Scientists Connections
Practical Thoughts on Observatory Scientists and Engineers Partnering in Education

Janice McDonnell
Institute of Marine & Coastal Sciences
Rutgers University
Presentation Outline

I. Education opportunities associated with Observatories
II. Lessons learned
III. Conclusions & things to consider
“Scientists operate in the boundary of what is known and what is unknown on behalf of humanity”.

(C. Morrow, Space Science Center, NASA).
Observatories are an Opportunity to Serve the Public

What can the public learn from you and your research?

**Audience:**

1. K-16 Teachers (K-5, 6-8, 9-12, 13-16)

2. Coastal Resource Managers

3. Public (including Tourists)

4. Students

**Learning Objective:**

?
#1: Formal Education: typically, public school (K-16)

Characteristics:

- Purposeful curriculum committed to learning
- Intentional learning activities (usually in school building)
- Employ certified teachers
- Schools are accountable to Federal - State government
- Matriculation/Degrees (form of grades, diplomas, etc.)
Formal Education

Potential Impact:
• *Sustained* opportunity to deepen knowledge and understanding of fundamental concepts related to the global and coastal ocean.
Formal Education Challenges: Ability to scale teacher training and materials development

3,254,000 teachers
51,610,806 students in U.S. public schools

U.S. Dept of Ed. 2001

• High teacher turnover
• Variable background/training in science/math
• Speed of “new” information we ask our kids to learn
• Constantly changing federal/state mandates
(No Child Left Behind, etc.)
Welcome!

Welcome to the classroom under the Atlantic Ocean. The folks at Rutgers Marine and Coastal Sciences have built a special website for you and your teachers so that you can join the scientists in the COOLroom as they explore the waters off New Jersey. Learn how to predict if it will be a good beach day or if the fish are running. See for yourself what the ocean looks like from 500 miles above the earth and 15 meters below the surface. We're glad you came. COOL classes are now in session.
How Does the COOLroom Work?

The COOLroom is full of sophisticated computers that interpret information being fed to them from a myriad of instruments deployed above, below and at the surface of the ocean off New Jersey.

The COOLroom scientists, called oceanographers, use the COOLroom’s computers to translate the raw data into charts and graphs and then organize them so they can be published on their website (www.thecoolroom.org).

From the COOLroom, scientists monitor several different data collection systems including:
- Remote Sensing Satellites monitoring the ocean’s surface temperature
- CODAR Beach antennas gather wave and current information
- The LEO Undersea Nodes provide an underwater weather report
- IMCS Meteorological Tower keeps track of the weather above the surface.

Over time, scientists will gain an understanding of how the ocean moves, interacts with the shoreline and atmosphere, with life in and around its waters (including man) and, perhaps, be able to predict behavior in the future.

Take a look at this series of photographs and attempt to determine what has happened based on the information available to you.

Now run the video clip from which the still photographs were taken.

Does the story you deduced from the still photographs match that portrayed in the video?

Scientists face this dilemma all the time as they attempt to interpret events and processes that occur in the ocean based on the data.
So, you've explored “What's COOL?” in the ocean. You've checked out the COOL Cards and met the Oceanographers in the COOLroom. You also know some pretty COOL Facts. It's time to use your newly acquired expertise and do some COOL Projects of your own. Whether you have been sent here by your teachers or have discovered the COOL Classroom on your own, have fun and keep checking back for new COOL Projects.

**COOL Biology Project: “Gone Fishing”**
Get caught in the ocean food web as you learn who's dinner and who are the diners beneath the waves--then use real data from the COOLroom to determine where the fish are off the coast of New Jersey.

**COOL Earth Science Project: “Create an Ocean Weather Forecast”**
Learn how to interpret data about ocean and atmospheric conditions to understand coastal upwelling--then use your knowledge and real data from the COOLroom to create an ocean weather forecast.
2003 National Evaluation of COOL Classroom in Middle and High School Classrooms

Objective:
Create virtual access (interface) for middle and high school teachers/students to COOL room scientists to improve understanding and awareness of coastal ocean science research.

Outcome:
#10b. Did you gain a better understanding of what scientists do by using this website?

- Yes: 81%
- No: 0%
- Not sure: 19%
Objective:

To develop a suite of 6-12 grade level appropriate on-line lesson plans that use real-time data from the COOL to enhance science learning (i.e., use inquiry based learning strategies).

Outcome:

b. I found the website lessons easy to integrate into my curriculum.

[Pie chart showing responses: strongly agree 47%, agree 43%, undecided 5%, disagree 5%, strongly disagree 0%]
Continued Development and Evaluation of COOL Classroom with Classroom Educators and Students

Asynchronous Teacher Professional Development Program

- On line discussion boards/chats
- Facilitating collaboration among teachers

[Image of website for COOL Classroom]
Mid Atlantic COSEE Community College Project

- Selected 3 Community College Faculty and 3 Middle School Educators from:
  - Phoenix, Arizona
  - Miami, Florida
  - Cleveland, Ohio

All community colleges were associated with the $9.3 million/5 year Alliance + project founded by CIESE @Stevens Institute of Technology

- Conducted a one-week training program June 2003
Mid Atlantic COSEE Observatory Course

Observatory scientists partner with educators to:

Brainstorm uses of Internet published real-time or near real-time data from coastal observing systems that meet national science standards and promote understanding and awareness of the marine environment. Led by Univ. Of Maryland Center for Environmental Studies (Horn Point).

Field Experience

Web based instruction

Classroom presentations
Use Evaluation to:

- Document change as a function of [programming], using both formal and informal methods.

- Enhance the potential of [programs].

“Program evaluation allows the educator to facilitate meaningful local change, while providing feedback"

Rule of Thumb = 10% of Education Budget should go to Evaluation (Needs Assessment, Formative, and Summative)

#2: Informal Education: Individuals (families, tourists, etc) that engage in self directed learning opportunities that inspire further learning and life long interest”.

Many (not all) informal education programs take place at public venues including zoos, aquaria, museums, nature, and science centers.

Characteristics:
- Voluntary
- Self-directed
- Opportunities that inspire and create awareness
Informal Education

Potential Impacts:
• Reach large numbers of people with a more shallow understanding of the content.

Challenges: Expensive and difficult to develop “stand alone” web sites, exhibits, etc.
Public Access to Observatory Data: www.thecoolroom.org

Welcome Seafarers!
How do you use the ocean?

- Fishermen
  Find out where the fish may be hiding

- Boaters and Sailors
  Discover where ocean currents are going

- Swimmers, Surfers and Divers
  Check out ocean temperatures and wave heights before you dive

Simply click on what you're interested in to begin your underwater voyage.

Looking for more than just New Jersey?

What's a COOLroom?
In the COOLroom, scientists from Rutgers University pull together data from satellites, coastal radars and underwater weather stations. The COOLroom.org is the place where this information is processed and posted on the web for you to use to make the most of New Jersey's Coastal resources.
Rutgers Science Pages

Series of 3
Observatory Related
Full Page Science Articles

3rd Place Winner
On AP Education Competition
#3. Non Formal Education: “organized, systematic teaching and learning carried on outside the formal school system with leadership from an adult or volunteer”. This audience is usually composed of students, teachers, coastal managers, etc that engage in guided learning opportunities.

**Characteristics:**
- Change-oriented deliberate, planned, staffed
- Unrestricted as to time and place
- Usually responsive to need and is an effective tool for development.

Non Formal Education

**Impact:** Emphasize new and different change-oriented education.

**EXAMPLES**
NFE encompasses a broad spectrum that can range from a youth learn to swim program to an agriculture workshop concerning pesticide application.

**Challenges:**
- Expensive
- High rate of turnover
- Very hard to capture the attention of the audience
Coastal Training Program at the Jacques Cousteau National Estuarine Research Reserve

Technology for Land Use Planning

The 5 Steps to Comprehensive Land Use Planning

This has been adapted from and is to be used in conjunction with “Environmental Planning for Small Communities: A Guide for Local Decision-Makers.” EPA/625/R-04/009, which was given to participants of our “Technology for Land Use Planning” Workshop, on March 12th, 2003.

Municipalities should use this strategic planning guide to determine how best to use technology, like GIS, to advance their land use planning efforts. By using this strategic planning tool, municipalities will be able to work towards a vision for the future, identify the needs of the community, investigate feasible solutions and act to set priorities for action.

To begin this process, you can either click on “BEGIN” at the bottom of this page, or “Step 1. Put together a planning team” below. You do not have to finish all five steps at once. Please go through each step in order. As you complete each step, you will hit a “Submit” button at the bottom of the page. You will then be directed to move on to the next step. You may choose to do so, or you may want to continue at a later time. You can come back to this page at any time and click on the link for the next step in the process below.

Step 1. Put together a planning team
Step 2. Develop a vision for the future
Step 3. Define your community needs
Step 4. Identify feasible solutions
Step 5. Set priorities for action (with schedule)

www.jcnerr.org
Conclusions and Next Steps

• Observatory Scientists should include in their science plans mechanisms to improve and increase the frequency of connections/interactions made between the observatory science community and the public (educators, students, coastal managers, and the public).
• The Mid Atlantic COSEE is conducting a national baseline survey of observatory scientists (Fall 2003) to measure “their involvement in education and outreach” over the COSEE 5 year effort.
• A website called Scientist Connections is in development to assist the observatory scientists in making good decisions on their investment in educational programs.
What you said you needed....

1. “Basically time and funds”.

2. “Assistance is required to place science information of a technical nature into manageable material for the classroom. I think I am able to do science well as educators are able to educate well. There is a missing link between the two and that will not be filled by sending the scientists to the classroom to put the kids to sleep. It will be met by involving educators in the science realm over summer breaks to develop science curricula”.

3. “More time and resources I guess. So busy trying to keep the lab going it is hard to find time to do outreach activities. Though I recognize that as being important for the general good, they are not a high priority on a day-to-day basis”.