

SUSTAINABLE SEAS EXPEDITIONS' PROJECT OCEAN STEWARD 2000 ONLINE WORKSHOP EVALUATION

BY KRISTINA BISHOP AND HOWARD D. WALTERS

DISTANCE LEARNING TECHNOLOGIES *have made it possible for educators to receive professional development at their convenience. But many people want to know: How effective is this web medium for teacher learning? This article reports an overview of the findings for an evaluation of a teacher professional development online workshop and highlights the learning outcomes.*

BACKGROUND

In April 1998, the National Geographic Society (NGS) launched the Sustainable Seas Expeditions (SSE). NGS worked closely with NOAA's National Marine Sanctuary program and NASA to develop education programs based on the results of the SSE missions, and to address the national need for increased marine education for the general public and students in K-12 grades.

THE ONLINE WORKSHOP

One of the education programs developed by SSE was Project Ocean STEWARD (Students and Teachers Empowered With Access to Real Data) 2000, an interactive teacher workshop sponsored by SSE, held October 9–November 3, 2000. This online workshop modeled a face-to-face workshop by using a conferencing software system to create a private, password-protected online environment for the participating educators.

In this workshop, participants were able to access online presentations from experts, participate in asynchronous discussions concerning marine science topics, and share ideas for using the workshop information in their classrooms. Participants were able to gain graduate credit for their participation if they wished. Keynote topics for the workshop included observing ocean color from space, biogeography and the sea, and exploring the Monterey Bay National Marine Sanctuary. Breakout sessions were designed to address a variety of related topics, including Human-Ocean Issues, Ocean Technology, Community Service, Field Studies, and Careers. A virtual library was also a component of the workshop.

The SSE Project Ocean STEWARD 2000 online workshop represented a strong collaborative effort of sponsors,

keynoters, supporters, and developers. Most of the 328 registrants were formal or informal K-12 educators. A small number were from colleges or universities. High school teachers comprised the largest group. Most middle and high school teachers stated they were science teachers in the fields of biology, environmental science, earth science, marine science, and oceanography. The participants were from 37 states and 19 foreign countries, with the largest single group (53) coming from California.

WORKSHOP GOALS

The primary goals for the Project Ocean STEWARD 2000 workshop were to introduce and empower teachers to understand the importance of the ocean and marine sanctuaries, and to reinforce this through understanding of processes (questions) and products (data) of scientific investigation and exploration. Other goals included:

- making new technologies, new knowledge, and new learning opportunities available to teachers and thus their students through the web;
- providing an opportunity for formal and informal educators to interact with scientists;
- offering educators the opportunity to interact and share ideas and projects;
- developing educators' knowledge and use of the web;
- assisting educators in gaining a multi-disciplinary curricular view of our National Marine Sanctuaries;
- assisting teachers in using data in classroom activities and providing them with activities for use in the classroom; and
- giving teachers the tools to develop their own expedition to link their local environment with the ocean.

EVALUATING THE WORKSHOP

The evaluators examined the participants' reactions to the ocean science content and to the distance learning medium. The purpose of this evaluation was:

1. to assess the workshop's effectiveness as a professional development tool; and
2. to determine the success of this model of online teacher workshops, using earth science data as content and sanctuaries as focused examples, to create innovative learning opportunities.

To evaluate the implementation of the SSE Project Ocean STEWARD 2000 online workshop, the evaluation team chose a combination of qualitative and quantitative methods, including participation statistics, an online survey with selective response and open-ended questions, external evaluators' participant observation, and informal feedback from the workshop planning team. The evaluation was both summative and formative in intent.

The goals of the SSE Project Ocean STEWARD 2000 were used as criteria to guide the evaluation. In order to gauge the level to which the experience satisfied the project goals, the evaluation team created four guiding questions. Each question addressed a unique objective for the workshop experience, and the subsequent evaluation was created based on these questions:

1. **Quality of Content:** How effective was the workshop for increasing participant awareness of ocean systems, ocean data, scientific exploration, and marine sanctuaries?
2. **Learning Opportunities:** Did the workshop provide a new learning opportunity for teachers that increased understanding of primary topics, an ability to link ocean sciences with national standards, and a knowledge and use of Internet and web-based science resources?
3. **Participation and Interaction:** Were the quality and quantity of online interactions among teachers, scientists, and participants satisfactory? Have participants subsequently made connections that create an ongoing community extending beyond the workshop time frame?
4. **Quality of Resources:** Was the workshop a helpful resource for marine exploration in that it provided tools, lesson plans, websites, and scientific data that can be integrated into a classroom setting?

PARTNERS

THE WORKSHOP represented a strong collaborative effort; its design team consisted of a dozen individuals from six organizations. Francesca Cava of SSE was the project manager. The workshop and evaluation were facilitated by a grant from NASA along with time and resources donated from the partner organizations. The design team was further bolstered by more than a dozen online facilitators and other staff members from key organizations, who created a production team of more than 30 individuals.

Participating organizations included the National Geographic Society's Sustainable Seas Expeditions (SSE), NOAA's National Marine Sanctuary Program, NASA Earth Science Enterprise, the University of Southern California Sea Grant, Project WISE at the University California, Berkeley, and The College of Exploration. Dr. Sylvia Earle provided an online welcome to the participants. Three keynote presenters: Dr. Gene Feldman from the NASA SeaWiFS Mission, Dr. Steve Gittings of the National Marine Sanctuaries Program, and Dr. Steve Webster of the Monterey Bay Aquarium, all provided online presentations.

Within each of these areas of interest, the evaluators not only analyzed the findings, but additionally explored recommendations to identify improvements that may be made for future workshops. The guiding questions provided a framework for the evaluation and were used throughout as an organizer for the evaluation model, method, analyses, and report writing.

The evaluation team also reviewed and incorporated the standards for professional development for teachers of science stated in the National Science Education Standards (1996) to frame the data analyses, and to evaluate the quality and effectiveness of the workshop.

GENERAL OVERVIEW OF EVALUATION RESULTS

One hundred and sixteen individuals (out of 328 participants) responded to the online survey, providing a 35 percent response rate. Based on the comments during the online workshop and those from the final survey, the workshop experience was clearly positive, informative, and inspirational for most participants.

Participants stressed the workshop's high quality and ease of participation. Participants noted that the online workshop was practical and convenient, "a valuable way to do continuing education at your own pace...." Participants rated the workshop as logistically well run and organized. They described the website information as easy to navigate and download. Further approximately 86 percent of the survey respondents "agreed" or "strongly agreed" that they had a positive experience. The participants said that their experience favorably impacted their knowledge and teaching, and increased their desire to participate in other online workshops.

SSE Workshop Team members commented that online workshops are a cost-effective way to bring together a large number of educators for dialogue with scientists because the cost per participant is substantially less than bringing together a similar number of teachers in most face-to-face workshops.

FINDINGS

The evaluation findings are organized using the same four categories, which represent the guiding questions (based on project goals) for this evaluation: 1) Quality of Content, 2) Learning Opportunities, 3) Participation and Interaction, and 4) Quality of Resources.

Quality of Content: How effective was the online workshop for increasing participant awareness of ocean systems and data, and scientific exploration and marine sanctuaries?

The online survey results included a widely expressed perception that the science content presented in the workshop was outstanding and that the presenters were, indeed, impressive experts in their respective disciplines. More than 80 percent of respondents either agreed or strongly agreed with the statement participation in the workshop greatly increased my awareness of ocean science content. Terms such as "accurate, excellent, expert, expertise, and awesome" were observed frequently in participant responses. The following select comments from participants

THE EVALUATION TEAM

SSE asked The College of Exploration to assemble a team to conduct an evaluation of the Sustainable Seas Expeditions Project Ocean STEWARD 2000 online workshop. Dr. Kristina Bishop, Mr. Peter Tuddenham and Mrs. Susie Ensign of TCOE, and Dr. Howard Walters of the University of Southern Mississippi/Institute of Marine Sciences' J.L. Scott Marine Education Center and Aquarium, and Dr. Leslie Adelman of the Institute for Learning Innovation conducted this evaluation in November and December 2000.

evidenced an increased understanding and appreciation for the ocean: "I love studying the ocean and this workshop definitely made me want to keep learning.... The workshop had an abundance of information, thanks to the wonderful scientists and participants.... This workshop allowed me to expand my ocean unit and gave me strong references for environmental issues, which were previously lacking.... I learned a lot about marine environments that I did not know."

Learning Opportunities: Did the workshop provide a new learning opportunity for teachers that increased their understanding of primary topics, their ability to link ocean sciences with national standards, and their knowledge and use of the Internet and web-based science resources?

One of the goals of the SSE Project Ocean STEWARD 2000 online workshop was to provide an innovative learning opportunity that was clear, well organized, and interesting for participants. By creating a logical and informative environment, participants would have a higher-quality experience, and finish the program having gained valuable knowledge. Several of the evaluation questions explored the quality and effectiveness of the workshop format for increasing content understanding and for supporting enhanced Internet skills. More than 90 percent of evaluation respondents (105 individuals) found the mixed text and multimedia workshop format to be effective. There was a widely expressed perception that the amount of content, the breadth of information, and the number of links to ocean science information provided throughout the workshop were overwhelming positive. Some participants perceived the prolif-

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METHODOLOGY

EVALUATION MODEL

To evaluate the implementation of the SSE Project Ocean STEWARD 2000 online workshop, the evaluation team selected a combination of qualitative and quantitative methods to present and analyze the questionnaire data. The evaluation was summative in its efforts to examine the outcomes of the completed workshop, but was also formative in examining this workshop with an eye to enhancing workshops in the future.

OVERVIEW OF EVALUATION INSTRUMENTS

Three evaluation instruments were used for this report. The following paragraphs contain brief descriptions of each instrument.

1. **Online Survey:** Participants were encouraged to complete an online survey at the end of the course. This evaluation survey consisted of 24 selective response and open-ended questions designed to give evaluators an idea of the participant's demographic profile, intentions for completing the program, impressions of the program, and criticism.
2. **External Evaluation through Participant Observation:** The second method of evaluation used the observations of two external evaluators, Drs. Adelman and Walters, who acted as participant observers and reported their findings. These observers followed the discussions, became familiar with the materials and the website, and tracked participant reaction to the workshop. Following the course, they each wrote a summary of their observations.
3. **Workshop Team Feedback Mechanism:** Online space was created to generate feedback from the SSE Workshop team. This area consisted of an open-ended evaluation space where SSE facilitators and the design team could record their written feedback about the workshop. Comments provided there are incorporated in the conclusions and recommendations.

OVERVIEW OF DATA ANALYSIS AND INTERPRETATION

Following the workshop, the 328 registrants were encouraged to complete a voluntary evaluation of their experience. The survey was completed, entirely or in part, by 116 (35 percent) of the participants. In addition to the selective response questions, these participants were asked a series of open-ended questions to solicit responses relative to various aspects of the workshop. In addition, workshop team feedback was elicited and quantitative demographic and online participation data were analyzed.

Participant responses to open-ended questions were analyzed using a modified content analysis technique, as described by Michael Quinn Patton in *Qualitative Evaluation and Research Methods* (1990), and by Sharan B. Merriam in *Case Study Research in Education: A Qualitative Approach* (1988). Therefore, when evaluating the responses to open-ended questions, the responses were read completely by the evaluator, and then highlighted using a multi-color marking technique to code for similar themes or constructs. Numeric counting of the similarities reflects two numerically interesting categories of responses from participants—the credibility of the information presented and the personal learning experienced.

eration of links as an obstacle to participation because they felt unable to adequately explore these areas. There were also minor complaints about technical difficulties related to inadequate computers or network connections, and to adjusting to the online navigation.

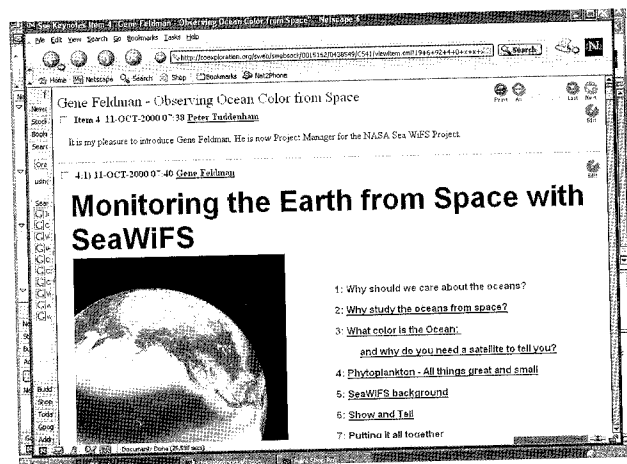
Participation and Interaction: Were the quality and quantity of online interactions among teachers, scientists, and participants satisfactory? Have participants made connections that create an ongoing community extending beyond the workshop time frame?

According to survey responses, the quality of participation in the SSE Project Ocean STEWARD 2000 workshop was very positive. Fifty percent of the workshop participants who responded to the survey indicated that they logged into the workshop two to four times a week, with nearly 30 percent signing in five or more times a week. As with many face-to-face discussion groups, most of the contributions to discussions were made by a limited number of people. There was engaging dialogue in each of the breakout sessions and there were thoughtful questions and appreciative comments to the keynote presenters. Participant tracking reviews showed that many more people were regularly reading the material, even though they were not writing responses.

It may seem that the lack of face-to-face encounters among participants, presenters, and facilitators would limit the important social aspects of learning. This assumption was not supported by comments from participants. Categorized responses from several open-ended questions make it clear that a true sense of community emerged for many participants: "I enjoyed the immediacy of the exchange.... I enjoyed 'hearing' scientists speak their heart.... An added bonus is knowing that there is an entire nation of teachers who have the same interests and concerns for the environment and how it is brought into the classroom."

The positive perception of community and participation may have been even more widespread if participants had been able to spend more time online. Time constraints, in their many forms, were clearly detriments to participation, with 22 individual respondents mentioning "time" as a major barrier.

Quality of Resources: Was the workshop a helpful classroom resource for marine exploration in that it provided tools, lesson plans, websites, and scientific data that could be integrated into a classroom setting?



A web screenshot used during the online workshop.

Of the 88 participant responses describing benefits from the workshop, the single largest pool of responses (31) described the practical benefit of gaining resources, such as web links, lesson plans, and other ocean science information for classroom use. Many participants reported an increased infusion of ocean sciences information into their classroom curriculum and activities. This suggests that the workshop is impacting a secondary audience, and that the workshop materials were organized and implemented in a way that made connections for participants between science content and educational settings. In light of the professional development standards cited in this article, it seems clear the participant's thought the workshop offered an excellent opportunity for continued lifelong learning by providing direct interaction with members of the scientific community. The content of the workshop presentations, which was current and relevant to ocean issues, provided an opportunity for the teachers to keep abreast of emerging science content, and to build on their knowledge and skills of oceans and ocean data. This was accomplished by giving them access to existing research and experiential knowledge. It also offered a platform for interaction with peers and colleagues to share ideas and activities for use in classrooms. The workshop supplied the teachers with excellent science resources and introduced them to scientific literature. It afforded a forum for discussing issues related to ocean and human health, career and community service, and field studies, as well as, factors affecting marine sanctuaries.

When reviewing and categorizing the evaluation data, it was clear the participants perceived great benefits from their workshop experience. They emphasized three categories of major benefits: 1) new content learned; 2) exposure to new educational resources; and 3) the value and quality of the interaction they experienced in the workshop. A number of

comments attested to participants' emotional connections to the content and the workshop experience: "Just knowing this resource exists and that science educators can connect with other educators who have more content, experiential, and research depth encourages my use of the Internet in education and for education...the discovery of a community..." Another respondent emphasized the excitement he discovered with the blend of the technology and quality of content in the SSE Project Ocean STEWARD 2000 workshop: "This is an exciting way to learn...to have access to this level of expertise in one course is beyond anything I have experienced before."

Participants also identified several more specific, positive aspects of their online workshop experience. Their comments are summarized as follows:

- **Professional/Quality Experience:** "An impressive variety and diversity of information and participants; engaging and inspirational content and dialogue; good organization and timeliness of issues relating to content/discussion."

* For all the figures in this article, the first number on the bar* is the percentage and the second number is the actual number of respondents.

- **Practical Format:** "The online format allowed participation 'anytime/anywhere,' self-paced; interactive; multi-media (particular emphasis on visual documentation in speakers lectures)."
- **Expert Staff and Presenters:** "Enthusiastic and passionate presenters; opportunity to interact with experts was appreciated; workshop staff were excellent at trying to facilitate and efficiently guide interaction."
- **Expanded Knowledge:** "Useful information, resources, and materials; great opportunities to share ideas and knowledge with others, 'accurate' and 'real' content appreciated, visual documentation stimulating."
- **Interaction/Real Time Exchange:** "The opportunity to ask questions and make comments, and having the workshop act as a forum that promoted interaction between diverse participants effectively brought together educators and researchers."
- **Enhanced Teaching:** "The experience enhanced teaching; it stimulated new thoughts and ideas on specific issues and problems."

PARTICIPANTS' PROXIMITY TO THE OCEAN

In the survey, the respondents demonstrated an interesting dichotomy in their relative proximity to the ocean. Slightly more than 1/3 of the respondents lived less than 20 miles from the ocean or Gulf of Mexico, while another 1/3 were more than 100 miles. This matches similar preferences shown in other studies, where people very close to an environment know it well and seek more information about it; while people who are very far from an environment have little chance to "know it," and try harder to make connections and seek information about such an environment.

The distance I live from the ocean or Gulf of Mexico:

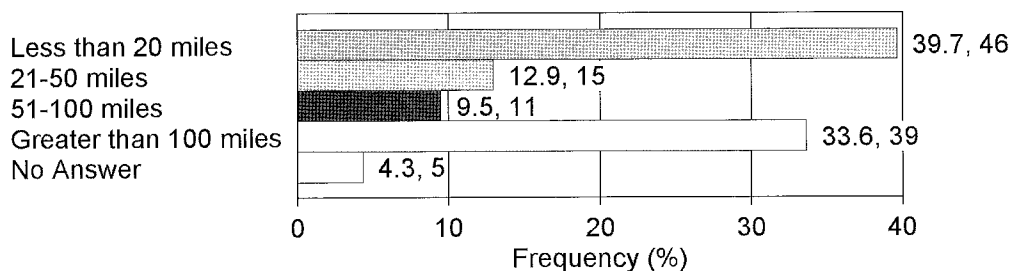


Figure 1: Distance from the Ocean*

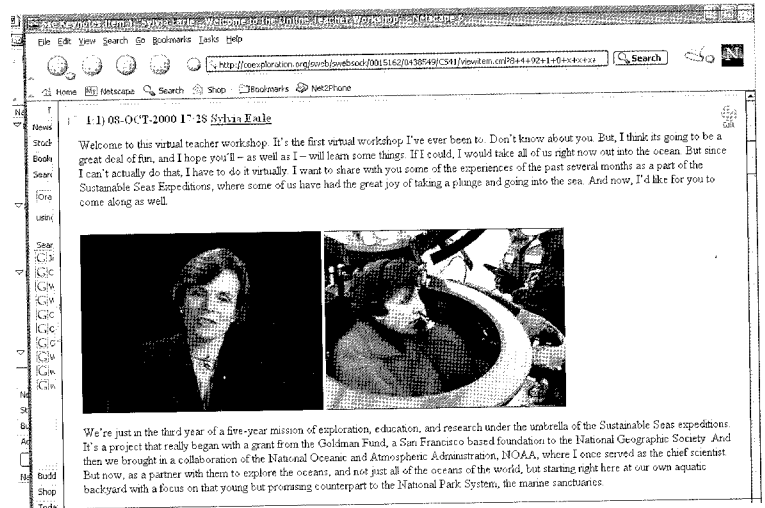
SCIENTIST KEYNOTER FEEDBACK

The core element in creating the online community is the link between the educator-participants and the science expert serving as the keynote speaker. These keynoters are asked to provide time daily for one week to interact with questions from participants. For most keynoters, this is a first experience. The authors solicited responses from select previous keynote speakers to ascertain their experience with the online workshop. These individuals used terminology such as "surprisingly gratifying...not much different from preparing a public address or a paper for publication...and it allowed me to think about content and not the design of the website [based on a perception of positive, technical support from The College of Exploration.]" Additionally, the scientists viewed the questions as "thought provoking and stimulating" and the experience an "efficient use of time." A final comment from a scientist/keynoter was "the immediacy of the discussions was key to keeping everything fresh."

RECOMMENDATIONS

The most frequently mentioned barrier to participants was a lack of time to participate. It would seem that individuals motivated to participate as individual

learners in an online workshop are generally fully engaged in other professional pursuits as well. Consequently, it may not be possible to satisfy the time issues for this audience, since they probably will always have a perception that they are "too busy." Workshop planners need to be sensitive to time concerns, since it is in their best interest to create an environment that promotes involvement and discussion.



A screenshot of Sylvia Earle used during an online workshop.

WORKSHOP EXPERIENCE

Based on comments made both during the online workshop and in the final survey, the workshop experience was clearly positive, informative, and inspirational for most participants. The workshop was logistically well run. Participants said it was organized, easy to navigate and download information, and easy to contribute to. As shown in Figure 2, an overwhelming 86.3 percent of respondents had a positive experience with the workshop. The workshop experience impacted participants' knowledge and teaching and increased participants' desire to participate in other online experiences.

Overall, I had a very positive experience with the Project Ocean Steward online workshop.

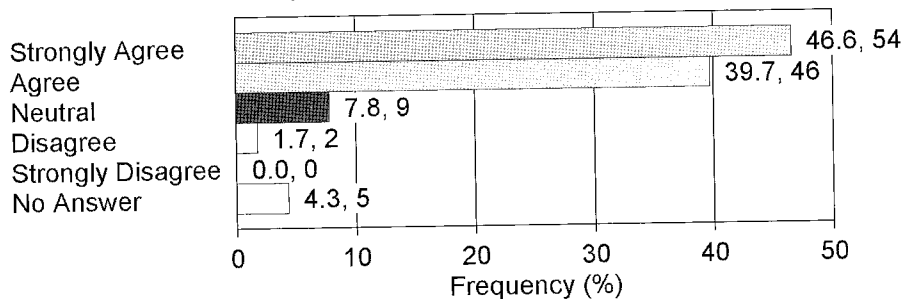


Figure 2: Overall Workshop Experience*

The barriers to participation and motivation mentioned by participants lead to the following considerations for improving and refining the process and content:

1. **Continued Improvements in Online Learning Communities:** Future workshops should continue to devise new strategies for encouraging participation and interaction of all registrants. The strategies may involve the following suggestions.

- ◆ Pay greater attention to the timing and length of workshops.
- ◆ Narrow the amount of content delivered.
- ◆ Provide more specific instructions on the age/audience appropriateness of content/materials.
- ◆ Invite teams/groups of colleagues to participate, thus providing an opportunity to build inspiration and infrastructure among participants who work together and enhance the long-term impact of the experience.
- ◆ Promote greater interaction of the discussion leaders to continually prompt responses and discussion.
- ◆ Encourage web exploration and participant interaction so each participant is involved in the online community.

- ◆ Review and assess the option of offering graduate credit to participants, realizing that this option is labor-intensive for workshop planners to manage.

2. **Refined Technology and Web Design:** The following actions may be taken to tap into the latest technology to facilitate future online workshops.

- ◆ Facilitate user navigation of and orientation with the online system, have a chart or map of the site, and use different design templates for each room.
- ◆ Develop an updated, more user-friendly tutorial for new users of the conferencing software system. This would alleviate frustration for users and allow them to concentrate more fully on the content of the workshop.

3. **Value-Added Research:** Additional research could provide more solid information about online behavior and about the effects of online professional development programs on teachers. By researching participants' online behavior, TCOE may continually refine workshops to create an optimal learning environment for teachers' professional development and students. This may include the following.

EFFECTIVENESS OF THE LECTURE FORMAT

Even though participants overwhelmingly rated themselves as possessing the base of technology skills required for the workshop, their comments within the evaluation indicate that they were happily surprised by their exposure to information and technology in the program. For instance, one respondent stated the following:

The online conference created a virtual collegial setting for discovery and discourse, finding intriguing information about the current state of exploration of the seas, or finding colleagues to 'chat' with. One could get lost in the amazing amount of fascinating topics and links that were available.

The mixed text and multimedia format for the lectures was effective.

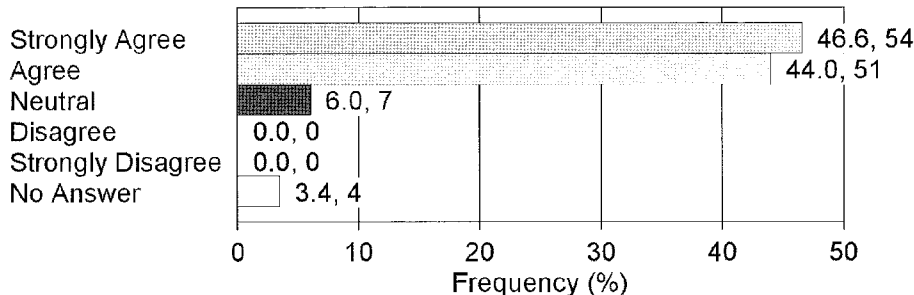


Figure 3: Effectiveness of Lecture Format*

- ◆ Calculate the average session length for participants, i.e. participation time (this is difficult to obtain from the current conferencing system software, but could be obtained from interviews or future evaluations).
- ◆ Gather additional participant-specific data (for example, number of comments made, number of different areas on the website visited, number of log-ins to measure interest and participation from week to week).
- ◆ Identify creative ways to directly and indirectly facilitate online interaction.
- ◆ Determine the reason for attrition by those who either never participated after registration or those who discontinued participation prior to the end of the workshop.

Additional research on the long-term impacts of this workshop is suggested to:

- ◆ determine to what extent and in what ways participants used the information from this workshop in their classrooms after participation;
- ◆ examine any ongoing professional communication among participants from the online experience; and
- ◆ explore the perceptions of group identity among participants.

According to the survey, 95 percent of respondents concluded that they are likely or very likely to participate in an online workshop again. Clearly, the professionals who were most invested in participation, as evidenced by their completion of the evaluation survey, were substantively pleased with their experience. The majority perceived that the workshop provided them with enhanced content knowledge and practical information to infuse in their classrooms. The workshop left these participants with a general desire for more time to have engaged online.

Four enthusiastic comments are representative of the large number of participants in the Project Ocean STEWARD 2000 online workshop: "This is an exciting way to learn...to have access to this level of expertise in one course is beyond anything I have experienced before.... The online conference created a virtual collegial setting for discovery and discourse.... Thank you so much for presenting this excellent online workshop. It has made a remarkable impact on me professionally and personally.... This workshop exceeded my expectations. It was truly first class. I have a lot that I will use in my classroom. Thanks for the new URLs. I would like more workshops like this, please."

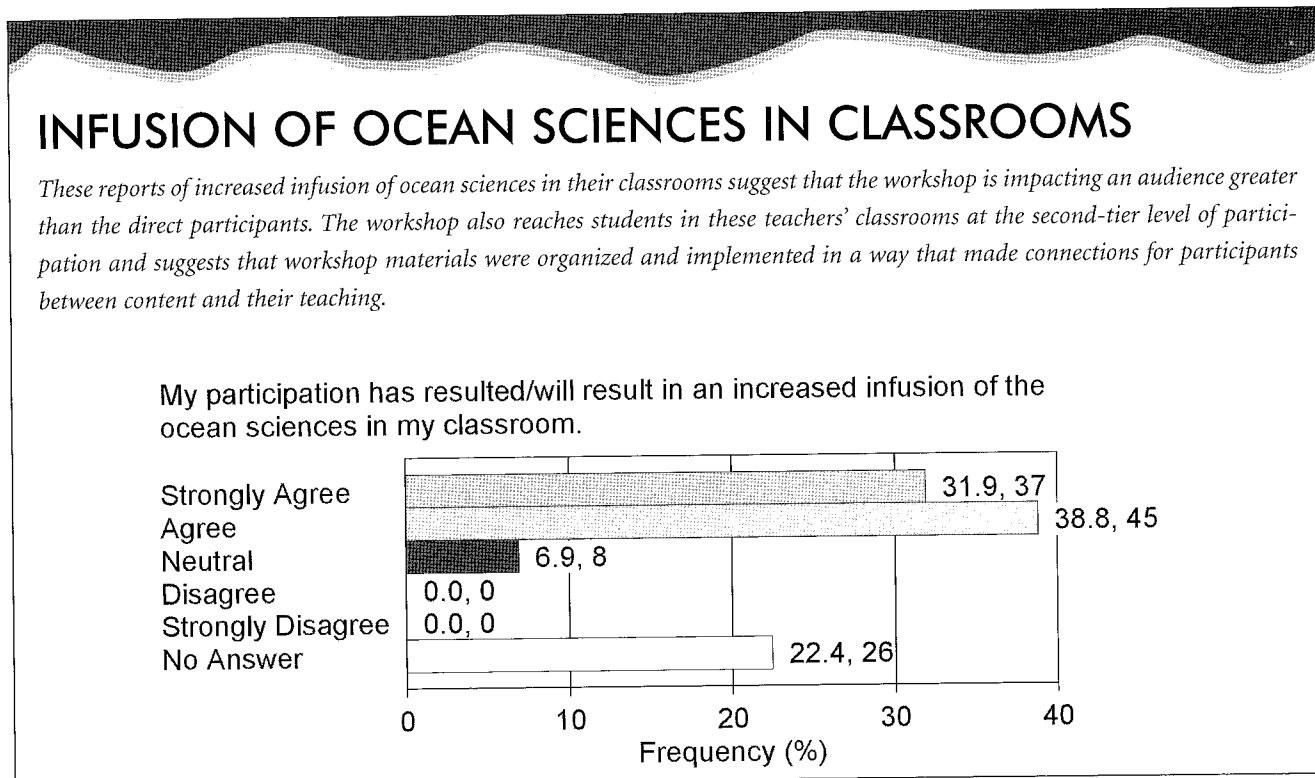


Figure 4: Increased Infusion of Ocean Sciences in Classroom*

Since the 2000 SSE online workshop, The College of Exploration (TCOE) has conducted a series of three online workshops on Conservation and the Coral Reef World with a total participation of nearly 1,000 teachers. The College of Exploration also hosted an online conference on Ocean Literacy and its Integration into Geography Education in 2002. A series of online teacher workshops, Classroom Explorations of the Ocean is planned for 2003. These workshops will be sponsored by the National Geographic Society and NOAA's Office of Ocean Exploration. Co-author, Walters will be hosting an online workshop focused on invasive aquatic species in the spring of 2003, with other colleagues, with funding from National Sea Grant in conjunction with TCOE.

In conclusion, the analyses of data from the SSE online workshop reveal strong and positive perceptions of this learning method by the educators who participated. The data reflect strong support for a conclusion that the online approach can in fact create social relationships among participants that are conducive to enhanced learning.

A significant obstacle to understanding online learning, however, is that the fiscal support to implement these workshops has not included sufficient support for broader, impact assessments. While it is not unwarranted to ascribe success to the programs completed thus far, based on anecdotal data, it is certainly timely for a serious study of this approach.

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- National Research Council (1996). *National Science Education Standards*. National Academy Press: Washington, DC.
- Patton, M. Q. (1990). *Qualitative Evaluation and Research Methods*. Sage Publications: Newbury Park.

FOR INFORMATION AND ACTIVITIES RELATED TO THIS ARTICLE THE BRIDGE RECOMMENDS:

Jason Academy

http://www.jasonproject.org/jason_academy/jason_academy.htm

Consortium for Oceanographic Activities for Students and Teachers (COAST)

<http://www.coast-nopp.org/>

Teachers at Sea

<http://www.tas.noaa.gov/>

TEA: Teachers Experiencing Antarctica and the Arctic

<http://tea.rice.edu/index.html>

REVEL Project

<http://www.ocean.washington.edu/outreach/revel/>

Project Oceanology

<http://www.oceanology.org/30TchrSmr.HTML>

Nova Southeastern University Oceanographic Center Distance Education

<http://www.nova.edu/ocean/disted.html>

Central Caribbean Marine Institute Educational Programs

http://reefresearch.org/html/educational_programs.html

CORE (Consortium for Oceanographic Research and Education: Educational Initiatives)

<http://www.coreocean.org/>

Maury Project

<http://www.ametsoc.org/amsedu/maury/index.html>

Rainforest and Reef

<http://www.rainforestandreef.org/>

GEMS (Great Explorations in Math & Science)

<http://www.lhs.berkeley.edu/GEMS/>

MARE (Marine Activities, Resources and Education)

<http://www.lhs.berkeley.edu/MARE/MARE.html>

Education Resources for K-12 Educators

<http://marine.rutgers.edu/pt/education/education.htm>

Volcanoes and Tide Pools

<http://www.naturescience.org/Volcanoestour.htm>