

SCIENTIST AND EDUCATOR PARTNERSHIPS AND OCEAN LITERACY: CREATING A NEW COMMUNITY OF PRACTICE

BY CATHERINE HALVERSEN AND LYNN UYEN TRAN

Engaging scientists and educators in meaningful partnerships to transform ocean sciences education is not a new effort or ideal. Since 2002, the Centers for Ocean Sciences Education Excellence (COSEE) has made this the hallmark of their efforts and cornerstone of their mission to instill a sense of urgency for, and a greater understanding of, ocean literacy in the public. Many of the COSEE efforts create opportunities for scientists to implement education, public outreach, and broader impact in the work that they do. COSEE and other organizations, such as NOAA, have provided opportunities to create rich experiences and generalizable results upon which future collaborations between scientists and educators can be built. This paper focuses on one such effort, the Ocean Literacy Campaign, and subsequent projects in which COSEE and NOAA played the convening role that brought together scientists and educators. We propose that educators and scientists participating in the Ocean Literacy Campaign are in the process of creating a new "community of practice" with shared customs and habits, which has implications for sustaining the work to promote ocean literacy. It suggests that partnerships between scientists and educators have utility and are enduring beyond individual projects, and that these partnerships can redefine the ways science and education serve society.

The Ocean Literacy Campaign has created rich opportunities and provided a vehicle around which scientists and educators¹ can forge new relationships and build a shared community of practice to accomplish a common goal—promote ocean literacy



Janice McDonnell and Scott Glenn with their students in the Communicating Ocean Sciences to Informal Audiences course at Rutgers University.

among the public. The Campaign began with the development of the *Ocean Literacy: The Essential Principles of Ocean Sciences K-12* (hereafter referred to as the Ocean Literacy Principles) in 2004, and led to subsequent activities, including the creation of the *Ocean Literacy Scope and Sequence for Grades K-12* (hereafter referred to as the Scope and Sequence) and other materials, such as textbooks, college courses, and curricula.

Bringing the expertise of scientists and educators to the same table and nurturing meaningful partnerships has been integral to the Campaign from the beginning. Scientists brought their science content knowledge and experience sharing that content with the public and their students; and educators brought their pedagogical content knowledge about how to help students and the public to make meaning of and understand the science. A remarkable, secondary result emerged from this ongoing and intensely engaging work. Scientists and educators developed a deeper understanding of each other's "community of practice" and respect for each other's expertise. From this understanding and respect, many individuals created invaluable and long-lasting relationships. This comment from a marine scientist reflected this sentiment:

As a scientist who specializes in education, the Ocean Literacy [Campaign]...has offered valuable opportunities to have substantive interaction with professionals in both science and education. From being one of the developers of the "Oceans for Life" Geography Scope and Sequence, through the subsequent development and review of the Ocean Literacy Principles and Scope and Sequence, I feel very fortunate to have been involved as both a scientist and an educator. My work with educators always provides me with a great deal of professional growth and personal enlightenment. And as someone trained in scientific research, I feel that my professional pathway in education has allowed me to make a much broader impact in science than I likely could have as a bench scientist.

-Dr. Judy Lemus, Hawaii Institute of Marine Biology, University of Hawaii

The continued collaborative work by scientists and educators on efforts in the Ocean Literacy Campaign, required each to cross out of their own community, and led to the development of mutually engaging scientist-educator partnerships that have fostered a new type of community of practice.

CREATING A NEW COMMUNITY OF PRACTICE

A community of practice is a group of people engaged in shared customs and habits, and is characterized by four activities of its members: *joint enterprise* towards goals and purposes, *mutual engagement* in activities, development of a *shared repertoire* of habits, rules, and traditions, and the process of *negotiating meaning* in practice (Wenger 1998).

In committing to, and participating in, the Ocean Literacy Campaign there was *joint enterprise* between ocean scientists and educators toward goals and purposes for achieving an ocean literate populace through formal and informal educational. There was *mutual engagement* in numerous activities to support these goals. These activities included: working together to develop and review the Ocean Literacy Principles and the Scope and Sequence; teaching the *Communicating Ocean Sciences* courses; developing the high school course, *An Introduction to our Dynamic Ocean* (COSEE Coastal Trends); writing the *Life on an Ocean Planet* textbook (Current Publishing and NMEA); developing curriculum, such as the NOAA-funded *Ocean Sciences Curriculum Sequence* (COSEE California); and COSEE Networked Ocean World's Ocean Literacy Interactive Animation, podcasts of the Pulse of the Planet lectures, and their *Student Summit for Ocean Literacy*. More information about these activities is described further in this NMEA Special Report. As the scientists and educators became involved in these shared activities, members from both communities learned from and about one another, crucial for forging partnerships and developing a community of practice.

Educators reported making personal connections and generating relationships that were, and will continue to be, worthwhile on many levels. For instance, in working on the Scope and Sequence, a high school science teacher commented about how the community contributed to his work back in the classroom:

It was great to unite with a diverse and talented group of... marine educators in a workshop environment to help develop the Scope and Sequence for the Ocean Literacy Principles....I worked on [the flow for Principle 1, which] was particularly useful to me as a young marine science teacher because I got to rationalize and reflect upon the order in which I have been teaching the material in the classroom.

—Benjamin Kay, High School Science Teacher, Santa Monica High School, California

In some cases, educators and scientists had worked in relatively close geographic and conceptual proximity for years but previously, had not experienced each other's work, much less collaborated with one another. In this instance, the college course, *Communicating Ocean Sciences to Informal Audiences* (COSIA), served as the shared activity where scientists and educators forged meaningful relationships:



Kristopher Jensen, Paul Martin, and Kathleen Cressy at a COSEE-West Ocean Observing Systems workshop building models to explore circulation patterns.

When we [educators] partnered with [scientists] in other universities before, we'd have a meeting and come up with great ideas that never went anywhere. But the COSIA course structured those partnerships so that we could actually be successful...There was a deliverable, there was an outcome, so that was a really good part of [the successful partnership].

—Aquarium Director²

These connections among educators and scientists have broadened the audience for their respective work and will likely lead to future opportunities to work together.

As they carried out these shared activities, scientists and educators entered into different forms of engagement (how we interact), different endeavors (what we do together) with different definitions of what matters, different habits and routines, and different reward systems (Wenger 1998). Collaborators engaged in collective learning about each other's valued practices, tools, guiding principles and goals, and then developed a *shared repertoire of habits, rules, and traditions* for their new community. For instance, some of these repertoires emerged from determining the criteria for what concepts should be included in the Ocean Literacy Principles and the Scope and Sequence, and what form those documents would take. Members were *negotiating meaning in practice* as they met online and face-to-face to discuss, debate, and explain the inclusion, exclusion, or placement of each concept, and eventually to produce the finished Ocean Literacy Principles and the Scope and Sequence. While they did not always agree, there was mutual professional respect and attempts toward consensus and resolution.

Additionally, they encountered discrepancies and entered into new and unknown domains that challenged their claims to

expertise (Engeström, Engeström, and Karkkainen 1995). For instance, a fisheries scientist and an oceanographer, respectively, offered the following comments:

Working with LHS [Lawrence Hall of Science] has made me feel that the work I do is much more relevant than I usually feel it is. The emphasis around [here], as in most research institutions, is on writing papers for technical journals, that in truth, few people read. We, as scientists, generally just talk amongst ourselves, and it is a pretty small world. I have enjoyed being pushed to identify unique characteristics of the ocean that kids might not think about because of their experiences as “terrestrial organisms” and to attempt to communicate that understanding in a way kids might be able to understand. Some of the ideas I thought about as a result of my engagement with your project are becoming part of a paper and presentation I am going to be giving at the International Council for the Exploration of the Sea science conference in Berlin.

—Dr. John Manderson, National Marine Fisheries Service

It was interesting to see the science concepts from an educator’s perspective with an emphasis on the importance of bringing the concepts to a “communicable level” without losing content. It was important to clarify for educators—and for myself—not only the Planet Ocean concept, that the ocean is an important part of the world, but also the importance of the order that concepts are presented in and their relationships to each other. The impact on my work is that I now have a greater consciousness about how I present new concepts to my university students.

—Dr. Myrna Jacobson, University of Southern California

Consequently, there was a shift from viewing knowledge as distributed hierarchically (or vertically) among people who possessed different levels of skill and competency (i.e. expert or novice) to “knowledge as distributed across actors who [were] competent in different types of practices” (Anagnostopoulos, Brass, and Subedi 2007). This shift was evidenced by the following comments from educators:

Whether it is in my work on the Ocean Literacy Campaign, the National Ocean Sciences Bowl, or the daily operations of the Northwest Aquatic and Marine Educators, I revel in the opportunity to share ideas with scientists. They no longer scare me. They know more about some things; I know more about other things. I hope that young teachers will avail themselves of the new climate of cooperation between the scientific and educational communities to strengthen their own work with students. “Just do it.”

—Gene Williamson, Retired Junior High/Intermediate School Teacher, Beaverton, Oregon

In my experiences with the [COSIA] course, the participation of scientists provides direct access to the latest research and results, offers valuable current and historical insights into the process and culture of science, and adds an important personal dimension to the practice of science (i.e., scientists are people, too!). Likewise, educators contribute to the partnership by sharing their practical experiences, their knowledge of current learning theory and pedagogy, and an understanding of the practice of education as both an art and a science—all of which reinforce the approach that effective teaching and learning experiences go well beyond simply telling people what you know, or what you think they should know. Forging effective partnerships between scientists and educators not only allow them to learn from one another, it also benefits other audiences by creating a learning community exponentially more powerful than either could alone.

—Eric Simms, Scripps Institution of Oceanography and Birch Aquarium

The work on the Ocean Literacy Campaign thus far necessitated scientists and educators to share their respective expertise across what sometimes seemed to be very distinct communities, each built to reflect the purposes of those making the decisions, and characterized by their very different, historically based institutionalized norms (Rowan and Miskel 1999; Scott 2001; Tyack 1974; Weick 1995). It became evident that the Campaign was offering scientists and educators opportunities to develop a community of practice that enveloped those who worked on the project from its inception, and those just recently joining the effort. Next, we briefly share insights from this process on developing strong partnerships that serve as the foundation for sustaining this community.

FOUNDATIONS FOR STRONG PARTNERSHIPS

There are several underlying principles for initiating and growing partnerships between scientists and educators that have contributed to developing this community of practice for the Ocean Literacy Campaign.

1. Draw on existing relationships and connections, and ask colleagues to contact their colleagues to join in the effort as well. It is helpful to select partners who have shared values, goals, and/or ideologies.
2. Think of knowledge and tools as assets to be shared, and that these can be built on and revised by the community. Encourage ownership of these assets among all the members of the community.
3. Cultivate mutual respect by encouraging a culture of honesty, open dialogue, careful listening, and recognizing distributed expertise.



Judy Lemus is one of many scientists who have played an integral role in developing the whole Ocean Literacy Framework.

4. Define goals and processes clearly and, very importantly, have a shared activity around which all partners can do meaningful work together toward those goals.

Successful application of these principles is reflected in long-lasting partnerships that extend beyond any one project, as members strive to work together and sustain the new community. One such success is indicated by the continued collaborations between scientists and educators at Hampton University and Virginia Aquarium (COSEE Coastal Trends):

Dr. [Deidre] Gibson and I have had the benefit of co-teaching [COSIA] for the past three years. That consistency has allowed us to get to know each other's strengths and areas of expertise, which makes the overall teaching experience a positive one. It is truly a partnership when we teach this class...COSIA...has been a catalyst for initiating additional partnerships between Hampton University [HU] and Virginia Aquarium. Staff and students in HU's marine science department serve as mentors in the Aquarium's Mentoring Young Scientists (MYS) enrichment program for middle school students, while Aquarium educators provide activities for HU's High School Open House Day. The COSIA course and the MYS program were both woven into the COSEE-Coastal Trends grant in which the Aquarium and HU are partnering with the University of Maryland Center for Environmental Studies. Hampton is also a partner in the Aquarium's recent NOAA grant proposal Sea Sojourn, which requests funds to develop ocean literacy strategies for reaching early learners.

—Karen Burns, Education Specialist for Bay & Ocean Literacy, Virginia Aquarium

Thus, there are “ripple effects” emerging from these personal connections that take on a life of their own and create

momentum as scientists and educators talk, collaborate, and learn from each other.

The most telling outcome of our work together has been that nearly all members of the community find the relationship to be mutually beneficial and of great value to them personally and professionally. A marine ecologist remarked:

Working on the Ocean Sciences Curriculum Sequence has enriched me both as an educator and as a scientist—it is a rare opportunity to sit with top-notch scientists and brilliant educators to think deeply about what is important in ocean science, and what we feel a young student really needs to know to interpret and appreciate the world around them. It not only helps the students, but it helps us to see the world and our science through fresh eyes.

—Dr. Drew Talley, University of San Diego and Ocean Discovery Institute

The efforts from the Ocean Literacy Campaign have generated opportunities to build partnerships between professional communities with complementary expertise to achieve a goal that neither community could achieve on its own. The development of this community of practice clearly indicates the potential for both scientists and educators to join in the community. Moreover, shared activities continue to emerge from these successful scientist and educator collaborations around Ocean Literacy. These efforts have shown that meaningful and long-standing partnerships are based on discrete, transferable principles that can be shared by the community and incorporated into other efforts to ensure that collaborations are mutually beneficial and lead to ongoing partnerships and opportunities. This has been, and continues to be, an inspiring experience for all of us currently involved in the community.

ENDNOTES

¹ For the purposes of this article, we are using the term ‘scientist’ to describe someone who works as faculty or researcher at a university, college, or research facility, with expertise and training in science. The descriptor ‘educator’ is used to describe someone working as a K-12 teacher or instructor in formal or informal environments, with expertise in learning and teaching. The lines between educator and scientist are often blurred, and certainly many science faculty members are also educators and well-versed in educational pedagogy; and educators may have science degrees and substantial science knowledge.

² This statement was excerpted from the 2008 evaluation report for COSIA [Inverness Research Associates. (2008)/ (See http://www.inverness-research.org/abstracts/ab2008-12_Rpt-COSIA-interim-eval-rpt.html)]. All quotes reported therein were anonymous.

REFERENCES

- Anagnostopoulos, D., J. Brass, and D. Subedi. (2007). The technology and literacy project: Crossing boundaries to conceptualize the new literacies. In *Faculty development by design: Integrating technology in higher education*, eds. P. Mishra, M. Koehler, and Y. Zhao, 93-112. Greenwich, CT: Information Age Publishers.
- Engeström, Y., R. Engeström, and M. Karkkainen. (1995). Polycontextuality and boundary crossing in expert cognition: learning and problem solving in complex work activities. *Learning and Instruction* 5: 319-336.
- Rowan, B., and C. G. Miskel. (1999). Institutional theory and the study of educational organizations. In *Handbook of research on educational administration*, eds. J. Murphy and K. S. Lewis, 359-384. San Francisco, CA: Jossey Bass.
- Scott, W. R. (2001). *Institutions and Organizations*. London: Sage Publications.
- Tyack, D. B. (1974). *The One Best System: A History of American Urban Education*. Cambridge: Harvard University Press.
- Weick, K. (1995). *Sensemaking in Organizations*. London: Sage Publications.
- Wenger, E. (1998). *Communities of Practice: Learning, Meaning, and Identity*. Cambridge: Cambridge University Press.

NMEA 2010 ANNUAL CONFERENCE

***From the Mountains to the Sea: NMEA 2010!*****Save the dates:** July 18-23, 2010**Conference location:** Gatlinburg Convention Center**Hotel:** Glenstone Lodge

The Tennessee Educators of Aquatic and Marine Science (TEAMS) invite you to Gatlinburg, Tennessee at the foothills of the Great Smoky Mountains National Park.

The conference begins Monday afternoon with an exhibit preview and reception. Before taking it to the top of Mount Harrison aboard the Gatlinburg Aerial Tramway, we will enjoy the Stegner Lecture performance. Tuesday through Thursday are jam-packed with general and concurrent sessions. Tuesday will conclude with a fun-filled night at Ripley's Aquarium of the Smokies. The annual auction will take place Wednesday evening so be sure to bring your checkbook! The highlight of the afternoon is the awards presentation followed by a real Tennessee Hoedown at Dumplin Valley farm; and Friday is full of field trips that will take you to exciting destinations around East Tennessee and concludes with a stampede at Dolly Parton's Dixie Stampede. For more information, visit www.nmeaweb.org/gatlinburg2010.