

A Role for LTER in Marine Science Education

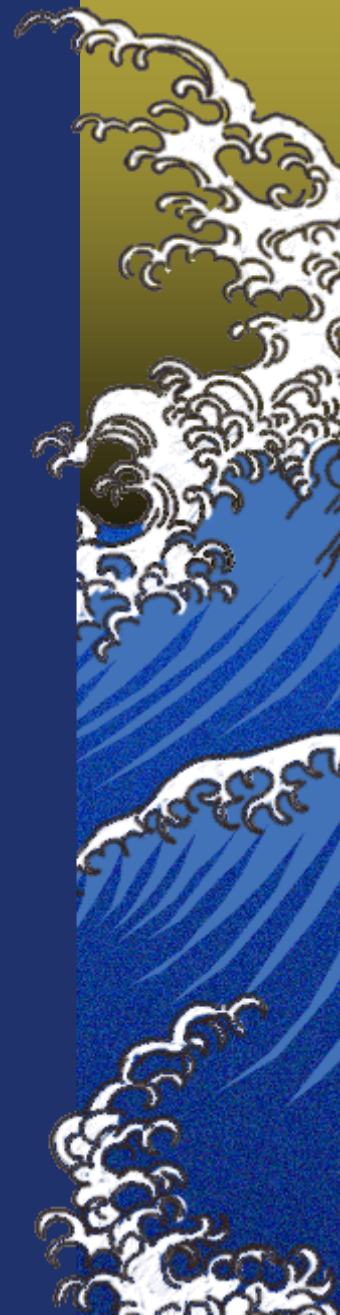
Ali Whitmer, PhD

Santa Barbara Coastal LTER

Moorea Coral Reef LTER

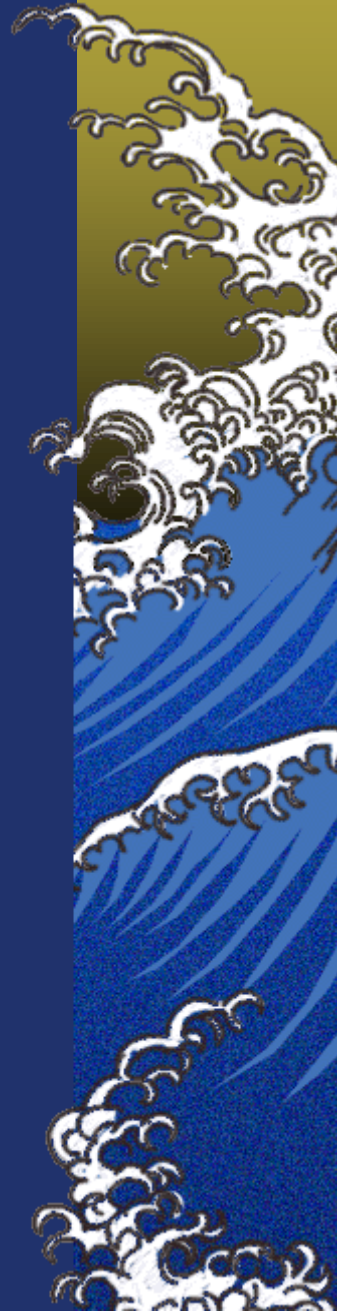


*Marine Science Institute
University of California Santa Barbara*



Outline

- ▶ *Ocean literacy*
- ▶ *A role for LTER in ocean science education*
- ▶ *LTER marine education strengths*
- ▶ *LTER program highlights*
- ▶ *A vision for the future*



What do people know about oceans?

- ▶ 1999 – National survey on the public's connections, values, attitudes and knowledge about the ocean. (The Ocean Project)
- ▶ In general, Americans express a strong emotional connection to the oceans and appreciate its recreational value and natural beauty.



However...

“Americans possess a superficial knowledge about the oceans. The public knows generally that the oceans are essential to human survival and that we need to protect them. However, many are unaware of the specific functions of the oceans and their own part in damaging the health of the oceans.”

(Belden Russonello & Stewart/American Viewpoint)



Need for Ocean Literate Society

- ▶ Creating an Ocean Literate Society
Vice Admiral Lautenbacher, Jr. NOAA, (June 5, 2002)
- ▶ NMEA Letter to US Commission on Ocean Policy
September 2002
- ▶ America's Living Oceans: Charting a Course for Sea Change
Pew Oceans Commission, May 2003
- ▶ A National Strategy to Improve Ocean Literacy and Strengthen Science Education Through An Improved Knowledge of The Oceans and Coast
Ocean Research Advisory Panel & National Oceanographic Partnership Program



Ocean Literacy Efforts

▲ Northeast COSEE – Working definition

“Ocean literacy is the awareness and understanding of a set of fundamental ideas, perspectives, or big picture concepts about the ocean that every citizen should have.”

- ▲ The ocean makes the planet habitable.
- ▲ Ocean and terrestrial systems are linked.
- ▲ The distinct properties of the ocean create distinct habitats and ecosystems.
- ▲ Humans and oceans are intimately linked.



Ocean Literacy Efforts, cont.

- ▶ What Every Student Ought to Know About the Oceans (July 2004)

Robert Stewart, Texas A&M University, and colleagues along with the National Marine Educators Association

- ▶ Online Workshop on Science Content and Standards for Ocean Literacy (October 2004)

Francesca Cava, National Geographic Society

Sarah Schoedinger, NOAA

Craig Strang, Lawrence Hall of Science, UC Berkeley

Peter Tuddenham, College of Exploration



A Role for LTER in Marine Education

- ▶ LTER educators and researchers provide significant ocean science education programs for multiple stakeholders
 - ▶ *K-12 students*
 - ▶ *Pre-service and in-service teachers*
 - ▶ *Undergraduate and graduate students*
 - ▶ *General public*



Strengths of LTER Marine Education

- ▶ A wide diversity of marine ecosystems, particularly coastal areas
- ▶ Network structure allows for coordinated efforts
- ▶ History and culture of integrating research and education
- ▶ Long-term projects = long-term education
 - ▶ Long-term relationship with formal and informal education programs
 - ▶ Evaluation and assessment
 - ▶ Impact diversity and resource issues



LTER Education Program Highlights

- ▶ Examples from marine LTER education programs
 - ▶ Forging Partnerships
 - ▶ Materials Development
 - ▶ Community Integration
 - ▶ Interdisciplinary Science Training



Forging Partnerships

Plum Island Ecosystem LTER & Massachusetts Audubon Society

Liz Duff and April Ridlon



Programs work together to provide teacher professional development and student research programs.



Middle school students study the invasive reed *Phragmites* at the Parker River Wildlife Refuge.

10/30/2001

Forging Partnerships

Florida Coastal Everglades LTER & Everglades National Park

Susan Dailey & Doug Vogel

Park ranger training program integrates FCE science into the ENP interpretive ranger training. More than 1/2 million visitors interact with ENP rangers each year.



Forging Partnerships

Georgia Coastal Ecosystem & Georgia Schools

Patricia Hembree

- SAPELO: Pairs teachers with researchers for field-based research.
- Partners with Georgia schools and school districts
- Evaluation shows increased confidence, content and practice knowledge.



▲ Forging Partnerships: long-term programming facilitates relationships among partners

- ▲ Opportunity to develop programs with shared goals
- ▲ Increase service and expand reach of LTER science
- ▲ Provide long-term, science-based teacher professional development
- ▲ Evaluation demonstrates long-term involvement increases trust and willingness to partner

▲ Materials Development

▲ Community Integration

▲ Interdisciplinary Science Training



Materials Development

Santa Barbara Coastal LTER

Ali Whitmer, Jenny Dugan, Ed Beighley & Peter Allen

A Virtual Tour of Arroyo Burro Creek & Watershed

This virtual tour of the Arroyo Burro watershed will help you learn about:
(1) the importance of our watershed resources,
(2) connections between watersheds and coastal ocean ecosystems,
(3) how human activities can affect these ecosystems

The tour has three parts which you can use in any order you like



Fly over the watershed

Runoff animation

Natural history connections



Created by SBC LTER in collaboration with



Watershed Resource Center, funded by



National Science Foundation

The virtual watershed tour is a computer-based module of a larger environmental literacy curriculum. Built for use in both formal and informal settings.



Interactive learning materials based on current data from the SBC-LTER. Models can be updated and materials can be added over time.

Materials Development

Virginia Coast Reserve LTER

David Smith



Environmental Science II

- Students collect water chemistry, temperature, plant biomass, GPS data
- Students analyze data in class
- Students present findings at the end of the course



✦ Forging Partnerships

- ✦ Materials Development: educational materials based on real data and science practice
 - ✦ Brings locally relevant data to students and public
 - ✦ Evaluation suggests gains in both general science and ocean science content knowledge for all participants
- ✦ Community Integration
- ✦ Interdisciplinary Science Training



Community Integration

Moorea Coral Reef LTER

Ali Whitmer



Atitia Center focuses on exchange of current scientific and traditional knowledge of Polynesian ecosystems.



Culturally responsive educational materials can be developed and evaluated in Moorea and the US.

Community Integration

Palmer Station LTER

Beth Simmons

Participation in Scripps' Open House

Survey Results: (n = 113)

- Understanding distinctions between the Arctic and the Antarctic was low for those aged 8 – 20.
- Desired communications with science research teams was on average 80%. (Teachers = 100%)



- ▲ Forging Partnerships: long-term programming facilitates relationships among partners
- ▲ Materials Development: educational materials based on real data and science practice
- ▲ Community Integration: consistent, up to date, relevant educational programming
 - ▲ Gauge public understanding and needs
 - ▲ Customize programming to be locally and culturally responsive
- ▲ Interdisciplinary Science Training



Interdisciplinary Science Training

Moorea Coral Reef, Santa Barbara Coastal, Palmer Station LTERs



Long-term ecological research projects provide an opportunity to engage undergraduate students in interdisciplinary research across multiple ecosystem types.

Interdisciplinary Science Training

California Current Ecosystem LTER

Mark Ohman (PI), Beth Simmons



The LTER Approach to Ecosystem Research

Focus of Seminar:

- creation of the NSF LTER network,
- time dimension in ecology, and the
- feasibility and merits of comparative study across diverse ecosystems

Planning for the Future

- ▶ LTER Planning Grant identified education as a necessary and integrated component of LTER synthesis
- ▶ Education and Outreach working group
 - ▶ LTER education program directors
 - ▶ LTER scientists
 - ▶ Science education researchers
 - ▶ Informal education specialists
- ▶ Including ocean science education partners
 - ▶ NOAA – National Marine Sanctuaries
 - ▶ GLOBE – NASA, NSF, US Dept. of State
 - ▶ USGS



Focus on Environmental Literacy

- ▶ Cross-site, regional, network-level focus on:
 - ▶ Develop exemplary teaching and learning programs
 - ▶ Conduct research to understand what we need to know to effectively reach a diverse audience
 - ▶ Impact the broader education system, including state boards, textbook publishers, education standards committees, etc.



Who Does the Work of Science?

Improving Science Literacy

Beth Simmons – PAL/CCE

Linking reading and writing
with marine science research

Author: *Mary Cerullo*

Sea Soup Zooplankton

Author: *Lucy Bledsoe*

Antarctic Scoop



Potential New Collaborations

Santa Barbara Coastal Niwot Ridge LTER

Ocean literacy for everyone.

