

COSEE-Ocean Systems: *Scientist Participation in Education Conferences and Venues*

COSEE-Ocean Systems (OS) has developed a strategy to assist scientists in communicating and presenting their research stories to new audiences at venues outside their usual professional milieu.

Examples where scientists have partnered with COSEE-OS include two annual conferences of the National Science Teachers Association (NSTA). These kinds of new settings provide scientists with meaningful opportunities to broaden their outreach impact. This document includes specific examples of scientist-COSEE collaborations at national educator conferences and the sustained effects those collaborations have had.

Research scientists do not make up a large percentage of attendees at science education conferences, in part because of time constraints, but also because they are unsure of how to appropriately prepare for and address audiences at these venues. However, when given assistance in a timely manner to create quality presentations that are useful to educators, they have a better understanding of how they can provide a "broader impact." They benefit both professionally and personally by reaching outside their usual "spheres of influence." Both scientists and educators benefit when scientists participate in conferences aimed at educator audiences. Educators at these venues benefit by meeting scientists first-hand and engaging them in dialogue about their cutting-edge scientific findings. Scientists who have been taught new pedagogical tools such as concept mapping benefit by gaining a working method for translating a clear message about their science to wider circles. Several scientists who have received OS professional development have found that concept mapping helps them improve communication within their scientific research circles as well.

I. NSTA 2008:

In early 2008, COSEE-Ocean Systems and COSEE Networked Ocean World (NOW) prepared for a joint workshop at the annual NSTA conference in Boston, Massachusetts. As part of this workshop, COSEE-OS staff approached Collin Roesler and Peter Girguis to gauge their interest in presenting their "scientific stories" through newly developed concept mapping software to middle and high school science teachers (Figure 1). At that time, Dr. Roesler was a research scientist at the University of Maine Darling Marine Center, and now is a faculty member at Bowdoin College. Dr. Girguis is a faculty member at Harvard University. Both scientists were excited to participate, but neither had experience with concept mapping techniques, so the OS staff initiated one-on-one concept mapping tutorial sessions. Topics discussed with scientists included techniques such as: assessing their audience's knowledge base, crafting a focus question, choosing clear and simple concepts, limiting amount of content per concept map, and crafting concise text for linking phrases.

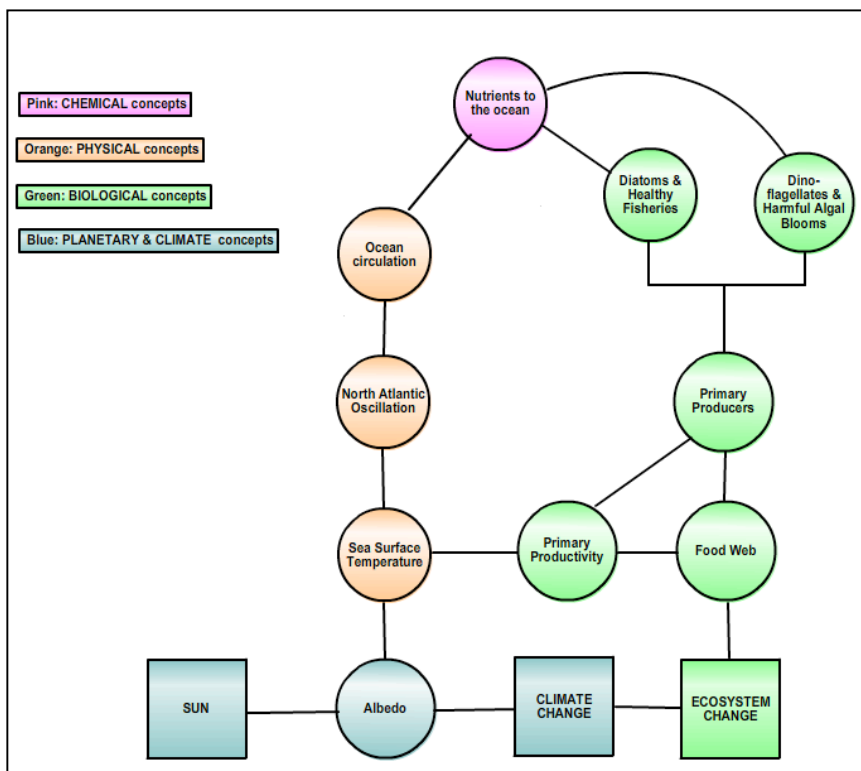


Figure 1: Example concept map created by Collin Roesler for the 2008 NSTA annual conference.

After the initial "consultation" in person or via telephone, the scientists were given a "homework assignment" to create their first draft maps. OS staff helped the scientists add OS database "assets" (images, videos, news items, and resources) to each of their concepts -- including some of their own content -- to make the maps interactive. The scientists were given advice on how they could effectively present their maps at the educator conference, as well as a chance to practice their presentations prior to the conference using the Concept

Linked Integrated Media Builder (CLIMB) software. Following each 20-minute interactive presentation, educators were encouraged to ask questions and provide comments on the concept maps or science topics with the scientists.

Scientists' Concept Map Topics at NSTA 2008 Conference (and Subsequent Concept Mapping Activities):

Peter Girguis (Harvard University): What are the essential living and non-living things required for chemosynthetic life to thrive in hydrothermal vent ecosystems?

Peter Girguis developed a concept map while he and his laboratory members were at sea researching the Juan de Fuca hydrothermal vent ecosystem; also he and his three graduate students and one postdoctoral researcher made a consensus based "cruise map."

Peter Girguis participated in a COSEE-OS webinar in August, 2010. The "Research-based Online Learning Environment" (ROLE) Model Webinars offer presentations (including concept maps) by scientists about engaging science content and by educators about new ways to use concept mapping tools in various educational settings.

Collin Roesler (Bowdoin College): Diatoms vs Dinoflagellates: How do phytoplankton species influence nutrients in the upper ocean?

Collin Roesler uses the COSEE-OS online tools (Ocean Climate Interactive and Concept Map Builder) with her students in the "Introduction to Oceanography" courses at Bowdoin College.

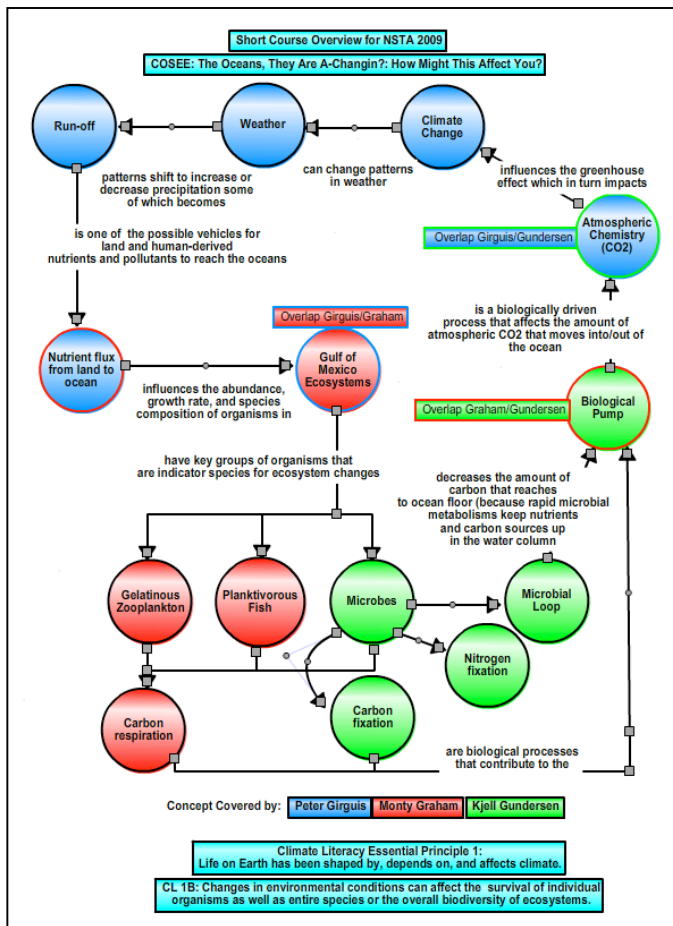


Figure 2: Example overview map created at the 2009 NSTA short course piloted by COSEE-OS.

learn concept mapping and design their own hyperlinked maps. Some scientists used the CMB as their primary presentation tool, while others used the maps as a central unifying theme around which they developed PowerPoint presentations for the educators. Evaluation data showed that each of these methods was useful to the educators, who were given access to hardcopy and online versions of the maps as well as the content-rich PowerPoint files. After each presentation, educators engaged the scientists in dialogue about content and transferability to their classrooms.

II. NSTA 2009:

In 2009, software updates significantly expanded functionality of COSEE-OS online tools -- Ocean-Climate Interactive (OCI) and Concept Map Builder (CMB). At the NSTA 2009 annual conference in New Orleans, Louisiana, COSEE staff conducted both a 3-hour short course and a special 1-hour COSEE session in which five scientists presented their research stories to educators using interactive concept maps. To augment the scientist professional development developed for NSTA 2008, OS staff asked scientists to not only create their own concept maps but also to highlight the connections among the topics of their co-presenters. Therefore, a specific Climate Literacy Principle (see below) was chosen and used to create "overarching concept maps" to structure the scientists' talks (Figure 2). Each scientist volunteered to address 4 to 5 concepts on an overarching map, and to use these concepts as the foundation for his or her research talk. With this model, each scientist was able to speak at multiple levels to the educators: they addressed the "big picture" level of climate change but also were able to relate details of their sub-disciplines in the ocean sciences. This approach addressed ocean sciences' cross-disciplinary nature in which physics, chemistry, biology, and geology often all play a part, helping the educators "connect the dots" and place the scientists' content in an appropriate context.

Using similar methodology described previously for NSTA 2008, scientists were assisted by COSEE-OS staff over the course of 2-3 months before the conference to

Climate Literacy Principle used for Overview Maps:

"Changes in climate conditions can affect the health and function of ecosystems and the survival of entire species. The distribution of fossils show evidence of gradual as well as abrupt extinctions related to climate change in the past."

Scientists' Concept Map Topics at NSTA 2009 Conference (and any Subsequent Concept Mapping Activities):

Peter Girguis (Harvard University): *How could rising atmospheric CO2 levels affect deep sea hydrothermal vent ecosystems?*

W. Monty Graham (Dauphin Island Sea Lab): *Changing patterns in the Gulf of Mexico: Why should we manage our fisheries as part of an ecosystem?*

Scott Milroy (University of Southern Mississippi [USM]): *Climate Effects: Nutrient fluxes via the Mississippi River and carbon fixation in the Gulf of Mexico*

Kjell Gundersen (USM): *What is the microbial loop, and why is it important?*

Karen Orcutt (USM): *What is marine nitrogen fixation, and why is it important?*

Kjell Gundersen and Karen Orcutt (USM) presented updated concept maps to a new group of COSEE educators through an online webinar on Wednesday, July 28, 2010. Profs. Orcutt and Gundersen teach at the University of Mississippi on the Gulf of Mexico. For this webinar, they adapted their NSTA 2009 concept maps about the Gulf ecosystem to include information about oil spill impacts on that ecosystem. They were joined by two high school science teachers for a presentation/discussion to about 20 participants about new ways to use concept-mapping tools in the classroom.