



current

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"...to make known the world of water, both fresh and salt."

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Cover Image: Top right: Com. John Bortniak, NOAA Corps; middle left and center: Florida Keys National Marine Sanctuary; middle right: NOAA Central Library; bottom left: Gulf of The Farrallones National Marine Sanctuary; bottom right: Kip Evans.

CURRENT LOG We're delighted to bring you another exciting general issue of Current. You'll find a variety of articles and activities, from one teacher's creative hands-on approach to teaching about marine organisms across the curriculum, to successfully venturing out of the classroom into field-based experiences and providing great learning opportunities at the same time. We will continue to publish one general issue a year, so please continue to send in your original manuscripts or activities on research, lessons, resources, or strategies for teaching marine education.

The summer is almost here, which means it's just about time to head to this year's Annual Conference July 18-22 in St. Petersburg, Florida. The theme is "Bridge the Gulf: Marine Science in the Sunshine," and the conference will focus on the coastal and marine issues of the region, while concurrent sessions will provide hands-on activities, ideas, and resources for educators to take back to their classrooms. In this issue of Current, you'll find online registration information, conference accommodation tips, field trips, special events, auction and proposal information, and much more. Join us along with the Florida Marine Science Educators Association (FMSEA) in the land of sunshine and coastal breezes this summer!

We wish to once again thank The BRIDGE for contributing links to each of the articles and activities in this issue. You can visit The BRIDGE's website at www.marine-ed.org/bridge for more information on ocean science topics, organizations, lesson plans, career information, and professional development opportunities.

*Fair summer winds,
Lisa Tooker
Editor*

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THE CLASSROOM EXPLORATION OF OCEANS ONLINE WORKSHOP SERIES

BY HOWARD D. WALTERS, ED.D., KRISTINA O. BISHOP, ED.D., AND CHRISTINE LUKETIC

THE CLASSROOM EXPLORATION OF OCEANS (CEO) was a series of online teacher education workshops implemented in 2003. These workshops and related materials were sponsored and collaboratively organized by the National Geographic Society and its Education Foundation; The National Oceanographic and Atmospheric Administration's (NOAA's) Office of Ocean Exploration; NOAA's Marine Sanctuaries; the College of Exploration (a not-for-profit education, technology, and research organization in Potomac Falls, Virginia); and the University of Southern California Sea Grant Program.

The goals of the CEO series were:

- to motivate and inspire educators to teach about the ocean and ocean exploration;
- to raise the level of ocean awareness among the education community, and ultimately, increase students' knowledge and understanding of oceans;
- to promote ocean literacy and "Oceans for Life" in teachers, and ultimately students, through identifying ocean-related concepts, accessing related resources, and connecting content knowledge and understanding to learning the standards;
- to create an ocean-focused community of teachers who have the ability to network with colleagues, communicate with content experts, and gain access to a comprehensive list of ocean-related resources; and
- to promote professional well-being and sense of worth, and give teachers a "sense of stature" through their interaction with their colleagues and scientific experts.

METHODOLOGY

The CEO project was implemented as a series of nine, one-week workshops for teachers and informal educators featuring monthly keynote presentations by nationally or internationally recognized ocean science researchers, and curricular materials and lesson plans to assist participants with classroom infusion of workshop content and concepts. These materials were presented in an innovative and responsive distance learning environment with interactive dialogue, implemented over the World Wide Web (WWW). Additionally, to further facilitate participants' post-workshop infusion activities, instructional and resource CD-ROMs were created and/or provided to participants as they registered for the program. Finally, to better guide educators in curricular integration following participation, National Geographic developed and provided a framework for ocean science literacy, which was provided to each participant:

Using Geography for Life as a model, the Geographic and NOAA have launched an effort to identify ocean concepts that should be used in the scope and sequence for geography standards.

The goal of this effort has been to infuse the national geography standards scope and sequence matrix with ocean content to illustrate how information on the ocean can be included in the classroom. The standards organize what needs to be taught and threads these topics throughout the entire school experience...Lesson plans were developed by National Geographic's Sustainable Seas Expeditions and NOAA's Ocean Exploration Program. Also included are lesson plans from a variety of other institutions and educational programs, including the U.S. Environmental Protection Agency, the Pacific Whale Foundation, the National Atmospheric and Space Administration (NASA), the American Academy for the Advancement of Science, the Public Broadcasting System, and the Consortium for Oceanographic Activities for Students and Teachers (National Geographic, 2004).

KEYNOTE PRESENTATIONS, PRESENTERS, AND TOPICS

The following list delineates the presenters for the CEO workshop series. Each of these presentations provided follow-up opportunities for the participants to ask questions of these researchers in a facilitated format, so that all participants were able to see both the questions and the responses in virtual "rooms" devoted to social interaction and communication. Additionally, other "rooms" provided links to lesson plans, government and university research centers, educational resource materials, and other related information for participants to explore individually. The range of speakers and topics below illustrates the advantage of the online format, as these researchers were able to participate from their own offices, or field stations, without traveling to a central location. This not only leveraged the project budget by eliminating transportation costs, but facilitated the participation of these very busy researchers who may not have had time to travel to a site-based workshop.

- *Oceans for Life*; Dr. Sylvia A. Earle, Explorer-In-Residence, National Geographic Society

- *The Deep Ocean*; Dr. Peter Herring, Southampton Oceanography Center
- *Earth Day Remarks*; Dr. Daniel J. Basta, Director, NOAA National Marine Sanctuary Program
- *Ocean Exploration*; Captain Craig McClean, Director, NOAA Office of Ocean Exploration
- *Living Lights in the Ocean*; Dr. Edith Widder, Harbor Branch Oceanographic Institution
- *The Arctic*; Dr. Margo Edwards, University of Hawaii
- *Antarctica and the Southern Ocean*; Dr. Genny Anderson, Santa Barbara City College
- Dr. Francisco Chavez, Monterey Bay Aquarium Research Institute
- *Exploring the Twilight Zone...of American Samoa*; Dr. Dawn Wright, Oregon State University
- *The Hunley*; Dr. Robert Neyland, Underwater Archaeology Branch, Naval Historical Center
- *The Monitor*; Dr. John Broadwater, Sanctuary Manager, Monitor National Marine Sanctuary
- *Submarine Volcanism and Hydrothermal Venting*; Dr. Stephen Hammond, Chief Scientist, NOAA Office of Ocean Exploration
- *The Oceans and Human Health*; Dr. Shirley Pomponi, Director of Research, Harbor Branch Oceanographic Institution
- *Deep Water Coral Reefs Off Southeastern USA*; Dr. John K. Reed, Harbor Branch Oceanographic Institution
- *Life in the Oceans Midwaters*; Dr. Bruce H. Robison, Monterey Bay Aquarium Research Institute
- *Crittercam: A Wild Point of View*; Mr. Greg Marshall, National Geographic Television and Film

PARTICIPATION AND SURVEY INSTRUMENT

Approximately 2,100 teaching professionals, primarily classroom teachers, registered to participate in the *CEO* workshop series. Of these, the majority were Caucasian and from the United States. Participants were comprised from 48 U.S. states and were further represented from 50 different countries, territories, or organizations, including the Department of Defense Schools, Puerto Rico, Guam, American Samoa, Northern Mariana Island, and the U.S. Virgin Islands. From this number, an estimated 300 became frequent, recurring participants in each of the weekly workshops during the week of implementation. This is a significant demarcation of participation as this implementation week included regular sessions in which the keynote scientists/presenters were monitoring questions and commentary.

Following each of these implementation weeks, participants could review the archived materials and continue interactive discussions among themselves, but without the facilitation

Classroom Exploration of Oceans

is an example of the Scientist-to-Educator linkage which has assumed an important focus in numerous, large-scale ocean science education initiatives in this country.

of the keynote speaker. Additional methods for evaluation during these "archival weeks" included cross-comparisons of automatic tracking data, manual inspection of discussion "rooms," participant observations, and survey estimation suggests from 400-800 persistent and recurring participants, using the workshop materials at some level.

From among these individuals—a sample of 191 participants completed an extensive survey piloted and refined through two previous online workshops of similar scale. Several items on the survey were designed as open-ended responses, with respondent narrative automatically compiled without editing. These narrative items included the questions:

- If your participation level changed from the anticipated level selected at registration, please explain why.
- Please describe how you intend to, or have integrated into your classroom, any knowledge gained from *Classroom Exploration of Oceans* workshops.
- What was the greatest benefit that you received from participating in this workshop series?
- What barriers to your participation did you encounter?
- What is your single most significant criticism of this experience?
- Which online resources, CD-ROMs, and/or lesson plans provided are most useful for your classroom teaching, and explain why?
- Please provide any additional comments you would like the organizers to hear.

Additionally, for those individuals who had also participated in either of the previous two workshops, a series of questions were provided including:

- What differences did you observe between the *CEO* workshops and the previous workshops?
- How did previous participation influence your decision to register and participate in the *CEO* series?
- What content or activities from the previous workshops are you incorporating in your classroom?

These items and related constructs were framed in an overlapping manner within numerous selected response and demographic items to assist in interpretation of the data in subsequent analyses. The narrative data, which influenced the development of this current paper, were analyzed using a constant comparative procedure and heuristic coding following Patton (1990) and Walcott (1994), and with categorical cluster analysis procedures described by Merriam (1990) from Guba and Lincoln (1981).

DATA AND ANALYSES

Respondents were queried with respect to personal benefits they received from participation in the *CEO* program. The most significant numbers of responses seemed to cluster in three areas. First, respondents indicated the *CEO* series resulted in an enhanced content knowledge and understanding of the oceans. Second, respondents indicated the *CEO* series provided tangible resource materials for use in their classroom instruction, i.e. lesson plans, videos, the CDs, web links, and student materials for both online and offline use. Finally, respondents indicated a primary benefit of the *CEO* series was the opportunity to network and interact with peers and scientists. While these first two clusters are somewhat intuitive, the third cluster—interactivity and networking—highlight an important finding regarding this online program.

While the participants were physically separated and interacting only in virtual reality, there was a strong connectivity among those who were most active such that they perceived and responded to group dynamics, social connections and interactivity, and social hierarchical structures in the online space. Additionally, there was a distinct interactivity with experts (scientists), which was different from their interactivity with peers—although positive in both aspects.

The scientists, presenters, and resource educators were viewed as expert and interaction with these individuals reinforced the perceived value, accuracy, credibility, and/or authority of the information. Interactions with peers resulted in a reinforcement of the perceived importance of infusion of ocean sciences content—somewhat of a validation of personal choices to not only participate in the workshop, but to plan for infusion of the content in classroom teaching after the fact. This finding in the data for the *CEO* series is important, as a working example of the type of scientist-to-educator linkage which has assumed an important focus in numerous, large-scale ocean science education initiatives in this country.

Further, survey respondents were identified who had also participated in a previously funded online workshop series

entitled *Coral Reefs*. While the queries with respect to the previous *Coral Reefs* workshop cannot be extrapolated to the potential results of the *CEO* workshop, of the 28 people who took *Coral Reefs* and provided responses to the *CEO* survey, 82% of these individuals are actively incorporating materials and lesson plans from the *Coral Reefs* workshop in their classroom instruction two years “after the fact.” This documentation is an important quantitative measure of post-program infusion of content and activities in the ocean sciences education community, and is strong support for the potential and successes of previous and current National Geographic and NOAA online programming for teachers.

Two important goals of this *CEO* workshop series were increasing participants’ awareness of ocean science content and, following workshop participation, increasing the infusion of ocean sciences content and concepts in the participants’ classrooms. Figures 1 and 2 are strong with respect to the self-reported perceptions of participants on these dimensions.

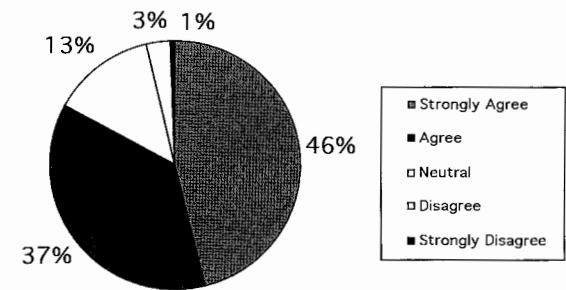


Figure 1. Approximately 83% of respondents indicate an enhanced understanding of ocean science content, following the workshops.

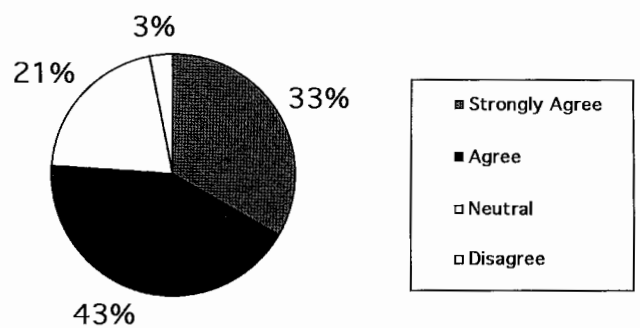


Figure 2. Respondents strongly agree and agree (76%) that they will increase infusion of ocean science content in their classroom instruction as a result of participating in the *CEO* workshops.

These are very similar to participant self-reported figures for other regional and national educational projects.

With respect to this last item (see Figure 2) respondents were queried to provide examples of how they intended to integrate the knowledge gained from *CEO* into their classroom teaching. A number of patterns emerge in these responses that illustrate

a powerful impact of participation in the provision of both tools for classroom use and enhanced content knowledge on the part of the teachers.

First, a number of the comments centered on the high quality and usability of the funding agencies' CD-ROMs, which were mailed to the participants after they registered. Comments specifically pointed to the value of the video clips, digital images and photos, lesson plans, and content information. Select narratives from respondents include:

Information from the various researchers gave me ideas for activities to use in my classroom. Videos from the CDs were a wonderful addition for introduction sections of my lessons...my students love the videos on the CDs...the CDs we received have many wonderful pictures and sights to get the students' minds working and thinking...The CD-ROM is full of good resources to use and share with my students. I will try and incorporate as much of this information in my Oceanography classes where appropriate...I found your CD very enlightening.

One respondent observed, "The CD materials have already led to my purchase of the NOAA CD of bathymetric charts on the U.S. East Coast for incorporation into topographic mapping lessons. I have only scratched the surface of uses for this material!"

An additional use of the CDs is revealed in a number of other responses, illustrating the "teacher multiplier effect" in the CEO series:

I will attempt to promote the use of the resources available during teacher workshops...I've passed CEO on to colleagues and classroom teachers as a resource...I also have shared this with my colleagues and will spread the word to other teachers as well...I requested copies of the Oceans of Life Brochure you sent out so that I can distribute these to colleagues.

A second pattern for infusion of CEO content and/or materials—beyond direct application of the CDs—is revealed in the enhanced content knowledge of teachers augmenting their capability to provide factual and relevant science content in classroom activities, with direct references to ongoing science research and "real scientists." The content and explanations provided by these scientists possesses an immediacy and relevance, and is "cutting edge" in a way textbooks typically cannot be. Further, direct interaction between scientists and teachers breathes life into what could otherwise be one-dimensional information. Select responses highlighting this observation include:

This workshop is keeping me connected to science. As to integrating this new knowledge into my classrooms...this workshop is giving me more to work with...I like the added details from the

scientists—they give new perspectives on things that I learned in the past, and I look forward to using their insights in my lessons...As a result of taking this workshop my students will be exposed to more ocean technology, research, and exploration than ever before. I am a marine biology person at heart but this workshop has exposed me to new fields and work being done. My students will truly benefit from this experience. I intend to integrate more ocean studies during the entire school year rather than only three weeks. I plan to keep studying this information, reading, and looking at the information that has been mailed (such as Oceans for Life and the CD-ROM)...

CONCLUSIONS

From the narrative and quantitative responses provided by the respondents, there appears to be a strong, positive sense of value associated with the CEO workshop and the supplemental electronic and print materials developed and provided with the workshop. There is a further, highly positive perception with regard to the technical quality of the CEO workshop in design and usability—and particularly with the attentiveness of the technical managers of this online program to monitor and respond to user comments and suggestions concerning features of the programming or presentation.

It seems, however, the strongest thread to be identified in the evaluation is the observation that increasing numbers of teachers are looking to the CEO partners, i.e. National

Benefits Reported by Participants

1. Enhanced content knowledge and understanding of the oceans.
2. Resource materials to enhance classroom instruction.
3. Opportunities to network with scientists and peers in a learning environment.

Geographic and NOAA, for education and curricular support to infuse ocean science content and activities into the broader K-12 curriculum in the United States. This conclusion is suggested based on survey data showing a numeric increase in teachers reporting previous National Geographic and/or NOAA online workshop experiences over time, i.e. 2.5% of respondents indicated participation in the *Sustainable Seas Expedition* workshops (2001), 17.1% indicated participation in *Coral Reefs* (2002), and by definition, 100% of respondents are participating in the *CEO* series (2003). As these teachers engage initially with online learning, it appears they are likely to return for subsequent online programs, to follow up the online program with continued, personal interactions with colleagues met "online," to seek out and purchase print materials and resources first identified online, and to infuse their classroom instruction with additional ocean sciences content. These teachers perceive and have expressed that the *CEO* series was a highly sophisticated social experience directly related to their professional learning needs as K-12 teachers and informal educators, and that the workshops provided access to high-quality electronic and print curriculum and lesson plans.

Finally, a significant theme for further research emerged through analyses of the narrative comments in the survey: individualized structuring of the learning experience. First, through an interactive effect of time constraints and quantity of material to access via the WWW, the survey respondents modeled a high degree of self-directedness in structuring their individual learning environments. This capacity was enhanced by the technical approach, facilitation, and software used to organize and manage the instructional platform. Narrative reflecting this individualized approach among respondents/participants includes:

There were so many questions asked in response to the lectures that it seemed appropriate to read all of the lecturer's responses rather than to start a conversation... There is such a wealth of information that it requires so much time... much of it I printed and read later... I spent more time surfing the links that were provided... I read all of the information from the keynotes and workshops, but did not have time to participate... I wanted to participate in the interactive chats and questions, and access the lesson plans more... Everything is so interesting that I like to go back and get more information and check my own understanding. I also like to go back to get information to share with others...

I print copies of all the talks and responses and use the resources as much as I can. So, I guess that I am participating in my own way, but not in the way the course is set up.

These select citations from the narrative illustrate a range of involvement from reading only, to printing and reading offline, to cursory reading of keynotes and discussion—and significant

"surfing" of links provided by the keynote speakers or in the *CEO* environment. The capability of the WWW to immerse workshop participants in an open-ended network of resource materials, lesson plans, content presentations, discussion groups, and seemingly limitless links—while producing some negative response based on time constraints—is clearly supporting individualized learning. The management system used in the *CEO* allowed the learners to freely navigate to materials of greatest interest, to participate at a personal comfort level (from fully interactive to read only), and to navigate "out" of the workshop to other related information, if they chose this approach.

The dynamic nature of this learning environment seems substantively different from typical, web-based courses reported in the literature. A study (Harlen and Altobello, 2003) funded by the National Science Foundation reported online environments were effective in enhancing content knowledge and possibly conceptual understandings of instructional frameworks—but not necessarily in bridging cognitive knowledge and professional practice. Harlen and Altobello suggested time limitations, the high degree of structure generally "built in" to an online course or workshop, and the uniformly paced instructional sequence as contributions to the deficiencies in online learning. It should be noted the Harlen and Altobello study specifically focused on a credit-oriented program—while a component of the current study—was a voluntary attribute. The instructional design for the *CEO* project allowed a high degree of personal choice and pacing of learning, and a structure that did not require individual learners to participate in activities they did not find a practical, professional value in. Further, the *CEO* design provided a mechanism for individual learners to control the time limitations: by withdrawing from social activities to pursue self-directed reading and study opportunities, or to focus on the social activities *per se*.

This difference in instructional design may have influenced the very positive reactions of the survey respondents as well as stimulating the observed trend of returning participants. Further, adult learning literature suggests that self-directedness is one of the dominant characteristics of authentic adult learning (Knowles, 1980a; Knowles, 1980b; Merriam and Cunningham, 1989). The observation within the survey data showing participants are engaging in intentional structuring and restructuring of the learning environment, and in intentional social connections with peers, scientists, and program facilitators, is perhaps essential evidence that the *CEO* workshop contributed to learning in a meaningful and durable way. Finally, this observation is clarified and magnified in the data from respondents who were also participants in the previous *Sustainable Seas* and *Coral Reefs* workshops and indicated they will continue to infuse their current classroom practice with content and activities acquired in previous online workshops.

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FOR MORE RESOURCES THE BRIDGE RECOMMENDS:

Classroom Exploration of the Oceans

<http://coexploration.org/ceo/html/introduction.html>

Distance Learning Resource Network

<http://www.dlrn.org/index.html>

NSTA Institute

<http://institute.nsta.org/>

The Virtual University Gazette's FAQ on Distance Learning, Accreditation, and College Degrees

<http://www.geteducated.com/articles/dlfaq.htm>

Distance Learning Web Resources

<http://www.kimsoft.com/dista.htm>

Distance Education Clearinghouse

<http://www.uwex.edu/disted/home.html>