The Mid-Atlantic Center for Ocean Science Education Excellence (COSEE)

Rutgers University – Institute of Marine & Coastal Sciences (IMCS)

University of Maryland – Center for Environmental Science

Hampton University

Stevens Institute of Technology- Center for Improved Engineering & Science Education (CIESE)

New York Aquarium

Virginia Institute of Marine Science (VIMS)

WordCraft

Chesapeake Bay Foundation
How the Mid-Atlantic COSEE came to be:

- May 2000 NSF Workshop to define COSEE (attended by RU)
- March 2001 NSF – committee met to draft the RFP
- January 2002 – Over 40 proposals were submitted to NSF
- Spring 2002 – Mid-Atlantic COSEE was funded
- October 2002 – Mid-Atlantic COSEE held its first organizational meeting
National COSEE Distribution

8 Centers Funded Around the Nation

2. CA-COSEE (LHS, MPC, SIO)
3. COSEE West (USC-Wrigley, UCLA, LA County Museum of Natural History, College of Exploration)
4. Florida COSEE (USF, Florida A&M, Consultants)
5. Gulf COSEE (USM, Dauphin Island Sea Lab, LUMCON)
6. Mid-Atlantic COSEE (Rutgers-IMCS, UMD, Stevens Institute of Technology, VIMS, Hampton University, NYA, CBF, WordCraft)
8. Southeast COSEE (Univ. of South Carolina, et al.)
Mid-Atlantic COSEE

PI- Rutgers University
   - Project Coordination
   M. De Luca  J. McDonnell
   E. Simms, L. Weiss

Steering Committee

NY Aquarium
   - lead on informal education programs

Evaluation-WordCraft

CIESE- Stevens Institute of Technology
   Liesl Hotaling (CO-PI)
   - lead on curriculum enhancement

University of Maryland
   Laura Murray (CO-PI)
   - teacher training program
   - development of grad assistantships

Chesapeake Bay Foundation

Virginia Institute of Marine Science (VIMS)
   Michael Newman (CO-PI)
   - lead on development of distance learning

Hampton University
   PI – Deborah Bodolus
   - Lead on diversity programs
Mid-Atlantic COSEE

Promote life long learning using coastal observing systems in NJ, NY, MD, and VA

• Promote the effective use of information technology
• Foster inclusion of underrepresented groups in the ocean sciences
• Facilitate professional development for K-12 educators
• Develop, identify, and distribute exemplary curricula
• Promote the education of public audiences
Coastal Ocean Observatories

Collections of instruments that provide long-term, continuous data, often in real-time or near real-time, for the purposes of:

- Detecting and forecasting oceanic components of climate variability
- Facilitating safe and efficient marine operations
- Ensuring national security
- Managing resources for sustainable use
- Preserving and restoring healthy marine ecosystems
- Mitigating natural hazards
- Ensuring public health
MA-COSEE Advisory Committee

Advisory Committee will meet twice a year at a convenient location in the Mid-Atlantic region (videoconferencing will be used in future meetings)

Advisory Committee Charge:

• Provide feedback and guidance on strategic directions of the Mid-Atlantic COSEE
• Provide recommendations on program implementation plans, facilitation of contacts and connections to key organizations and people
• Provide guidance/assistance in fund raising for COSEE programs or products.
Mid-Atlantic COSEE Task Categories

- Curriculum Development & Enhancement
- Professional Development for a Variety of Audiences
- Distribution and Marketing of Products & Services
- Evaluation
Focused on unique and compelling applications of scientific data for middle and high school audiences

**COOL Classroom**: Initiated by Rutgers University to utilize data from the Long-term Ecosystem Observatory (LEO) and the Coastal Ocean Observation Laboratory (COOL).

**Gulf Stream Voyage**: Developed by CIESE at the Stevens Institute of Technology

**Non-Point Source Collaborative Project**: Developed by CIESE
Curriculum Development & Enhancement

C.O.O.L. Classroom

www.coolclassroom.org

Introductory Lessons

Problem Based Lessons

Data Collection & Analysis
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.
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.

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**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.

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**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.
Welcome, Teachers!
Here you will find information about how to use the COOL Classroom, the Students' COOL Projects, and printable teaching guides for each of the clusters.

Teaching Students' COOL Projects in the COOL Classroom
These project clusters allow you to use real-time ocean observation data to validate concepts that your students are learning in the classroom. The lessons are grouped by content area: Biology, Geology (Earth Sciences), and Physics. The projects are designed to help students learn to interpret data and analyze its meaning. Each cluster can either stand alone, or be used in conjunction with other clusters to develop greater understanding and skills. All projects can be linked to topics frequently presented in science classrooms.

Each cluster is designed with the same structure:

Assumption of Prior Knowledge: The content you should cover prior to engaging in the activity.
Introductory Lesson: Designed to help develop the skill of interpreting real-time data.
The Gulf Stream Voyage is an online multidisciplinary project for grades 9 – 12 utilizing both real time data and primary source materials. Students access real time ocean data, atmospheric data and historical primary source materials to discover the science and history of the current.
Oceans Connecting the Nation will be an online collaborative project for grades 6-8 & 9-12 designed to develop an understanding that everyone, independent of geographic location, is connected to the ocean. Core activities associated with the project will involve the study of Non-point Source Pollution (NPS). Students will conduct water quality testing of major local source to determine the levels of pollutants and share results.
Community College Outreach Effort
Enhancement of Alliance+ Project

- $9.3M U.S. Dept of Education TICG Grant
- 5 year program in Phoenix, Miami, Cleveland
- Training 10,000 teachers over 5 years
- Community College partnerships: two-tiered turnkey training program
- 30-hour Savvy Cyber Teacher hands-on course on “unique and compelling” Internet application for K-12 science curricula
- Mid-Atlantic COSEE will offer training on COSEE products (COOL Classroom & Gulf Stream Voyage) to selected Community College faculty
Professional Development

Evaluation of C.O.O.L. Classroom and Gulf Stream Voyage:

Three Treatment Study with 24 educators (MS/HS):

I. No training (use the site with their own preparation)
II. Asynchronous teacher training module (via Internet)
III. Face-to-Face teacher training (Weekend in May 2003)
National Estuarine Research Reserve
Coastal Training Program

“Science to Management”
- Educational Seminar Series
- Technical Training Series

• Needs Assessment and Market Analysis
Professional Development for Middle/High School Educators

Coastal Ocean Ecology: Integrating Science and Education

A Mid-Atlantic COSEE course based on real-time data from coastal observing systems
Coastal Ocean Ecology Course - Objectives

To provide educators with:

• A working knowledge of coastal ocean habitats

• Insight into current research in these respective topic areas

• Use of internet published real-time or near real-time data from coastal observing systems and other remote sensing methods to augment themes

• Access to tools that assist in bringing the experience to the classroom.
Coastal Ocean Ecology Course - Themes

- Watersheds
- Wetlands
- SAV systems
- Dunes and Beaches
- Open water (pelagic)
- Benthic systems
- Marine Pollution

• Course will use the unifying theme of Coastal Observatories
Coastal Ocean Ecology Course - Description

- Two-week course aimed at middle/secondary school educators
- General introduction lectures centered on themes
- Lectures from scientists from the COSEE partner institutions
- Field/lab activity based on the research topic
- Real or near-real time data
- Data from Coastal Observing Systems ([http://www.csc.noaa.gov/coos/index.html](http://www.csc.noaa.gov/coos/index.html)).
Coastal Ocean Ecology Course - Development

2003

- Develop (spring) and implement (summer) a pilot course
- Select 3 teachers from each state (Course total = 12)
- One teacher from each state will spend the entire summer in training as a master teacher
- Graduate students will be instrumental in course and applications development
- Development of applications to the classroom
- Posted on COSEE website
Coastal Ocean Ecology Course - Development

2004-2007

Each year:

• The course will be offered to 20 teachers at each partner institution

• COSEE partners will exchange experiences via interactive video network (IVN)

• COSEE partners and master teachers will develop additional applications; test in the classroom

• Posted on the COSEE website
Coastal Ocean Ecology Course - Participant Selection

- Competitive application
- Nominations and recommendations from administrators, science educators, peers
- One teacher in each region for a 7 week fellowship
- Teachers funded to participate
Coastal Ocean Ecology Course (Days 1-2)

Watershed

• Lecture: Land to water: Connections from land to estuaries to oceans (LM Presentation)

• Field: Stream ecology and water quality

• Watershed cont.

Computer/Applications:
Land Use and Water Quality using GIS. Tom Fisher
Wetlands

- **Lecture**: Wetland ecology: Unifying principles, importance, types
- **Field**: Sea Level Rise and Wetland Loss: Analysis of sulfide intrusion in mesohaline marshes. Court Stevenson
- **Computer/applications**: Wetland CD (completion date, Jan 2003). Murray, Stevenson, Whitelock
SAV Ecology

- **Lecture:** Ecology of underwater grasses: types, habitats, value, problems
- **Field:** Light limitation for SAV, GIS mapping of seagrass beds

- **SAV Ecology, cont.**
- **Computer/applications:** SAV Ecology CDs. Murray and Melton (mostly complete), Lathrop & Haag et al. (completed)
Dunes and Beaches.

• Lecture: Ecology of coastal beaches and dunes
• Field: Barrier island ecology
• Computer/applications: TBA
Coastal Ocean Ecology Course (Day 7)

Open waters/Coastal Observing Systems

- Lecture: General ecology of open water habitats
- Field: Water quality sampling at CBOS station
- Computer/applications: Coastal Ocean observing systems (CBOS, LEO-15, [http://www.csc.noaa.gov/coos/index.html](http://www.csc.noaa.gov/coos/index.html)) (needs more work)
- Tom Malone: Status of COOS and GOOS
Remote sensing of coastal oceans

- Lecture: How and what is measured. Raleigh Hood
- Field: Chlorophyll analysis
- Computer/applications: Comparison of chlorophyll in Chesapeake Bay for wet vs. dry years. ([www.cbrsp.org](http://www.cbrsp.org)) (complete)
Coastal Ocean Ecology Course (Day 9)

Benthic systems

- Lecture: Ecology of coastal benthic systems
- Field: Oyster ecology; sediment sampling; reef, mud and sand communities
- Computer/applications TBA
Coastal Ocean Ecology Course (Day 10)

Marine pollution

• Lecture: Toxics in marine systems. M. Newman
• Field: ???
• Computer/applications TBA
Distribution and Marketing of Products & Services

Development of Web Products to market

and

Distribute Mid-Atlantic COSEE products
INTEGRATED GOALS OF COLUs Production
Provide learning modules for teacher training

Provide learning modules for 6-12 grade classes & public

Provide audiovisual aids for teachers
  Organized around Web-based modules
  Linked to sources of more information
  Indexed to state Standards of Learning (SOL)
  Includes color overheads and FLASH files
COLUs will be produced initially for seven topic areas covered in the MA-COSEE course – Coastal Ocean Ecology

- Watersheds
- Wetlands
- SAV Systems
- Dunes and Beaches
- Open Water (pelagic) Systems
- Benthic Systems
- Marine Pollution
- (Coastal Observing Systems)
COLUs Structure

- Web-based Module
- FLASH Materials
- Education Standards
- Color Overheads
**COLUs: Web-based Module**

**Use:**
- Teacher learning in course
- Classroom workstation
- View to initiate discussion

**Segment A**
**Self Test A**

**Segment B**
**Self Test B**

**Segment C**
**Self Test C**

**Summary Segment**

**Segment:**
- FLASH based programs with voice-over narration
  - Audiovisual vignettes within each segment (voluntary access)
  - Link to e- and paper references
  - Professional but accessible
Pollution COLU Segments

What is pollution?

Why should I care?

Video-Vignette
The Boomarang Paradigm

Video-Vignette
How bad is it?

Video-Vignette
Wise partnership with nature

What can I do?

Discussion

Summary
Augmenting the Web/CD-based Materials

Goal: To foster teacher use of materials in teaching situations with different levels of resources and administration priorities.

PowerPoint ® Materials
Supplied for teachers to use to develop their own lectures based on or enriching COLU Web or CD venue.

Color Overheads
Supplied also for teacher customized presentations of concepts/information in the classroom.

Standards of Learning (SOL) Index of Materials
Supplied to allow the teacher to quickly and effectively identify the SOLs that the materials support.
Sequence of COLUs Production

FIRST PRIORITY
SAV Systems: Considerable interest, materials and information are currently available this COLU.
Marine Pollution: Strong interest and primary area of expertise of M. Newman

UNDEFINED PRIORITY
Watersheds
Wetlands
Dunes and Beaches
Pelagic Systems
Benthic Systems
Family Programs

The New York Aquarium is the Mid Atlantic COSEE partner most oriented to public (family) audiences. As a COSEE partner, NY Aquarium staff will:

1. **Develop Docent Activities for the Public**: Docents will engage Aquarium visitors in COSEE-related activities on Earth Day and selected weekends (Ocean Immersion – Celebrations - Festivals in regional schools – associated with MARE).

2. **Design a brochure** for distribution at the Aquarium that will both engage visitors in the exhibits and introduce them to COSEE and its mission.

3. With partners, begin investigating how a COSEE presence can be integrated into selected Aquarium exhibits (with additional funding sources).
COSEE Evaluation

• Evaluation is…
  – the systematic collecting, analyzing and reporting of data (quantitative and qualitative)
  – about our audiences’ knowledge, skills, behaviors and/or attitudes
  – regarding specific content
  – for the purpose of making informed decisions about programming

• Evaluation is not necessarily…
  – research (with experimental treatment & control groups)
Evaluation Plan

- Front-End
  - Needs Assessment
  - Benchmarks
  - Baseline

- Formative
  - Program Improvement
  - Product Improvement
  - Baseline Comparison

- Summative
  - Worth
  - Merit
  - Baseline Comparison

Year 1  Years 2 to 4  Year 5
COSEE Evaluation: Year 1

• Front-end
  – Needs assessments
  – Benchmarks/
    Best practices
  – Baseline

• Formative
  – Program/product
    improvement
COSEE Audience Changes
for baseline

Our audiences will
• gain/acquire new knowledge about the coastal ocean environment.
• gain/acquire an affinity toward and appreciation of the coastal environment.
• use partners' real-time observatory data for teaching, decision-making, recreation, etc.
• use web-based and computer-based tools to teach, make decisions and/or answer questions related to the coastal ocean environment.
• experience and gain a better understanding of what scientists do/what teachers and the public need.
• improve interest in (by the public) and communications about (by scientists and decision makers) coastal ocean environment processes and issues.
• become more active stewards of the coastal ocean environment.
• turn to COSEE partners to answer questions or learn more.
• Now that you know more about COSEE and our plans, how do you hope our audiences will be different after 5 years? What impact would you like to see us make on the region? What impacts do you think are reasonable?
2. In your opinion, what strategies should we use to improve the connection of the Ocean Sciences to national systemic efforts to improve awareness, understanding, and use of scientific data in the classroom? Options discussed include (1) strengthening the correlation of materials and programs with both the National Science Education Standards (NSES), and the AAAS Benchmarks (2) influence the creation of new text books and materials to include the Ocean Sciences, and (3) advocating the amendment of the NSES to include the Ocean Sciences. In what ways might the COSEE partner institutions and advisors pursue the most promising of these strategies?
3. Our Mid-Atlantic COSEE offers a unique public venue through the NY Aquarium. Can you suggest education and outreach strategies for COSEE that focus on families?
4. The Jacques Cousteau National Estuarine Research Reserve is a partner in the Mid-Atlantic COSEE. The Reserve offers numerous workshops and products to the coastal decision-making audience. Please comment on our plans to scale up delivery of products/services to the coastal management community.
5. One of our COSEE tasks includes improving communication and collaboration between the scientific community and our COSEE target audiences (teachers, families, minorities, coastal managers). Our plan is to use graduate students (trained in the sciences) to act as “scientists in residence”- proposal task #5). Can you comment/suggest strategies to meet this objective.
6. A major goal of COSEE is to increase minority participation in the ocean sciences. Do you have any thoughts/concerns/feedback on our plans to improve minority participation in the Ocean Sciences.
QUESTIONS FOR OUR ADVISORS

7. What (evaluation) data would say to you that we had made a difference/had a positive impact?

8. Do you have any concerns about/issues with the evaluation plan proposed for the five years? Any thoughts/suggestions about the baseline survey and its use to evaluate COSEE over the five years?
9. How can we market COSEE?

10. Can you suggest additional fundraising strategies, grant opportunities, etc to help us achieve an operation and sustainable budget?