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Collaborative Research: Centers for Ocean Sciences Education Excellence - National Network Partnerships

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Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)	Annette V deCharon

Accomplishments

* What are the major goals of the project?

The goal of this award was for the National Centers for Ocean Sciences Education Excellence (COSEE) Office (NCO) to build capacity for the National COSEE Network through the development of internal and external Network partnerships.

Internal partnership activities allowed for the proliferation of effective ocean science education practices within the National COSEE Network (NCN). The internal partnerships took the form of:

- Establishment of COSEE Network Effective Practices workshops
- Coordination with COSEE Centers to produce nationally distributed materials

The development of external partnership and collaborative activities allowed for the penetration of NCN activities, products, and programs to the broader science research and education community, particularly those activities which facilitated the broader impacts of ocean science research. Partnership, collaborative, and brand awareness building activities included:

- Establishing a COSEE presence at several national society meetings
- Development of Memoranda of Understanding with several national societies and organizations
- Partnering with the aforementioned societies to deliver programs

*** What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?**

Major Activities:

The NCO provided support for internal and external capacity building. Activities related to the administrative, logistical, and resource support for the NCN, guidance and support for individual Centers, and the collaboration among the Centers and other organizations with similar or complementary interests. The NCO also facilitated, participated in, and supported NCN working groups. Activities funded through this award included the development of the Partnership and Collaborations Working Group and the implementation of its activities.

In preparation for the dissemination of Center information within and beyond the NCN, the NCO led the coordination and production efforts of several documents. The documents were tools for information distribution during national society meetings and the enhancement of branding efforts. Photos and information from each Center were collected to produce the COSEE accordion brochure and Center "one-pagers", one page profiles of each Center. The NCO developed a template for each Center to ensure uniformity in the documents. The NCO edited and printed the Center profiles, providing each Center with electronic and hard copies of the profiles and offered the profiles at the COSEE booth during national meetings.

Best Practice Workshops:

In another effort to promote internal Network collaboration, the NCO established the COSEE Network Best Practices workshops. Three Best Practices workshops were conducted, the first in 2009, with the theme of Best Practices in the Professional Development of Educators; the second in 2010, with the theme of Best Practices in the Engagement of Ocean Scientists in Education and Outreach; and the third in 2012, with the theme of Best Practices in Broadening Participation in the Ocean Sciences..

The objectives of each of these meetings were to:

- identify common elements across the Network
- develop a portfolio of examples of COSEE models based on published literature
- identify and discuss solutions to common challenges
- identify post-program engagement strategies

NCN Website:

The NCO develops and maintains the National COSEE Network website under the direction of Annette de Charon at the University of Maine. During the first years of construction and use by the Network, improvements and enhancements were identified to provide a more robust resource and tool. The funding reported herein provided the means to address needed improvements identified by the NCN Web Working Group (WWG). Some highlights of the activities are listed below and included in the attachment.

In 2013, the Web Working Group, working with Raytheon Web Solutions (RWS):

- Designed and developed Content Management System (CMS)-based templates for uploading and archiving high-level COSEE accomplishments (e.g. models, events, resources). The templates were unveiled for comments at the COSEE Network meeting in May 2013 and will be used to consolidate and make available COSEE's most important contributions to the ocean sciences.
- Redesigned the home page to display information relevant to a post-NSF funded COSEE era.
- Developed procedures for archiving the websites of those Centers whose funding ends in 2013/2014.
- Completed training in broad-based CMS maintenance in preparation for running the websites without RWS oversight.
- Relocated the COSEE files to a new server.

Partnerships and Collaborations:

This award funded the position of the COSEE Partnerships and Collaborations Coordinator for five months per year. The Coordinator was responsible to lead the efforts on external partnership development, collaborative efforts and program, and building brand awareness. These efforts took the form of establishment of a NCN presence at various national society meetings; the development of Memoranda of Understanding with several national societies and organizations; and partnership with the aforementioned organizations to deliver programs.

The NCO organized a NCN presence at various national science and education society conferences and meetings in an effort to increase the visibility of COSEE within target audiences. To support this effort, the NCO redesigned and created a new booth for exhibits. In broad terms, a COSEE presence at a conference is defined as a series of presentations by NCN members, a COSEE booth in the conference or meeting exhibit hall, and a social activity (luncheon, reception) that featured one or more ocean scientists.

The target audiences selected underscored the tenets of the NCN mission. The PIs sought to increase the understanding of viable careers in ocean sciences within diverse communities, recognizing that the face of the ocean sciences workforce does not reflect current U.S. demography. A NCN tenet is to support efforts to increase ocean awareness, literacy, and opportunities for underrepresented populations to participate more fully in the ocean sciences. Therefore the NCO developed and strengthened its presence at the Society for the Advancement of Hispanics/Chicanos and Native Americans in Science's national conference.

To reach members of the general public, the NCO partnered with AGU to host a booth and conduct ocean science activities during the USA Science and Engineering Festivals, held in Washington, D.C.

Supporting ocean scientists is a primary area of activity for the NCN. In an effort to strengthen existing relationships, increase COSEE literacy within the scientific

community, and increase the quantity and quality of scientist-educator interactions, the NCN established a presence at the AGU Fall Meetings and bi-annual Ocean Sciences Meetings.

Underscoring the NCN commitment to promote the national Ocean Literacy Principals and to promote scientist and educator interactions, the NCN maintained and strengthened its presence at the annual National Science Teachers Association's national conference.

In collaboration with the American Meteorological Society (AMS), the NCO developed a webinar series focused on the topic of hurricanes and coastal hazards. This five-part webinar series offered participants a unique opportunity to interact with top hurricane scientists in the country, while learning about a range of hurricane-related topics. Target audiences included instructors of high school and undergraduate level courses and informal science educators (<http://www.hurricanescience.org/resources/webinar2012>).

Decadal Review:

The COSEE 2011 NSF decadal review documents summarize the first nine years of COSEE's engagement and work with scientists and educators "to spark and nurture collaborations among research scientists and educators to advance ocean discovery and make known the vital role of the ocean in our lives."

The review documents are provided in electronic form through the NSF Ocean Sciences website (<http://www.nsf.gov/geo/oce/programs/cosee/decadal-review/index.jsp>). The documents consist of a number of chapters detailing – the National COSEE Network's legacy, capacity, and evolution; Portraits of the Centers; Return on Investments; Governance; Role of Evaluation; and an Appendix which provides a list of all NSF's core COSEE Center awards over time, as well as a compilation of other related awards in support of COSEE activities.

The report was written by the COSEE Decadal Review working group (DRWG), COSEE Evaluation Working Group (EWG), National COSEE Office, and current and former COSEE-PIs from July 2010 through May 2011. The individual Centers developed the COSEE Center Portraits, Highlights, and a set of seven documents that present the work of the individual Centers with regard to: partnerships, publications, presentations, broader impacts assistance, cross-Center activities, and grants other than the main NSF Center awards.

Specific Objectives: The objectives of the Best Practices in the Professional Development of Educators Workshop included:

- Identification of common elements in COSEE professional development programs
- Development of a portfolio of examples of COSEE Professional Development models based on published literature
- Development of a suite of COSEE best practices in the professional development of educators, including frameworks, teaching strategies, and other similar parameters
- Identification and discussion of solutions to the challenges of engaging scientists in the professional development of educators; recruiting and retaining educators for COSEE professional development programs

- Identification of best practices in successful transfer to the classroom and the production of education materials based on COSEE professional development programs
- Identification of post-program engagement strategies

Recommendations:

Future COSEE Professional Development of educators should integrate technology. This integration will allow for greater impact on greater numbers of participants. The NCN should be on the “cutting edge” of assisting scientists in making their data more accessible to educators on-line; provide a context for the visualizations developed by ocean observing systems; and serve as an interface between scientists and educators in the web environment.

The NCN’s future needs to include additional partnerships if its Professional Development efforts are to reach more diverse audiences. This includes moving COSEE materials and products to inland states. If every Center “reached out” to one inland state, it would dramatically improve COSEE’s reach. The NCN should investigate the possibility of partnering with large ocean sciences research initiatives to serve as their bridge to educators.

A gap analysis would help to identify where COSEE needs to focus its future Professional Development efforts. During the workshop, the group discussed content priorities including the areas of watersheds, deep-sea exploration, climate change, learning science, social networks, natural hazards, ocean and human health, and conservation.

Objectives of the Best Practices in the Engagement of Ocean Scientists in Education and Outreach Workshop included:

- Identification of common elements in COSEE Center engagement of scientists in broader impact activities
- Development of a portfolio of examples of COSEE broader impact activity models based on published literature
- Development of a foundation of COSEE best practices in the engagement of scientists, including frameworks, strategies, etc.
- Identification and discussion of solutions to the challenges of engaging scientists in education and outreach activities; recruiting and retaining scientists for COSEE Center activities
- Identification of best practices in successful transfer of the scientists’ expertise and resources to classroom and public audiences
- Identification of post-program engagement strategies

Prior to the work session, twelve COSEE Centers completed a survey focused on the best practices in the engagement of scientists in education and outreach activities.

Discussions focused on:

- Key Elements in COSEE Scientist Engagement in Education and Outreach
- Key Elements in Recruiting Scientists from Underrepresented Populations and

- Preparing Scientists to Work with Diverse Audiences
- Preparing Scientists to Interact with the Public, Educators, and Students
- Transferring Scientists' Expertise and Resources to Classroom and Public Audiences
- Post-program Engagement Activities
- Implementation of the COSEE Scientist Survey
- Mentoring Strategies: COSEE Staff Mentoring Scientists
- Mentoring Strategies Between Scientists Mentoring Educators
- Overcoming Obstacles and Contributing to the Field
- Collaborations and Partnerships
- The ideal scientist engagement program that utilized the most effective practices that had been discussed during the meeting

In 2012, a third best practices work session was conducted with the theme "diversity." The goal of this work session was to expand on the positive work Centers have done, identify promising pathways for future work and set the stage for the design of fundable, multi-Center projects that advance NSF's broadening participation goals.

Objectives of the Best Practices in Broadening Participation in the Ocean Scientists included:

- Review of the past diversity work of individual Centers and identify common 'promising practices'
- Examination of selected non-COSEE national initiatives and regional projects with the potential to expand our expertise and benchmark our work
- Identification and initiation of multi-Center collaborative projects that build on the NCN's established infrastructure and unique strengths

To prepare for the workshop, 13 Centers and Center affiliates completed a survey, profiling 24 projects considered by Center PIs to be good examples of successful past diversity work. Participants were also asked to review relevant publications on 'effective practice' from the National Academy's Expanding Minority Participation 2010 report and extracts from the BEST Commission (Building Engineering and Science Talent) reports. Over the past 10 years, multiple (3+) Center diversity efforts have focused primarily on four strategies:

- The use of traditional knowledge as an engagement strategy for underrepresented groups
- Professional development of educators who teach diverse populations
- Research experiences for diverse students
- Role models, mentoring and community building in diverse situations

COSEE at Meetings:

The objectives for the NCO to organize a NCN presence at various national science and education society conferences and meetings was to increase the visibility of COSEE within target audiences. In broad terms, a COSEE presence at a conference was defined as a series of presentations by National COSEE Network (NCN) members, a COSEE booth in the conference or meeting exhibit hall, and a social activity (luncheon, reception) that featured one or more ocean scientists.

Partnerships and Collaborations:

The objective of the NCO in creating formal partnerships (signed Memoranda of Understanding) with several organizations, including the American Meteorological

Society (AMS), the American Geophysical Union (AGU), and the Association for the Sciences of Limnology and Oceanography (ASLO), the Center for Microbial Oceanography: Research and Education (C-MORE), and a draft MOU is currently waiting for signature with the United States Coast Guard (USCG) was to leverage and share respective resources, while partnering to disseminate NCN products and services more broadly.

Significant Results: **Science Meetings**

During the 2009 American Geophysical Union Fall Meeting, the NCO reached 440 people through the COSEE booth; hosted 1 oral session and 2 poster sessions and a Young Investigators Luncheon.

In addition, the NCN was featured by Julie Stuart of Making Ideas Visible. Ms. Stuart was contracted by AGU to create daily murals reflective of the Meeting Highlights. The completed white boards were in the main conference building alongside and visible from the escalators.

During the 2010 American Geophysical Union Fall Meeting, the NCO reached 650 people through the COSEE booth; hosted 2 oral sessions and 2 poster sessions and a Town Hall Meeting.

During Ocean Sciences Meeting (2010) the NCO reached 300 people through the COSEE booth; collaborated with the ASLO ASLOMP program to host a Young Investigators luncheon, which had 87 participants; hosted 7 oral sessions and 5 poster sessions.

During Ocean Sciences Meeting (2012) the NCO reached 500 people through the COSEE booth; collaborated with ASLO to create a double booth in the exhibition hall that featured outreach experts and tools; collaborated with the ASLO ASLOMP program to host a Young Investigators luncheon, which had 100 participants; and hosted 3 oral sessions and 5 poster sessions.

SACNAS Meetings

In 2009, the NCO reached 150 people through the COSEE booth and co-sponsored an ocean science symposium.

In 2010, the NCO reached 250 people through the COSEE booth and co-sponsored an ocean science symposium and an education panel session.

In 2011, the NCO reached 200 people through the COSEE booth and for the first time, partnered with several organizations to create an Ocean Sciences Row on the exhibit hall floor. The NCO co-sponsored an ocean science symposium and an education panel session and collaborated with Research Experiences for Undergraduates (REU) PIs to represent Ocean Sciences in the Conversations with Scientists Session. The NCO also participated in the SACNAS Community Day, open to 500 students and local residents where hands-on activities to engage student attendees were conducted in partnership with Marine Advanced Technology Education (MATE) Center. Hands-on activities included activities from The Oceanography Society publication *Teaching Physical Concepts in Oceanography* and MATE ROVs.

In 2012, the NCO reached 100 people through the COSEE booth and partnered with several organizations to populate Ocean Sciences Row on the exhibit hall floor. The NCO co-sponsored an ocean science an education panel session and

represented Ocean Sciences in the Conversations with Scientists Session with approximately 60 students in attendance.

In 2013, the NCO reached 200 people through the COSEE booth and partnered with several organizations to populate the Ocean Sciences Row on the exhibit hall floor. The NCO co-sponsored an ocean science symposium and an education panel session and represented Ocean Sciences in the Conversations with Scientists Session with a record 80 students in attendance.

Science Education

During the 2009 National Science Teachers Association, the NCO reached 400 teachers through the COSEE booth, offered a Short Course, hosted a full day of COSEE sessions, hosted a luncheon for over 80 teachers featuring Dr. Isaac Ginis, who spoke about his hurricane research.

During the 2010 National Science Teachers Association, the NCO reached 620 teachers through the COSEE booth and partnered with the Innovative Technology Experiences for Students and Teachers (ITEST) Network to populate a quadruple booth. The NCO hosted a full day of COSEE sessions, hosted a luncheon for over 80 teachers featuring Drs. Scott Glenn and Oscar Schofield, who spoke their research and ocean observing systems.

During the 2011 National Science Teachers Association, the NCO reached 500 teachers through the COSEE booth and offered hands-on demonstrations. The NCO partnered with the Marine Advanced Technology Education (MATE) Center to populate a double booth. The NCO conducted a short course, a full day of COSEE sessions, and hosted a luncheon for over 80 teachers featuring Dr. David Hollander, who spoke about his research related to the Deepwater Horizon oil spill.

During the 2012 National Science Teachers Association, the NCO reached 300 teachers through the COSEE booth; hosted a full day of COSEE sessions; and participated in the National Earth Science Teachers Association (NESTA) Share-a-thon, reaching approximately 50 additional teachers with information about COSEE. The NCO also collaborated with C-MORE to host a luncheon for over 80 teachers featuring Dr. Sonya Dyhrman, who discussed her research with marine microbes.

Public Outreach

In April 2012, the NCO collaborated with the American Geophysical Union (AGU) Education Department staff to offer a hands-on oceanography themed booth during USA Science and Engineering Festival. Over three days, over 500 people through hands on ocean science activities.

Key outcomes or
Other achievements:

As a result of this award, the NCO created brand awareness and disseminated ocean sciences education and career information across the four target audiences and successfully created and sustained partnerships with professional societies.

Since 2008, the COSEE profile within the SACNAS community has increased, demonstrated by the increasing numbers of attendees in all NCO hosted sessions and events. The NCO has successfully shifted cultural awareness regarding the potential of pursuing a career in ocean sciences by providing the participants (mainly undergrad and graduate students) with opportunities to learn more about the pathways into ocean science related careers directly from ocean scientists. The NCO started with the COSEE booth on the exhibition floor and has developed partnerships with other ocean-related organizations to create an Oceans Sciences

Row on the exhibition floor. The NCO has been privileged to receive members of the SACNAS Leadership in the COSEE booth, thanking us specifically for opening the door to ocean sciences for their membership.

*** What opportunities for training and professional development has the project provided?**

Professional development for National COSEE Network members was provided through the Best Practices meetings described earlier.

COSEE provided professional development for practicing and young scientific investigators through:

Young Investigators Luncheons

The purpose of the luncheons was to reach young investigators (students finishing their Ph.D.s, post docs, and those in academic positions for less than 5 years) and provide guidance on crafting sound and robust broader impact plans for their federal agency proposals. Very few of the participants had heard of COSEE prior to these events. The participants were provided with an overview of broader impact statements and were given an opportunity to network and discuss activities in which they have either been a part the past or might be interested in implementing in the future. Attendees were also provided with information about the National COSEE Network and how the Network might be of assistance with future proposals.

Town Hall: Strategies for Effective Education and Public Outreach

Scientists are increasingly being asked to become more involved in communicating the broader impacts of their work. With the threat of a declining scientific workforce and an increase in public literacy on ocean and aquatic science issues, the time is now for connecting ocean science research and public education. Scientists joined NCN members for a workshop that included discussions and demonstrations that addressed skills such as assessing prior knowledge of nonscientist audiences; understanding learning theories; and finding or developing simple, practical educational tools.

ASLOMP/COSEE Young Investigator Workshop

Sponsored by the NCO and the ASLO Multicultural Program, these events provided information for young investigators about the NCN, education and research opportunities within the Network, and scholarship and fellowship opportunities (including REU programs). Workshops were intended for ASLOMP students and faculty, however many students outside the ASLOMP program attended. Participants received a complimentary lunch and informational materials.

Educators

Scientific presentations for educators at National NSTA conferences and short courses featuring ocean sciences content during NSTA conferences were conducted and are described earlier in this report.

SACNAS

The NCO provided SACNAS Conference participants with several professional development opportunities where ocean science professionals interacted with conference attendees in discussions about careers in ocean sciences.

Educational Panel Sessions featuring ocean scientists provided participants with perspectives on higher education and careers in ocean sciences.

*** How have the results been disseminated to communities of interest?**

Conference reports are posted to the COSEE website and sent out via the COSEE Network News (CNN) newsletter so that all of our constituents are apprised of all of NCO activities. CNN is disseminated via email to over eight hundred people who are subscribed.

The decadal review information is posted on the NSF website and is available for public review.

Products

Books

Book Chapters

Conference Papers and Presentations

Liesl Hotaling LAH Education Highlands, NJ, US lieslhotaling@yahoo.com Gail Scowcroft University of Rhode Island Graduate School of Oceanography Narragansett, RI, US Jan Hodder University of Oregon Oregon Institute of Marine Biology Charleston, OR, US Cheryl Peach Scripps Institution of Oceanography, UCSD San Diego, CA, US (2013). *COSEE Engagement of the Ocean Research Community*. OCEANS '13 MTS/IEEE Marine Technology Society. San Diego, CA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Ms. Liesl Hotaling Beacon Institute for Rivers and Estuaries 199 Main Street Beacon, NY 12508 Ms. Gail Scowcroft Office of Marine Programs University of Rhode Island South Ferry Road Narragansett, RI 02882 (2009). *COSEE – Collaborations to Bring Ocean Science Research to the Public*. MTS/IEEE OCEANS Marine Technology Society. Biloxi, MS. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Inventions

Nothing to report.

Journals

Licenses

Nothing to report.

Other Products

Physical Collections.

Reports of the best practices workshops have been produced and distributed to all NCN members. Brochures and other promotional materials have been produced to inform non-COSEE members about NCN activities.

Other Publications

Patents

Nothing to report.

Technologies or Techniques

Nothing to report.

Thesis/Dissertations

Websites

COSEE Facebook Page

<https://www.facebook.com/COSEENetwork>

Facebook is a social networking website that COSEE uses to provide information about COSEE and its partners. The COSEE Facebook page is maintained by the National COSEE Office. Currently COSEE has over one hundred "likes."

COSEE Twitter

<https://twitter.com/COSEE>

Twitter is a social media venue that COSEE uses to promote upcoming events and to share news about the Network. COSEE has over 1600 followers on this social media venue. Many professional oceanographic and marine organizations follow COSEE.

Centers for Ocean Sciences Education (COSEE)

<http://www.cosee.net>

The site contains resources for scientists and educators, information about events that are occurring at COSEE Centers, news information from COSEE Centers and general and specific information about the COSEE Network. The website is maintained by COSEE Ocean Systems staff and a web working group meets monthly to discuss the functionality of the site. Representatives from each Center participate in the Web Working Group.

Participants/Organizations

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
deCharon, Annette	PD/PI	1
Companion, Carla	Other Professional	1
Taylor, Lisa	Other Professional	1

Full details of individuals who have worked on the project:

Annette V deCharon

Email: annette.decharon@maine.edu

Most Senior Project Role: PD/PI

Nearest Person Month Worked: 1

Contribution to the Project: Principal Investigator

Funding Support: This and other grants.

International Collaboration: No

International Travel: No

Carla Companion

Email: carla.companion@maine.edu

Most Senior Project Role: Other Professional

Nearest Person Month Worked: 1

Contribution to the Project: Research Associate

Funding Support: This and other grants.

International Collaboration: No

International Travel: No

Lisa Taylor

Email: lisa.taylor@umit.maine.edu

Most Senior Project Role: Other Professional

Nearest Person Month Worked: 1

Contribution to the Project: Research Associate

Funding Support: This and other grants.

International Collaboration: No

International Travel: No

What other organizations have been involved as partners?

Nothing to report.

What other collaborators or contacts have been involved?

NO

Impacts

What is the impact on the development of the principal discipline(s) of the project?

With the growth of the National COSEE Network through its partnership and collaborations, resources developed by the Centers have been distributed to the broader ocean science research and education communities. Through the NCO's presence at ocean science and education conferences and meetings, valuable resources were able to be shared. This allowed scientists, students, and educators to be exposed to the ocean sciences; communication strategies; and best practices that could influence scientist's research, curricula, and career paths. The NCN is a leader in engaging scientists in education and outreach and is poised to transfer that knowledge and best practices to the larger community. The information that was gathered during the Best Practices work sessions is valuable and is continuously shared with our partners, collaborators, and within the Network. There has been an increase in the education sessions at national scientific conferences that has been influenced by the work within the NCN. Scientists are becoming more involved in education and outreach and are looking to the NCN for broader impact plans and assistance with implementation.

What is the impact on other disciplines?

Nothing to report.

What is the impact on the development of human resources?

Through the partnership with American Meteorological Society and the National Hurricane Center, the NCO has increased the capacity of formal and informal science educators to deliver scientifically sound content to their various audiences.

What is the impact on physical resources that form infrastructure?

Nothing to report.

What is the impact on institutional resources that form infrastructure?

Nothing to report.

What is the impact on information resources that form infrastructure?

Nothing to report.

What is the impact on technology transfer?

Nothing to report.

What is the impact on society beyond science and technology?

Nothing to report.

Changes/Problems

Changes in approach and reason for change

Nothing to report.

Actual or Anticipated problems or delays and actions or plans to resolve them

Nothing to report.

Changes that have a significant impact on expenditures

There was an increase in the number of conferences/meetings/festivals that COSEE staff attended.

Significant changes in use or care of human subjects

Nothing to report.

Significant changes in use or care of vertebrate animals

Nothing to report.

Significant changes in use or care of biohazards

Nothing to report.