COSEE Coastal Trends

User's Guide

Scientist-Educator Partnership Program

COSEE **COASTAL TRENDS**

CENTERS FOR OCEAN SCIENCES
EDUCATION EXCELLENCE

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Introduction

To make science interesting and to capture student and public attention in today's world, science must cross disciplines and be presented in exciting, lively forms (Wallis and Steptoe 2006). The field of ocean science includes all disciplines of the NSF STEM education initiative and, thus, provides an integrated venue to enhance student preparation for professional and scientific careers in the 21st century (http://nsdl.org/). Partnerships between scientists and educators can establish the necessary links to real-world research that makes science come alive for students. Collaborations between teachers and scientists can help bridge the gap between current scientific research and the K-12 classroom and provide a mutually beneficial process that improves teacher scientific knowledge, student achievement in science, and scientist communication skills (Chennell 1999; Dea 2000; Glasson & Bently, 2000; Ovens, 2000; Silverman 2009). Such opportunities have the added benefit of going beyond the experience by forming sustained partnerships between scientists and educators (Dressner & Worley 2006). COSEE Coastal Trends has developed a model that communicates ocean science research to formal and informal audiences. The Scientist-Educator Partnership (SEP) is designed to help scientists and graduate students apply their research efforts to be useful to a broader segment of society and improve their communication skills--all the while enhancing the link between ocean science research and education.

Overview of Scientist-Educator Partnership program

Goal

The goal of the Scientist-Educator Partnership is to facilitate collaboration between members of the science and education communities to foster broader understanding of ocean science research.

Components

The components of the Scientist-Educator Partnership (SEP) include:

1) Selection of research topic and scientist

2) Establishing Scientist-Educator Partnership Teams

3) Conducting an orientation program

4) Participation in a six-week research/education experience

5) Assembly of education module

6) Participation in a follow-up workshop

7) Peer review and field-testing of the modules

8) Web-posting and integration of modules into the ocean science course

Objectives

- Engage scientists, educators, students and the public in collaborative partnerships

- Offer opportunities for scientists to effectively communicate research to a broader societal community

- Develop sustainable ocean science education and public outreach activities with ocean scientists, graduate students, educators, and college students

For more information see: *www.coseecoastaltrends.net/programs/scientisteducatorpartnership/*

Component Details

1. Research topic and scientist

COSEE Coastal Trends is assembling an ocean science curriculum called *An Introduction to Our Dynamic Ocean* (www.coseecoastaltrends.net/programs/oceansciencecourse). The curriculum is based on the Ocean and Climate Literacy Essential Principles (OLEP) and Fundamental Concepts (http://www.coexploration.org/). The curriculum is arranged by topic and provides existing research-based, high quality activities to support each of the OLEP concepts. A gap analysis is being conducted to identify areas where concepts lack activities. COSEE Coastal Trends chooses ocean research topics and scientists to participate in the SEP based on this gap analysis. Thus, education modules developed by SEP teams will serve to "fill" the gaps in the ocean science course curriculum.

2. The Scientist-Educator Partnership Team

The four-member SEP team includes an ocean research scientist, a graduate student, a secondary school educator, and an underrepresented college student. COSEE Coastal Trends seeks scientists with active research projects associated with the selected topics and who are mentoring graduate students studying in the same field. We recruit educators through web advertisement and online application to participate in the SEP. The selection of the educators is based on experience, professional accomplishments, potential to transfer pedagogical knowledge to the team, and ability to develop high quality applications for the classroom. Through our partnership with Hampton University and the Living Marine Resources Cooperative Science Center (LMRCSC, http://www.umes.edu/lmrcsc/), Deidre Gibson, project director of the LMRCSC at HU, works with the other PIs to recruit qualified rising juniors and seniors based on grades, enthusiasm for the field of marine science and interest in research and education.

3. Orientation program

Team members attend a two-day orientation program, presented by COSEE Coastal Trends staff. The orientation program includes

- a get-to-know each other session for team members
- content overview of the each of the ocean science research topics
- introduction to science communication and pedagogy skills
- information on expectations and meetings
- guidelines for module development (e.g. use of the *Module Template*, see below)

In order to facilitate communication between researchers and educators, the SEP teams use concept mapping exercises (DeCharon et al. 2009). By working on concept maps both individually and collectively, the team members learn about each other's perceptions and

build a consensus on the key messages of the research. These concept maps then serve as the basis for the education module content including text, visuals and storyboards.

4. The six-week research/education experience

Conducting Ocean Science Research
The team works together for six weeks of the summer. During the research/education experience, the educator and college student are integrated into the scientist's and graduate student's research program.

Communicating the Research
The team also collaborates to create an education module (see *Assembly of Education Module* below) and submit a weekly blog post hosted on the COSEE Coastal Trends website (see see *Research/Education Experience Timeline* below for suggested weekly blog author), both with the aim of broadly disseminating various aspects of the team's research and experiences.

The team meets on a weekly basis during the six-week experience to discuss suggested aspects of science and education (see Research/Education Experience Timeline below for weekly discussion topics and leaders) and to discuss module development. The discussion topics are meant to serve as a starting point for team communication and to help guide the module development process.

Expected outcomes
- Improve scientist communication/pedagogy skills.
- Provide scientists with a venue for applying research to broader audiences.
- Help advance teacher/student understanding of ocean science research.
- Assemble an education module that communicates the scientists' ocean research to formal and informal audiences.

Responsibilities of each team member
a) Scientists
- lead research activities, including lab/field projects,
- provide background materials on research,
- select graduate students to participate in SEP,
- attend orientation, weekly team meetings, and wrap-up meeting,
- serve as science expert for module development
- participate in online review of final draft of education module.

b) Graduate students
- set up weekly team meetings
- serve as "task manager," making sure the team uploads module page drafts and final revisions to the online Module Template according to the *Research/Education Experience Timeline* below
- involve teacher and undergraduates in field/lab projects,
- attend orientation, weekly team meetings, and wrap-up meeting,
- participate in online review of final draft of education module.

c) Educators
- guide communication/pedagogy skill development for team,
- lead development of classroom activities for the "Teach" page of the education module,
- participate in research projects to gain knowledge and experience in the topic
- attend orientation, weekly team meetings, and wrap-up meeting,
- transfer research to classroom by implementing education module with students,
- participate in online review of final draft of education module.

d) Undergraduate students
- conduct research project during a ten week summer experience,
- attend orientation, weekly team meetings, and wrap-up meeting,
- provide input and communication guidance for all pages of the education module,
- organize research science adaptation to public audiences through Communicating Ocean Science to Informal Audiences (COSIA) and Mentoring Young Scientists (MYS) programs (see www.coseecoastaltrends.net/programs/),
- participate in online review of final draft of education module.

Research/Education Experience Timeline

The following table outlines suggested weekly discussion topics and provides a timeline for submitting module pages and completing blog entries. Tasks should be submitted by the end of the designated week (end of day, Friday).

Week	Meeting Leader	Topic/Task
1	Scientist	- Discuss Introduction to Ocean Science Research: What is it? Why is it important? - Team Submits draft of "Learn" page of module to online template. - Begin activities development for "Teach" page.
Scientist posts a **blog entry**. Feel free to write about anything associated with your research and/or experience so far with the team.		
2	Graduate Student	- Discuss your team's research topic: What do we study? How do we study it? - Team Submits final Revision of "Learn" page of module. - Continue development of "Teach" page.
Graduate student posts a **blog entry**. Feel free to write about anything associated with your research and/or experience so far with the team.		
3	Educator	- Discuss how we can relate research topic to secondary level school students. - Team Submits draft of "Explore" page of module to online Module Template. - Continue development of "Teach" page.
Educator posts a **blog entry**. Feel free to write about any aspects of your research/team experience so far.		
4	College student	- Discuss how we can relate research topic to underrepresented audiences. - Team Submits final revision of "Explore" page of module in online module template. - Team Submits draft of "Teach" page in online Module Template.
College student posts a **blog entry**. Feel free to write about any aspects of your research/team experience so far.		

5	All	Test activities from the "Teach" page.

Choose one or more team member to post a **blog entry**/entries. Write about anything associated with your research and/or team experience.

6	All	**Finalize** Education Module in the online module template.

Choose one or more team member to post a **blog entry**/entries. Write about anything associated with your research and/or team experience.

5. Assembly of education module
The assembly of educational modules by the SEP teams serve as an essential communication vehicle for the diverse team members to "gather up" and discuss ocean science research in general, the research topic specifically, communication of the research topic to formal and informal audiences, classroom pedagogy skills and processes, and how to make the content relevant to broad audiences (specifically those underrepresented in science). Therefore, module development becomes a mechanism for team-work, collaboration, and focus for the SEP. The module also provides a mechanism by which scientists communicate ocean research to a broader audience.

The Module includes a "Learn" page that captures user's interest, an "Explore" page that explains what is happening with and how scientists are studying the topic, and a "Teach" page that provides classroom activities based on the research. The module development process is guided by a *Module Template*, which is a structured user-friendly online tool that allows teams to upload specific content and visuals for each module page. Specific details and guidelines for using the Module Template and populating each page are included both in the Module Creation Guide (separate document) and within the structure of the online Module Template.

6. Follow-up workshop
After finalization of the modules by COSEE Coastal Trends staff, draft versions of the modules will be reviewed by the SEP participants in a one-day, online follow-up meeting (Fall).

7. Peer review and field-testing of the modules
The College of Exploration (TCOE, www.coexploration.org) will develop an online panel of peer educators who review and comment on the module's usability in the classroom. In partnership with local school districts, the modules are field tested through programs associated with the Horn Point Laboratory STEM Center.

8. Web-posting and integration of modules into the ocean science course

Final revisions are made by the COSEE Coastal Trends staff, followed by publication of the tested version of the education module on the COSEE Coastal Trends website. As a means of increasing ocean literacy, the modules will be assimilated into the Ocean Science Course curriculum (see above). Inclusion of modules in the course provides participating scientists with "ownership" of the course and encourages them to review content materials.

The Scientist-Educator Partnership COSEE Liaison

COSEE Coastal Trends is collaborating with each of the COSEEs to implement the SEP in their area. As part of this collaboration, each Center will select a member of their staff to participate in the SEP program by serving as the COSEE Liaison between COSEE Coastal Trends and the collaborating Center. The responsibilities of the COSEE Liaison are:

- participate in a three day SEP training session,
- serve as the "on the ground" person in direct contact with the SEP team,
- be invited to attend the following year's training program to serve as a mentor for new team liaisons.

The SEP training session is conducted at COSEE Coastal Trends (HPL). During the training session, the COSEE Liaison learns how to conduct the program and receives instruction in effective visualization and synthesis techniques to assist the teams in communicating the research to a broader audience. The COSEE Liaison then serves as the "on the ground" person in direct contact with the SEP team hosted by their home COSEE during the 6 week research/education experience. The Liaison keeps teams on track, making sure teams hold weekly meetings and complete required tasks according to the *Research/Education Experience Timeline*, and answers questions about effective science education and communication.

COSEE Coastal Trends staff:

- helps each partnering COSEE assemble teams,
- provides an orientation program for the teams,
- provides support throughout the six-week SEP program,
- hosts follow-up meetings for the teams, and
- assembles the final education module.

Year-Long Program Timeline and Expectations

Fall-Winter	Identify topic and scientist
Spring	Assemble teams; distribute User's Guide to all participants
Late May	Undergraduates receive training at Hampton University (Gibson)
Early June	Undergraduates arrive at research site
Mid-June	Educator arrives at research site; COSEE staff conducts 2-day orientation program
June-August	Team participation in 6-week research/education experience with wrap-up meeting at the end
Mid-Fall	Final online review of modules by team members
Late-Fall	Online peer review of modules
Fall-Winter	Final revision of modules by COSEE Coastal Trends; posting on web

References

Chennel, F. 1999. The teacher scientist network. *Education in Science: The Bulletin of the Association for Science Education*. No. 184, pp. 20-21.

Dea, P. 2000. College-High school partnerships: A close encounter. <u>In</u>: *Bringing the Excitement of Science to the Classroom*, Bacon, W.S. (ed.) Tucson, AZ: Research Corporation. pp.15-20.

DeCharon, A, J. Albright, and C. Herren. 2009. Online tools help get scientist and educators on the same page. EOS, vol. 90, no. 34

Dressner, M. and E. Worley. 2006. Teacher research experiences, partnerships with scientists, and teacher networks sustaining factors from professional development. *Journal of Science Teacher Education*. 17:1-14.

Glasson, G.E. and Bentley, M.L. 2000. Epistemological undercurrents in scientists' reporting of research to teachers. *Science Education*. Vol. 84, no. 4. pp. 469-485.

Ovens, P. 2000. Teacher research as a basis for teaching: A part of the future? *Education in Science: The Bulletin of the Association for Science Education*. No 189, pp. 14-15.

Silverman, P.M., 2009. "The Research Dynamic: A Professional Development Model for Secondary School Science Teachers," *CBE Life Sci Educ* 8(2): 123-130.

Wallis, C. and Steptoe, S., 2006. "How to bring our schools out of the 20th century," *Time* (10 December), at http://www.time.com/time/printout/0,8816,1568480,00.html.