

Supporting and Extending the SEACOOS Program: The Extension and Education Work Group

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Introduction

A complementary Extension and Education (E&E) component provided outreach of the observations, collection and analysis of data from the Southeast Atlantic Coastal Ocean Observing System (SEACOOS). Outreach extended to stakeholders who could apply this new source of information and to educators in formal and informal situations. Extension activities were operated through the Sea Grant Extension Programs of North Carolina (NC), South Carolina (SC), Georgia (GA) and Florida (FL). Education activities were channeled through the three Centers for Ocean Sciences Education Excellence (COSEE) in the SEACOOS domain, and the University of Georgia Marine Extension program. E&E Work Group (WG) activities included identifying stakeholders and their needs, increasing awareness of SEACOOS and ocean observing systems in general, and developing concepts for potential products.

This document is one of seven articles in this special edition of the MTS Journal dedicated to SEACOOS. One objective is to provide a basis of SEACOOS experiences and lessons learned that can contribute to the further development of the Southeast

ABSTRACT

In addition to the observation, collection and analysis of data, Southeast Atlantic Coastal Ocean Observing System (SEACOOS) funding supported the development of a complementary Extension and Education (E&E) component. Extension activities were operated through the Sea Grant Extension Programs of North Carolina, South Carolina, Georgia and Florida. Education activities were channeled through the three Centers for Ocean Sciences Education Excellence in the SEACOOS domain, and the University of Georgia Marine Extension program. E&E Work Group (WG) activities included identifying stakeholders and their needs, increasing awareness of SEACOOS and ocean observing systems in general, and developing concepts for potential products. This article is designed to describe (1) how education and outreach functions were developed with SEACOOS funding to E&E Principal Investigators, (2) the “lessons learned” from the many collaborations, and (3) “best practices” gleaned from the four years of activity funding. Best practices for E&E included defining clearly the target audiences, identifying information needs, providing products appropriate to the audience, designing evaluations with a strong feedback loop, and developing long-term relationships between audiences and providers. This article is one of seven published in this special edition of the *MTS Journal* to provide a forward-looking discussion of future development of the Southeast Regional Coastal Ocean Observing System (SE RCOOS).

Regional Coastal Ocean Observing System (SE RCOOS) under the Southeast Coastal Ocean Observing Regional Association (SECOORA). The analysis of the five-year SEACOOS pilot study will assist further development of other regional and national coastal ocean observing programs.

Briscoe et al. (this volume) provide perspective on the evolution and current status of regional efforts relating to Global Ocean Observing System and U.S. Integrated Ocean Observing System (IOOS) developments. They clarify the relationship between Regional Association (RA) oversight of the Regional Coastal Ocean Observing System (RCOOS; the observing, data communications, modeling and information management components of the system) and national coordination through the National Federation of Regional Associations (NFRA; <http://usnra.org>). A program overview (Seim and Mooers, this volume) provides insight on the origins of SEACOOS, including adoption

of a work group organizational structure promoted by Ocean.US for integrated and sustained coastal ocean observing systems (Ocean.US Report #1, 2002). Within the constructs of this organization, the E&E WG was established at the onset of the SEACOOS project. The E&E efforts, tasks, lessons learned and best practices are included in this article. Activities of the other three other work groups (information management, modeling and observing) are considered elsewhere.

Evolution of Extension & Education Work Group Activities

1. Why an Outreach Component?

The broad definition of “outreach” is the act of reaching out or extending something. In the context of SEACOOS E&E, it describes the ways in which knowledge resources were transferred to internal (SEACOOS community) and external

audiences. The goal was to link the research to applications for the direct benefit of human enlightenment and enablement. Whether for the benefit of decision makers, researchers or ocean science literacy initiatives, the SEACOOS mission required engaging in effective interactions to connect research and development activities to the development of specific applications for RCOOS information. As the concept of RAs evolved, the mission expanded to work not only within the region, but with other regional associations and with federal IOOS partners. For our purposes, education refers to audiences relating to formal K-12 and informal learning centers while extension encompasses all other audiences (e.g. federal and state agencies, commercial and recreational fishermen, maritime industries, private sector businesses).

The SEACOOS program was first and foremost a research endeavor. Product development was contingent on, among other things, successful integration of multiple data streams. Concern was raised about the ability of the E&E WG to engage potential stakeholders prior to the maturation of the research program elements. Given that a central tenet of IOOS is that the system be relevant to societal needs, engagement of users is required. The question becomes “when to engage.” The SEACOOS PIs understood the need for clear identification of potential applications and user groups early in the timeline for construction of the RCOOS.

2. Leadership and Leveraging

Fostering two-way communication between researchers and application end-users, a linchpin of IOOS, is also a fundamental practice of Sea Grant Extension programs (Figure 1). With origins attributed to pioneer oceanographer Athelstan Spilhaus (Spilhaus, 1964), Sea Grant College Programs integrate scientific research, education and training, and technical assistance to provide information that is responsive to user needs and brings university expertise to solve marine-related issues. Thus, it was a natural fit for the Sea Grant Extension Programs in the

SEACOOS domain (NC, SC, GA and FL) to become the vehicle through which SEACOOS extension operated. Likewise, in 2003, three of the newly formed COSEE programs funded by the National Science Foundation (NSF) and National Oceanic and Atmospheric Administration (NOAA) became the core of SEACOOS education efforts. COSEE SouthEast—serving NC, SC and GA—COSEE FL and COSEE Gulf of Mexico were charged with increasing interactions between research and education audiences.

Primary Investigators (PIs) of the SEACOOS E&E WG consisted of leaders from the four Sea Grant Extension Programs and three COSEE programs in the SEACOOS domain. In year three, the University of Georgia Marine Extension leader joined the E&E WG. Organizationally, the E&E WG had a chair to represent the group on the SEACOOS Executive Committee. The chair position rotated among PIs, a strategy that allowed people with different areas of expertise in education and extension to provide leadership. Fiscally, the E&E WG received approximately eight percent of the total project budget. Funds were highly leveraged as the E&E WG made extensive use of partnering with Sea Grant specialists and agents, and COSEE staff to increase program impacts. During the five-year program, more than 55 months of unfunded

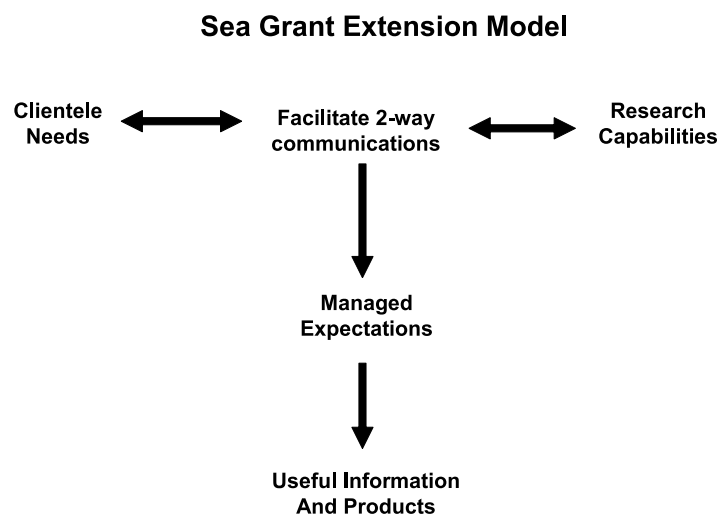
time was contributed by 22 individuals. The diverse areas of expertise represented include fisheries, tourism, conservation, Geographic Information Systems (GIS), communications, enterprise development, science education and administrative support. Additionally, time and expertise from members of other SEACOOS work groups, and collaborations with people from federal and state programs, industry and private sector businesses, and other regional associations allowed the E&E WG to achieve much more than would have been possible with SEACOOS funds alone. Combined, internal and external leveraging account for all major program impacts.

3. Establishment of Objectives

Stated in the SEACOOS Strategic Plan (<http://seacoos.org/>; see “documentation”) was the goal to significantly increase the quantity and quality of environmental information from the coastal ocean of the southeast U.S. and make this readily available for a range of societal, scientific and educational applications. Two specific core objectives fell within the scope of E&E WG activities: (1) promoting the use of coastal information by decision-makers, educators and the general public through outreach and education activities; and (2) coordinating with governmental agen-

FIGURE 1

SEACOOS model modified from Sea Grant Extension.



cies and the private sectors to enhance the development and efficiency of the observing system to expand economic opportunities.

In 2003, a year prior to completion of the SEACOOS Strategic Plan, the E&E WG convened a planning meeting to define program areas: (1) Identify stakeholders and their needs; (2) Increase awareness of SEACOOS; and (3) Develop concepts for potential products. The need to evaluate product impacts and program outcomes was also recognized. For assessing outreach efforts related to increasing program awareness, quantities of distributed printed information were tracked, as were the number of people engaged during various extension (e.g., boat shows and marine trade shows) and education (e.g., teacher workshops) programs. Focus groups, written surveys and other evaluation tools were options to be applied as needed.

Consistent with the program areas defined at the initial planning meeting and later in the SEACOOS Strategic Plan, the first products of E&E efforts included a user characterization study, an internal user needs assessment (<http://seacoos.org/>; see “documentation”) and a report describing the economic value of a regional coastal ocean observing system (Dumas and Whitehead, 2008). Supporting the COSEE and the national goal of improving ocean literacy to create a more scientifically literate workforce and citizenry, education efforts were focused on developing products that would allow informal educators, teachers and students to become aware of coastal ocean observing systems in the region and pilot strategies to bring ocean data into the classroom. The approach satisfied the SEACOOS goal of promoting the use of coastal ocean data by educators and COSEE’s desire for an interdisciplinary approach to ocean science education.

4. Product: The User Characterization Assessment

The SEACOOS user characterization assessment was significant in that it greatly influenced subsequent efforts of the entire SEACOOS program. Eleven

major categories of users were identified, along with the most commonly requested information (wave, current and wind data). More importantly, the initial characterization of user groups indicated that a useful designation be made between “super-users” (groups accustomed to large amounts of data and who often are product generators), and more casual users (those who typically require tailored information products). The concept of Thematic Areas-cross-work group projects targeting specific super-users evolved from the survey.

Super-users were selected to ensure that SECOORA and the RCOOS developed a vocal constituency willing to advocate for funding, and because many required the unique, accurate, real-time representations of ocean circulation SEACOOS provided. Identified users included the U.S. Coast Guard for search and rescue applications and NOAA HAZMAT for spill response and nowcasts/forecasts of pollutant dispersal. Development of applications for the National Weather Service (NWS) Weather Forecast Offices (WFO), state and federal emergency managers, and fisheries oceanography were also explored.

The user characterization survey made it clear that within the four-state SEACOOS footprint, there are differences in both the types of information available regionally and the types of information users. The E&E WG recognized that in order to maximize work group resources, product development needed to show regional synergy, while retaining local relevance. A framework classifying activities according to regional, sub-regional and local target audiences was adopted. Framework categories included (1) facilitated researcher/user interaction on a region-wide and sub-regional scale; (2) increased public awareness of SEACOOS to the general public and targeted public audiences; (3) provided SEACOOS internal program development that could improve communications among the four work groups; and (4) provided a transition structure for SEACOOS E&E activities to merge with SECOORA.

Summary of Annual Activities

Annual activities are described with reflection of the “lessons learned.”

1. Year One: January, 2003 – August 31, 2003

Activities. Development of Web-based communication as the primary dissemination mechanism for SEACOOS data and the needs assessments were two primary activities conducted in Year One. The E&E WG evaluated various web sites to determine the strengths and weaknesses of web-based outreach programs. Feedback was provided to the SEACOOS web master who incorporated ideas into the E&E web pages of the www.seacoos.org web site. The E&E WG also hosted its first workshop to engage stakeholders, bringing together 32 participants to identify projects and link various state, federal, academic and private sector extension representatives. Even with effective teleconferencing and web-based communication tools, the value of face-to-face meetings cannot be overestimated.

Reflection. It is important to note that, with the exception of the Education Specialist (2005-2006) and an E&E Project Coordinator (2004-2007), all other work group members had non-SEACOOS-related work obligations and volunteered time. Challenges to product development related to the maturation of the observing system in the early years, and major funding cuts in later years. Progress was often the result of serendipitous and opportunistic partnerships and often did not have time for planned formative and/or summative evaluations. Therefore, an important lesson is to report quantitative and qualitative metrics at every opportunity—planned or not. These are critical to demonstrate value and to secure sustainable COOS funding. Regional Association planners must be cognizant of this and willing to fund or support the assessment efforts. Though complicated by the need to be responsive to new information and opportunities as they became available, it would have been beneficial in the first year for the E&E WG to create its own strategic plan, including performance metrics.

2. Year Two: September 1, 2003 – August 31, 2004

Activities. The development of E&E products, presentations at regional and national meetings, working one-on-one and with user groups, site-specific demonstration projects, and coordinating efforts between states and projects were activities to increase awareness of SEACOOS. A second survey conducted in partnership with The Coastal States Organization using the web, targeted the identification of research, information and technology needs of coastal managers. A regional outreach coordinator was hired to serve as the principal regional connection between users and the SEACOOS work groups.

Reflection. Launching the SEACOOS E&E web pages was significant because it centralized the dissemination of information. The first of a series of education posters, Making Waves, was produced and disseminated to excite students and teachers about oceanography, and to guide them to supporting materials and activities located on the SEACOOS web site. Evaluation consisted of tracking the distribution of the 10,000 posters disseminated via the Sea Grant and COSEE program offices. The web site also allowed the first of many teacher workshops emphasizing SEACOOS research to utilize real-time data, specifically the unique integrated products being generated by the SEACOOS Information Management work group (IM WG).

During initial interactions with educators and coastal managers, three potential issues became apparent: (1) The E&E WG needed to have more effective communication with other SEACOOS work groups, particularly the IM WG; (2) Web development for the E&E pages was going to be challenging—lacking dedicated personnel support and not having a clearly defined audience; and (3) Strategies were going to be needed to accommodate educators if they were to be able to incorporate SEACOOS information into their standards-based curricula. Compared to other user groups, most teachers and students have considerably limited capabilities in

terms of access to computers with adequate processing power.

On reflection, an obvious solution to the communication issue would have been to establish cross-working group liaisons to develop stronger links between the data management group and stakeholders. SEACOOS has excellent examples of the effectiveness of this strategy, employed for the Product Interface Committees—teams representing all work groups and external (federal, state, industry) experts who worked together to address specific problems. However, for the pilot RCOOS, few full-time staff and many of those graduate students (leading to high turnover rates) precluded long-term liaisons.

3. Year Three: September 1, 2004 – August 31, 2005

Activities. An exciting development was the creation of the Jennette's Pier Observing Partnership Education Kiosk in North Carolina, the result of grassroots extension efforts. Visitors to the pier gained access to near-real-time data and could learn about the meteorological and oceanographic instruments via a screen kiosk. In addition to a "surf cam" which broadcast views of the ocean near the pier, a big attraction for the recreational surfers, boaters and fishermen was that the kiosk provided Coastal Ocean Dynamics Applications Radar (CODAR) data, educating viewers about surface currents in the Outer Banks region. The collaboration with SEACOOS, the NC Sea Grant Extension Program, the North Carolina Aquarium Society, the University of North Carolina Coastal Studies Institute, Surfchex, the Outer Banks Boarding Company and the U.S. Army Corps of Engineers demonstrated for the first time a community's willingness to support SEACOOS data.

Reflection. The SEACOOS User Needs Workshop for Georgia served to prioritize COOS data needs of commercial and recreational fishing industries, marine operators and emergency managers (workshop report available on the program web site). It was a considerable challenge to include

emergency managers as 2005 brought major hurricanes into the region—Dennis, Emily, Katrina, Rita and Wilma. It became clear that the E&E WG was missing important opportunities to broaden engagement with the public and various user groups by not having more hurricane-related information available. Mechanisms should be established to allow responsiveness to environmental "events," both in terms of bringing resources to bear on finding solutions to problems and delivering time-sensitive products.

SEACOOS was involved with two workshops, the National IOOS/COOS Education Workshop (Ocean.US Report #4) co-hosted with COSEE SouthEast, NOAA Coastal Services Center and Ocean.US, and the SEACOOS Extension Workshop (workshop report available on the program web site). Bringing together researchers, extension specialists and science educators from different, often culturally diverse communities, ensures that targeted applications and products developed by the RA complement other regional efforts and missions. (See the summary report, Best Extension Practices, Report from the SEACOOS Extension Workshop, for a more detailed explanation.)

4. Year Four: September 1, 2005 – August 31, 2006

Activities. SEACOOS E&E WG momentum reached its peak in Year Four. With national COOS efforts underway, a wealth of real-time data and modeling information being generated by SEACOOS, and armed with the reports from the surveys describing users and their application needs, the E&E WG was poised to generate a variety of products. The E&E WG continued to increase connections between users and emerging information from the science community.

Several high-profile products were launched in Year Four including four touch screen kiosks displayed on public piers and at informal education centers, and a media cruise, including Cable News Network (CNN), on the Explorer of the Seas, a SEACOOS partner vessel equipped

with a real-time monitoring system and public outreach program. Two COOS-related DVDs were developed for educators through the COSEE programs and 25,000 educational posters, Forming Hurricanes and Flowing Ocean: Understanding the Gulf Stream, were distributed nationally. These products all served to increase program awareness.

A noteworthy applications development project is the Carolinas Coast project (Dorton et al., 2007). SEACOOS E&E partnered with the Coastal Ocean Research and Monitoring Program (CORMP) and the Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS) to expand the Carolinas Coast Marine Weather Portal (see www.weather.gov/carolinascoast). The project, a collaboration with the NOAA NWS WFO in Wilmington, was pursued to improve weather forecasts and hazard warnings for the marine and coastal community in the Wilmington WFO footprint. Working with the NOAA NWS WFO in Ruskin, FL, guidelines for the expansion project, the Southeast Marine Weather Portal were outlined. The information was used for a proposal that subsequently was awarded competitive funds from the NOAA Coastal Services Center.

When the E&E WG learned that funding would be drastically reduced in Year Five, there was added urgency to transition E&E WG activities to SECOORA. The SECOORA Business Plan was being developed with outreach included in the Marketing Management section.

Reflection. Activities of Year Four emphasized the key issue of allocating sufficient resources to ensure development of products. Despite assessments conducted to identify a wide range of potential users and information needs, there was a lack of resources to deliver customized application products. Seim et al. (2008) proposed the idea of “forecast, applications and analysis centers” associated with the RA. Personnel dedicated to product development would be grouped in close proximity, maximizing resources and fostering strong communication among developers.

5. Year Five: September 1, 2006 – August 31, 2007

Activities. With the exception of support for a final program documentation effort, no new funds were allotted for the E&E WG in Year Five. Despite cuts, Year Four projects were continued using residual and leveraged funds, and partnerships were pursued to launch new programs, among them kiosks at the Roper Mountain Science Center (SC) and the South Carolina Aquarium. A fourth poster, Catching the Current: Who Goes With the Flow, was completed and 15,000 were distributed nationally.

Reflection. As a first step in the evolution of SEACOOS E&E activities, targeted stakeholder focus groups were organized to determine and prioritize the information demands. These meetings generated “wish-lists” of information needs and also refined the stakeholder profiles. The needs assessments revealed that stakeholders have significant differences in the complexity of information desired. The efficient SEACOOS data integration system promoted high-end products for super-users, such as researchers, the U.S. Coast Guard and the NWS. However, some of the less sophisticated data users could have benefited from less complicated data products. The Rutgers, New Jersey “Cool Room” approach is a good example of how information can be tailored to fishermen, surfers and other general public audiences (see <http://www.thecoolroom.org/>).

Summary of Lessons Learned from Extension & Education Experiences

Any complex project yields educational experiences for those involved. SEACOOS was no exception. The diverse audiences E&E activities targeted included the general public (recreational boaters, swimmers, fishermen, surfers, SCUBA divers), formal and informal education audiences, coastal resource managers, legislators, county, city, and state officials, and leaders in the tourism industry. A variety of E&E strategies were developed and tested for different

audiences. Initially, awareness products were broad in scope and developed for regional/national distribution and “marketing” of SEACOOS. Products included banners, bookmarks and decals with the program logo and “url” designed to promote the branding identity of SEACOOS and product recognition. As the program matured, stakeholder-specific products such as workshops, public exhibits, web-based activities and DVDs were developed. An ongoing challenge exists for creating metrics to assess the impacts of outreach activities and products.

The initial SEACOOS user characterization assessment led to the concept of Thematic Areas-cross-work group projects targeting specific super-users. The identified audiences were the U.S. Coast Guard, NOAA HAZMAT, and fisheries oceanographers—audiences that depend on sophisticated modeling products displaying physical state estimations of the ocean, particularly ocean currents. Engagement with these audiences is noticeably absent by the E&E WG. Looking forward, it is important to recognize that stakeholders differ in their level of sophistication; some require direct communication with those generating the data and fall outside the purview of E&E. However, for the vast majority of stakeholders, E&E provides important science-based interpretation of information.

The following section identifies five important lessons that were learned about conducting extension and education projects in a regional ocean observing project.

1. Relationship Building

Professional and business relationships are first and foremost personal relationships. One of the most important tasks that SEACOOS E&E undertook was developing lines of communications between stakeholders and researchers. This engagement of stakeholders must be a two-way communication to allow clientele to make their needs and preference for information known to researchers and conversely let researchers share with clientele a realistic view of what technologies and information can

be made available. E&E developed iterative and continuing processes hosting formal meetings, informal workplace interactions, focus groups, individual social interactions and continual feedback to both groups.

2. System Integration

Integration of activities from research, operations, data management, and information product development prevents the “stove pipe” organization and promotes feedback among the work groups—one key to success. Outreach efforts work best when they are integrated in all stages of planning. The regional association will need to invest in a well-articulated process for developing applications. This would include processes for the evaluation, validation, and verification of observations and model output.

3. Managing User Expectations

Targeted user groups must understand that the development of information products can be a long process and they must be engaged in the development to provide feedback. Promising too much too soon can lead to dissatisfaction for information users and frustration for researchers and extension specialists. Involvement of the users in the entire process can help ensure that they are aware of the realities of developing new information products and delivery methods.

4. Information Development and Private Business

Certain specialized information products are more appropriate for private enterprise development. Extension specialists should work from the start with representatives of the private business sector to provide assistance and, most importantly, encourage the efforts of value-added private business.

5. Education and Extension Strategies

Practices that apply to both education and extension activities include having clearly defined audiences, explicitly expressed information needs, evaluation designed with a strong feedback loop, and a focus on long-term relationships with clientele and educators. These practices result in establishing a more user-driven system that is responsive to real information needs. This in turn generates real support and enhances project longevity.

Summary

This review presents how the SEA-COOS extension and education outreach functions have been structured and developed. The activities and products resulted from practices intended to establish a user-driven system that is responsive to real information needs. The full scope of products, workshops and education programs developed by the SEACOOS Extension and Education Work Group is located on the SEACOOS website.

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