NOAA Technical Memorandum GLERL-149

EDUCATOR HOUSE CALL: ON-LINE DATA FOR EDUCATORS' NEEDS ASSESSMENT - SUMMARY REPORT

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September 2009

UNITED STATES
DEPARTMENT OF COMMERCE

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NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION

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NOAA's Mission – To understand and predict changes in Earth's environment and conserve and manage coastal and marine resources to meet our nation's economic, social, and environmental needs.

NOAA's Mission Goals:

- Protect, restore and manage the use of coastal and ocean resources through an ecosystem approach to management
- Understand climate variability and change to enhance society's ability to plan and respond
- Serve society's needs for weather and water information
- Support the Nation's commerce with information for safe, efficient, and environmentally sound transportation
- Provide critical support for NOAA's Mission

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1. INTRODUCTION

The overreaching purpose of this focus group was to advise NOAA and NOAA partners on the best ways to make NOAA data available to educators with a focus on online delivery. There was also an emphasis on inquiry-based education.

According to three science education reports, "Students should learn science through inquiry and should understand the concepts and processes that shape our natural world." (Ledley et al., 2008). Inquiry-based education is a constructivist approach to student learning that is student centered rather than teacher centered. In this style of teaching, educators provide the experience or data and analysis tools students need to explore concepts and answer questions. In today's economy where school districts are cutting corners to meet budget demands, most schools lack funding to allow students to go outdoors for field studies, however, web-based data allows students to learn real science through inquiry. The advantages of using real data in the classrooms are:

- Prepares and allows students to address real world problems.
- Teaches them to analyze the validity of data and its conclusions.
- Teaches quantitative skills, technical methods, and scientific concepts.
- Builds scientific, technical, quantitative, and communication skills. Manduca and Mogk (2002).

Using data in the classroom also presents some challenges:

- Students require more individual guidance.
- Students need training on how to use the tools to manipulate the data.
- Requires more preparation for the teacher.
- Available data is too complex for students, and teachers don't know how to access it.
- Lack of alignment to curriculum standards.

There is a great need to make science data available in a format that can be used in a science classroom. Most of the data available is difficult for educators to use because it is not formatted for classroom use. The data available for a teacher resource needs to be formatted to lend itself to pedagogical uses, curriculum materials, and student research activities (Ledley et al., 2008).

To meet these educational data requirements, there needs to be descriptive information that goes along with the data, and the data needs to be (1) audience appropriate, (2) packaged in a

common format such as Excel, Word, or Adobe Acrobat documents, and (3) reduced in size for educational purposes.

According to Manduca and Mogk (2002), instruction that includes web-based data is most effective when students can find and access data relevant to the topic they are investigating, evaluate the quality of this data, use appropriate tools and interfaces to manipulate and render data to answer questions, combine multiple and diverse data sets to solve a central problem (selecting or compressing data subsets to address a specific task), generate visualizations and representations that communicate interpretations and conclusions, and contribute, view, and evaluate their own data in the context of larger data sets.

2. METHODS

On July 15, 2009, NOAA's Great Lakes Environmental Research Laboratory (GLERL) co-hosted a focus group – Educator House Calls: On-Line Data for Educators.

The focus group was conducted at GLERL's main laboratory in Ann Arbor. The workshop was organized and funded by COSEE Great Lakes with student staff support from Eastern Michigan University under the NOAA Environmental Literacy Grant "Sailing Elementary Teachers Towards Ocean Literacy Using Familiar Water Resources."

The purpose of the focus group was to assess educator needs that might be filled using existing NOAA GLERL data and to assess on-line formats and mechanisms needed to deliver the data to classrooms.

Seven educators participated in the focus group. Participants included both classroom teachers and museum educators and were selected to represent a range of grade levels, discipline specialties, and backgrounds. Educators selected for the focus group all indicated that they were currently using on-line data resources in their classrooms.

Stephanie Crook—High School Biology Teacher from Lake Central High School in Illinois.

Kay Swartzlander—Middle School Science Teacher from Adrian Middle School in Adrian, MI.

Steve Durant—High School and Washtenaw Community College math teacher from Roosevelt High School in Wyandotte, MI.

Connie Atkisson—Elementary Teacher from O.W. Holmes Elementary School in Detroit, MI.

Carole Gutteridge—Elementary Teacher from North Road Elementary School in Fenton, MI.

Nancy Bryk—Ann Arbor Hands on Museum in Ann Arbor, MI.

Jackie Formoso—Shedd Aquarium in Chicago, IL.

Each participant was asked to review GLERL's current on-line data resources, including the pilot segment "Great Lakes Water Data Sets for Teachers" (http://people.emich.edu/srutherf/NOAA/)

developed under the NOAA Environmental Literacy Grant "Sailing Elementary Teachers Towards Ocean Literacy Using Familiar Water Resources" prior to the focus group. Each participant was also asked to come prepared to briefly present on how they currently use data and/or on-line resources in their classroom.

Six GLERL scientists (Greg Lang, Dave Schwab, George Leshkevich, Tom Nalepa, Hank Vanderploeg, and Ron Muzzi) helped to establish a baseline understanding of current GLERL research programs and research-oriented online resources. Programs included:

- The Real-Time Meteorological Observation Network (RTMON) (http://www.glerl.noaa.gov/metdata/) which provides real-time meteorological data and webcam images updated every 5-15 minutes on a continual basis.

- Coastwatch (http://coastwatch.glerl.noaa.gov/) which provides NOAA satellite data and images.

- The Great Lakes Coastal Forecasting System (GLCFS) (http://www.glerl.noaa.gov/res/glcfs/) which provides models integrating physical data from buoys and satellites into graphical 'nowcasts' and forecasts.

- Google Earth Great Lakes Tour (http://www.glerl.noaa.gov/pr/ourlakes/gl_tour.html) which provides an orientation and introduction to the Great Lakes through a graphic interface, interactive maps, and video.

- Regional and local scale kml overlays (e.g., http://www.glerl.noaa.gov/res/glcfs/bd/) which allow GLERL data and models to be imported into Google Earth.

- Tour of the Preserved Biology Lab – invasive species and benthic food web research.

- Tour of the Experimental Biology Lab – invasive species, harmful algal blooms, physiology, and behavior.

- Tour of the Marine Instrumentation Laboratory and High Bay – buoys, underwater video, and equipment design.

Three outreach partners (Sandra Rutherford – EMU, Nikki Koehler – COSEE and GLOS, and Elizabeth LaPorte – MI Sea Grant) provided a baseline understanding of current NOAA-supported efforts to provide Great Lakes scientific data to educators.

3. RESULTS

Obstacles

One critical discussion thread revolved around the challenges that educators face in implementing activities based around on-line data. Some of these challenges are:

- Locating data that accommodates the targeted student audience.
- The data should be formatted in a way that holds the student's attention.
- Prerequisites should be included along with the data.
- Lack of computer access and software in a school district.
- Many schools have firewalls, filters, and blocks so students and teachers cannot access many websites.
- Aligning data sets with state Grade Level Content Expectations, High School Benchmarks, and National Science Education Standards.
- Teachers often lack the time to teach Great Lakes content in the classroom because they have to teach what is required in their school district's standards and benchmarks.
- Teachers also lack the time to develop new lessons.

Needs

- Career information that accompanies the data.
- Depictions of the scientists and the research behind the data.
- Understanding the methods used to collect the data, including pictures and videos of the instruments.
- Digital storytelling.
- Video clips and images that accompany the background information.
- Connecting the data to the state Grade Level Content Expectations, High School Benchmarks, and National Science Education Standards.
- Connecting data to concepts (e.g., what dataset can I use if I want to demonstrate a linear model or exponential growth).
- Organizing data according to grade level.
- Targeting the resources that goes with the data to specific grade levels.
- Accompanying story for younger grades (e.g. Amelia the Pigeon, and Harriet the Bat by NASA (remote sensing), Ducks in the Flow by EMU (currents)).
- Connection to important/local issues or interests.
- Connection to local experiences (experiments students can do themselves, local issues).

4. RECOMMENDATIONS

- All materials intended for use by classroom teachers should be aligned to relevant standards and grade level expectations. Alignment to additional standards (e.g., math, social studies, etc.) should also be considered where relevant.
- Materials should provide a 'low-tech' option to allow flexible implementation for educators who are resource limited. For example, materials to be printed for students should be printable in black-and-white rather than only in full color high resolution.
- Storytelling styles and media should accompany data to provide a context for data.
- Great Lakes research institutions should invest in producing short video clips (~2 minutes) to accompany online data. These could include: interviews with researchers about their careers or projects, clips showing data being collected, clips showing student researchers and/or other visual imagery that support interpretation of the data.
- Accompanying background material should provide for connection to student experiences. This could be centered around issues (e.g., where are invasive species in my community), data collection (e.g., instructions for a homemade plankton net or Secchi disk), parallel classroom experiments, or involvement in citizen monitoring programs.
- A forum for discussion by teachers (e.g., discussion board) accompanying the data and background materials would likely enhance use as teachers can see how others are using the data.

5. LITERATURE CITED

Ledley, T.S., C.A.Manduca, and S. Fox. Recommendations for Making Geoscience Data Accessible and Usable in Education. EOS 89(32):291-292 (2008).

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