

An Integrated Curriculum For The Washington Post Newspaper In Education Program

Employ Technology to Explore

- Student Activity: Exploring Some Ocean Web Sites
- Teacher Notes: Exploring Some Ocean Web Sites
- Quiz and Discussion Questions: Exploring Some Ocean Web Sites
- Teacher Notes: Okeanos Explorer and More Resources
- Teacher Notes: High Tech Treasure Hunting
or It's the Journey, Not the Destination



NATIONAL GEOGRAPHIC EXPLORER-IN-RESIDENCE ENRIC SALA

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Exploring Some Ocean Web Sites

You are embarking on a study of the world ocean and the role of the ocean in the Earth system. Throughout this learning experience, you will be using several Web sites to access and interpret a variety of environmental information, including recent observational data. The objective of this activity is to explore features on some of these Web sites.

We are looking at some images from a Web site with links to the Earth system: DataStreme Ocean (www.ametsoc.org/amssedu/ds-ocean/home.html). You will find information on physical, chemical, geological, and biological aspects of the ocean, including the atmosphere/ocean interaction. Let's take a quick tour of the type of information available by checking on the resources that I have provided below.

Exploration

1

For **Physical & Chemical** aspects, select Sea Surface Temperatures. This image uses a color scale to depict the global pattern of sea surface temperatures (SSTs) (in degrees Celsius) averaged over a recent 7-day period and based on measurements by infrared sensors onboard Earth-orbiting satellites. (Depending on your browser, you may have to place your mouse cursor on the slide bar to the right and scroll down to view the entire image.) Compare SSTs in the Northern Hemisphere with those in the Southern Hemisphere.

2

For **Geological** aspects, click on Current Earthquake Activity. The USGS Current World Seismicity page provides a global map of the locations of seismic (earthquake) events color-coded for the past seven days. The size of the squares represents the magnitude of recent earthquakes. Note how earthquakes are concentrated along the margin of the Pacific Ocean. Details of recent earthquakes can be found by clicking on their map squares. Return to the DS Ocean Web site.

3

The ocean is home to a wide variety of habitats and organisms. For **Biological** aspects, click on Ocean "Color" (Productivity). This is a satellite-derived (SeaWiFS) color-coded map of biological productivity in the surface waters of the world ocean. Data is averaged from October 1978 to date. Orange and red indicates the highest productivity, while dark blue and violet indicate the lowest productivity. Note the vast areas of relatively low productivity over the central regions of the subtropical ocean basins. Individual months within this period may be chosen for viewing.

4

For **Atmosphere/Ocean Interaction**, visit TRMM Tropical Rainfall. The TRMM (Tropical Rainfall Measuring Mission) page includes color-coded maps of the Monthly Mean Rainfall (in mm per day) across the tropics for the last 30 days ending on the present date. Changes in rainfall are linked to large-scale shifts in the atmosphere/ocean circulation in the tropics.

In addition, one of the oldest and largest private, nonprofit research institutes for global ocean exploration is the Woods Hole Oceanographic Institution (<http://www.whoi.edu/>). Explore the site and find an article that interests you. The Oceanus Topics on the right-hand sidebar are one way to search in an area of your interest. Read, take a few notes and be prepared to discuss your article in class. These are usually brief secondary source articles that link to more in-depth research when possible.

— Adapted from American Meteorological Associations DataStreme Ocean materials

Name _____ Date _____

A FEW QUESTIONS FOR YOU

Exploring Some Ocean Web Sites

- _____ 1. The latest global sea surface temperature map indicates that SSTs are generally higher over the (western) or (eastern) tropical Pacific Ocean.
- _____ 2. The USGS map of Current Earthquake Activity indicates that earthquakes appear to be more common along the (east) or (west) coast of North America.
- _____ 3. Woods Hole Oceanographic Institute is located on the (east) or (west) coast coast of North America.
4. Currently, what oceans are exhibiting the lowest biological productivity? How do you account for the differences in productivity?
5. Write a brief summary of the article you read in the WHOI Web site. What type of technology enabled the discovery to be made?

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TEACHER NOTES

Exploring Some Ocean Web Sites

By Lisa Wu

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An innovative Internet-based distance-learning course directed towards middle-school teachers, but open to all K-12 teachers, has been developed and is being implemented nationwide. The course, DataStreme Ocean, explores the ocean in the Earth system with special emphasis on (1) the flow and transformations of water and energy into and out of the ocean, (2) the internal properties and workings of the ocean, (3) interactions between the ocean and the other components of the Earth system (hydrosphere, atmosphere, lithosphere, and biosphere), and (4) the human/societal impacts on and response to those interactions. I use many sections of the DataStreme Ocean course Web site with my students.

Visit the American Meteorological Society's Web site (<http://www.ametsoc.org/amsedu/>).

Select Education at the top. In the right-hand sidebar, click on DataStreme Ocean. Then select DS Ocean Course (www.ametsoc.org/amsedu/DS-Ocean/home.html). Features include:

- The general public has access to the Weekly Ocean News which also includes a Concept of the Week section as well as Historical Events.
- Supplemental Information provides information on a special topic of interest.
- Student Resource and Career Information (<http://www.ametsoc.org/amsedu/DS-Ocean/StuResources.html>)

- DataStreme Ocean Information is available for teachers and students to use. To familiarize my students with this site, I adapted an introductory activity from the DS Ocean course for my students. [See "Exploring Some Ocean Web Sites."]

Additionally, each week I post the current Weekly Ocean News that includes Ocean in the News (a summary listing of recent events related to the ocean), Concept of the Week (an in-depth analysis of a topic related to the ocean in the Earth system), and Historical Events (a list of past events such as tsunamis or specific advances in the understanding of oceanography).

When appropriate, a feature called Supplemental Information-In Greater Depth is provided on a topic related to the principal theme of the week. These are all posted in my Blackboard for my students to access. They are a great resource for student project ideas, sounding informed at the dinner table, writing the English essay, or impressing their friends at lunch! Since AMS updates the information each week, it is as current as the events themselves.

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TEACHER NOTES

Okeanos Explorer and More Resources

By Lisa Wu

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Alone or with a crew, what motivates us to explore?

Historically, exploration might have been driven by the desire to increase political power, to gain economic benefits or to keep pace with other nations. Today, the exploration of the oceans is driven by a need to understand and improve conditions related to issues such as climate change, energy resources, protecting sensitive environments and improving human health. Yet underlying both the historic and modern motivations are human courage, curiosity and the desire to meet the challenge of the unknown.

As technology has developed, so has our ability to explore the oceans. In 2008, a modern ship dedicated to ocean exploration and advancement of knowledge was commissioned. Called the *Okeanos Explorer*, from the Greek *okeanos* meaning ocean, this ship can send a remotely operated vehicle to collect images including HD video from the sea floor to the ship to the shore in real time. The “telepresence” technology which makes this possible allow scientists on land to confer or even guide the ship through its missions.

The National Oceanic and Atmospheric Administration (NOAA), which is part of the Department of Commerce, has developed educational materials to enhance and help explain discoveries being made during *Okeanos Explorer* missions and illustrate the key topics of exploration, energy, climate change, human health and ocean health.

Visit NOAA Okeanos Explorer (<http://oceanexplorer.noaa.gov/okeanos/welcome.html>). Here you can learn about this ship, its technology and explorers, watch slide shows, link to podcasts and follow the ship as it explores. On the right sidebar, select Education. In the Educational Materials Collection you will see Vol. 1 and 2 called Why do we explore? These volumes contain both a compilation and links to NOAA educational materials. There are learning objectives, audio-visual materials, key words, and hands-on activities to enhance reading material. These can be downloaded from the Internet for free.

Choose Volume 1. The first lesson in Volume 1 is called “To Boldly Go” You can link directly to the lesson by clicking on Okeanos Explorer (http://oceanexplorer.noaa.gov/okeanos/edu/collection/media/vol1_wdwe.pdf).

This is an introductory lesson to initiate a discussion about exploration – to let students see that there are modern day explorers as fearless and curious as those in our past and that there is still so much to be discovered on our planet. Additional activities are recommended within the text on the Web site.

Images may located using NOAA’s Photo Library (<http://www.photolib.noaa.gov/>). These can be used to stimulate journal entries, further reading and discussion.

Weigh Anchor!

TEACHER NOTES

High Tech Treasure Hunting or It's the Journey, Not the Destination

By Lisa Wu

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It is a fantastic voyage, not fantastic destination. As Ralph Waldo Emerson wrote, life is a journey and not a destination. Some discoveries are made serendipitously — a mold that grows on a Petri dish or an island discovered because a ship ran aground on a reef. These discoveries were not part of a planned journey. Exploration, like a journey, has always involved risk.

Early exploration was in part driven by a need to accurately map our world, to establish new colonies, and find the safest and most efficient trade routes. Explorers were guided by a compass, the night sky, and a sense of “dead reckoning.” Today, accurate maps are still being created and modified based on data from explorations, tectonic activity and technological developments.

Our modern explorer is equipped with a Global Positioning System (GPS) in addition to a view of the navigational stars. In fact, ocean science has always been a curious juxtaposition of ancient and modern methods. For example, there are pictures of a colander (that's right — you use one in your kitchen) held by the high technology remotely operated vehicle's manipulator or arm to collect delicate organisms from the deep.

Ocean Exploration

These sites familiarize students with navigation, exploration and technology.

<http://oceanexplorer.noaa.gov/oceanos/edu/collection/wdwe.html>

Okeanos Explorer

Visit the lesson in Why Do We Explore, Vol. 1 at NOAA's Web site. Scroll down to “Calling All Explorers” (Grades 9-12). In the hands-on activity, “Your Own Expedition of Discovery,” students will learn what it means to be an explorer, both modern and historic; recognize that not all exploration occurs on land; understand the importance of curiosity, exploration, and the ability to document what one studies; gain insight into the vastness of unexplored places in the deep sea; and gain appreciation of science mentors and role models.

<http://oceanexplorer.noaa.gov/>

NOAA Ocean Explorer

NOAA chronicles the adventures and discoveries of NOAA's at-sea science and education teams.

http://oceanexplorer.noaa.gov/explorations/02galapagos/background/education/media/gal_gr9_12_11.pdf

Designing Tools for Ocean Exploration

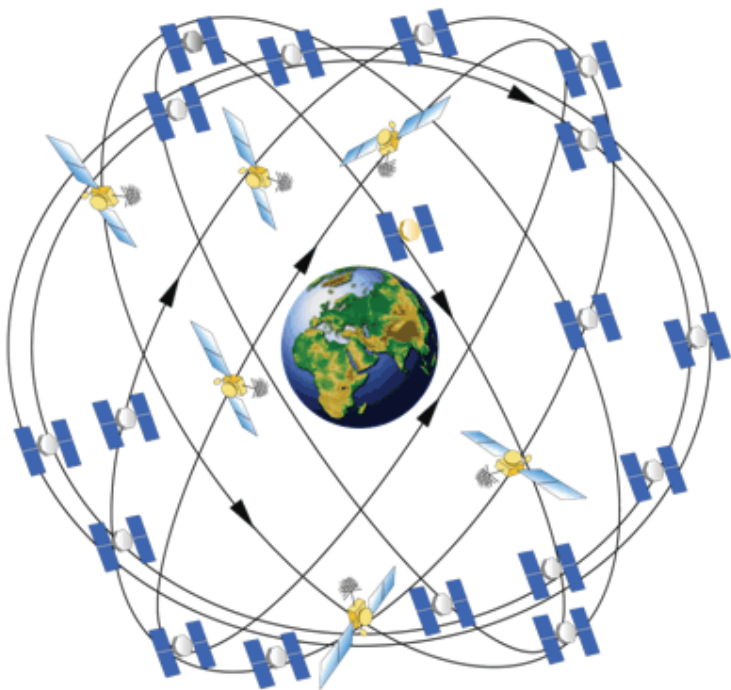
Related to the Galapagos Rift Expedition, this activity helps students understand the complexity of ocean exploration; learn about the technological applications and capabilities required for ocean exploration; discover the importance of teamwork in scientific research projects; and develop the abilities necessary for scientific inquiry.

<http://ocean.si.edu/>

The Smithsonian Ocean Portal

The “OP” portal, created in collaboration with organizations including NOAA, contains dynamic, multi-media content designed to engage young adults, ocean enthusiasts, and middle school teachers and their students in ocean science, education and conservation.

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As teachers organize GPS-based activities, two Web resources are worth attention for their diversity of resources. In these explorations it is not about the hardships but about the competition, the mystery, the game, and teamwork:

1. U.S. Government information about the Global Positioning System (GPS) (<http://www.gps.gov/>). This Web site provides helpful background information, policy, and links to GPS Adventures (<http://www.gps.gov/multimedia/exhibits/adventures/>), a site designed to teach students and adults about GPS technology.

2. An example of a GPS lesson is found in NOAA's Okeanos Explorer (<http://Oceanexplorer.noaa.gov/okeanos>). In this lesson, students become familiar with the term geocache, a treasure hunting game enjoyed by millions of people all over the world.

Lessons also include links to other relevant lesson plans from the NOAA Office of Ocean Exploration and Research and the Ocean Explorer Web site. NOAA recommends that educators who use the Okeanos Explorer Education Materials Collection should regularly check the Okeanos Explorer Education section for the latest information about new education offerings and professional development opportunities.