PRISMS collection assembles resource reviews as part of the NSDL.

http://nsdl.org
Can we find online resources that promote learning effectively?
Resources that are available or attractive may not support learning effectively.
Bring students to a great place with the PRISMS protocols and library and NSDL
PRISMS: Phenomena and Representations for the Teaching of Science in Middle School

prisms.mmsa.org

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

• Download this seminar’s companion guide with resources from the seminar and more!

• Participate in our blog associated with this seminar http://expertvoices.nsdl.org
Welcome to The NSTA Learning Center

Get the Help, When You Need It

If you want a better understanding of what you teach—the science content in your subject areas—and how to teach it—techniques to help your students learn—you've come to the right place! NSTA developed this electronic professional development website with your classroom needs and busy schedule in mind. Through the Learning Center website, you can gain 24-hour access to more than 1,200 different types of resources and opportunities, such as:

- Nearly 1,000 NSTA Journal articles (270 of them available FREE of charge)—many containing high-quality lesson plans.
- More than 30 FREE Science Objects (one-to-two-hour interactive simulation-based learning experiences).
- More than 100 e-chapters from selected books and series (over 45 chapters FREE of charge).
- FREE weekly live Web Seminars where you can interact with experts from NASA, NOAA, FDA, and the NSDL Community.

PLUS: To enrich your professional growth, NSTA has also developed a suite of practical tools called My Library, My Notepad, and My Transcript. Use these tools to organize, personalize, and document your work within the Learning Center.

http://learningcenter.nsta.org
National Science Teachers Association

Gerry Wheeler, Executive Director
Frank Owens, Associate Executive Director
Conferences and Programs
Al Byers, Assistant Executive Director e-Learning

NSTA Web Seminars

Flavio Mendez, Program Manager
Jeff Layman, Technical Coordinator
Susan Hurstcalderone, Volunteer Chat Moderator

LIVE INTERACTIVE LEARNING @ YOUR DESKTOP
Fall 2007 Season

Beginning in September

http://leaningcenter.nsta.org
NSTA SciGuides:

Provide tools to quickly and easily locate targeted science content information and teaching resources from NSTA-reviewed science web sites.

http://sciguides.nsta.org
Web Seminar Evaluation

http://institute.nsta.org/survey/nsdlssurvey11.asp