CCC Ocean Science Quest ROAD Reporters Workshop Summary

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The California Coastal Commission has the responsibility to enforce state laws that are intended to protect a rare and valuable resource. Many environmental organizations and individuals support the commission's effort and many individuals and organizations feel that they are adversely affected by its rulings. A great deal of the conflict and competition between environmentalists and commercial interests is the result of the consequences of the laws of natural science. Most environmental educators try to influence what people think and what they do. Some people are highly resistant to these efforts. Dr. Bob Field's Ocean Science Quest educational program gets back to basic science and tries to influence how people think rather what they should think. When people understand how natural systems function, democratic processes can be trusted to serve public interests.

The Ocean Science Quest program relies on two innovative educational methods - learn by examples and learn by doing. Dr. Field has created two sets of intellectual property that will be loaned to Cal Poly at no charge for the benefit of this program. First is a set of Ocean Science Quest poster displays. The second is a set of methodologies for student participation. No funds from this grant will be used to create new intellectual property.

The poster display consists of eight posters that already exist. Each poster is three feet tall and nearly eight feet long and displays the four pages of a fictitious oversized tabloid newspaper called "The Natural Enquirer". Collectively, the tabloid newspapers explore the theme that the diversity, abundance, and distribution of life depend on interactions of energy and matter in the oceans, atmosphere, solid Earth, and Sun. The truth-is-stranger-than-fiction approach is intended to be provocative, informative, and entertaining. The story begins with sea otters in a kelp forest and explores a series of global themes emphasizing sunlight, gravity, and heat transfer.

Some participants may recognize connections with Dr. Art Sussman's systems (energy, matter, and the web of life) approach in his Guide to Planet Earth and to Sam Ham's thematic interpretation principles. The display emphasizes the rare and critical nature of California coastal waters including the remarkably important kelp forest ecosystem, tide pools, seasonal cycles, and historical global climate changes. In the end it is apparent that the sea otter and the kelp forest are highly interdependent and that both are metaphors for the ocean as a whole and for all of life.

The displays are just the starting point. The workshop includes fully illustrated PowerPoint slide shows, discussion groups, and field trips whenever possible. The ultimate goal is for participants to write and illustrate short stories suitable for a student edition of "The Natural Enquirer". This produces a visible product, encourages student engagement, and provides a way to attract a larger audience with the finished product.

The process of producing the paper is spelled out in Dr. Bob Field's "ROAD Reporter" approach. ROAD stands for read, observe, analyze, and discuss. Reporting involves writing short newspaper stories as well as oral and graphic communication. All stories must be tied to the theme of the ocean science workshop. Reading involves the Ocean Science Quest newspapers as well as a list of 96 library books on a variety of subjects and Internet searches as well as use of other media resources. The newspaper format is very flexible (from world news to sports and entertainment) and the tabloid style allows a great deal of artistic license that is not tolerable in serious scientific writing.

The tabloid newspaper approach is accessible, flexible, and appropriate to the truth is stranger than fiction nature of the coastal environment and of the entire universe. Newspapers serve everyone through their many sections and features: world news, local news, environment, health, science, weather, sports and recreation, entertainment, business, book reviews, commercial advertisements, help wanted, personal and classified ads. There are unlimited opportunities for students, teachers, and the community to relate to science. The short story (four to eight paragraphs) is ideal for getting a message across efficiently and effectively. Follow-up stories in additional issues can expand and explore themes and facts in details. Illustrations and pictures make the medium highly visual and enhance understanding of complex concepts.

The approach fits all ages and abilities. As investigative ROAD reporters, participants (students, teachers, general public), take responsibility for their own education, for life long learning, using readily accessible resources in newspapers, magazines, library books, websites, emailing experts, interviewing people, contacting environmental and commercial interest groups, etc. What does a ROAD reporter do? A ROAD reporter uses words (oral or written) and pictures to tell a story. Where does the story come from? From the ROAD: Read, Observe, Analyze, and Discuss. This is what scientists do: experimentalists and theorists observe and analyze, sometimes with expensive powerful hardware and computerized equations, but basically they observe and analyze. The Ocean Science Quest dispenses with the complexity and invites you to investigate things you can see while standing outdoors anywhere, inland or along the coast. You can be miles from the ocean and ask how does the ocean affect what I see? How do the things around me affect the ocean? The Quest in Ocean Science Quest means ask questions.

Dr. Bob Field has created an ocean science educational program that is fresh, innovative, and can be readily replicated across the state. The approach integrates physics, chemistry, biology, mathematics, and the four geophysical sciences. It emphasizes how to think rather than what to think, drawing the participants in and encouraging them to reach their own conclusions. The two most important concepts behind the Ocean Science Quest are thematic interpretation and system analysis. Both affect both content and method. The approach is highly flexible and can appeal to the general public and the mass media without losing sight of the goal of emphasizing science education. Schools, libraries, and "museums" can participate. Environmental educational programs often treat all age groups the same in terms of science content and do not meet state science standards for older students, this program can be integrated into science classrooms everywhere and can challenge the brightest and oldest participants.

In order to realize the potential for this program, it is necessary to provide professional development for teachers and for non-profit environmental educators. The grant will provide resources to organize and present workshops for educators and to evaluate the success of the effort. Dr. Bob Field's Ocean Science Quest Project can provide ocean science educational opportunities to underserved audiences throughout California including students, teachers, the general audience, and those who normally resist the message-based approach of environmental educators. The techniques developed can be applied to all grade levels.

Dr. Bob Field's Ocean Science Quest educational program has a provocative, entertaining, and informative approach to ocean science education that is fresh, innovative, and can be easily replicated across the state. The approach integrates physics, chemistry, biology, mathematics, and the four geophysical sciences. It emphasizes how to think rather than what to think, drawing the participants in and encouraging them to reach their own conclusions. The two most important concepts behind the Ocean Science Quest are thematic interpretation and system analysis. Both affect both content and method. The approach is highly flexible and can appeal to the general public and the mass media without losing sight of the goal of emphasizing science education. Schools, libraries, and "museums" can participate.

Eight fictitious "Daily Sea Star" and "Natural Enquirer" tabloid newspapers collectively explore the theme that the diversity, abundance, and distribution of life depend on interactions of energy and matter in the oceans, atmosphere, solid Earth, and Sun. The truth-is-stranger-than-fiction approach is intended to be provocative, informative, and entertaining. The story begins with sea otters in a kelp forest and explores a series of global themes emphasizing sunlight, gravity, and heat transfer. Some participants may recognize elements of Dr. Art Sussman's systems (energy, matter, and the web of life) and Sam Ham's thematic interpretation principles. The display emphasizes the rare and critical nature of California coastal waters including the remarkably important kelp forest ecosystem, tide pools, seasonal cycles, and historical global climate changes.

Eight 20-square foot posters were created and displayed at Cal Poly's Kennedy library for six weeks. Each poster is three feet tall and nearly eight feet long and displays four pages of an oversized newspaper. Hundreds if not thousands of library users saw the display. The event was publicized in the community and tours were held for the general public. The exhibit was publicized at several faculty meetings and among docents and visitors in the local district of the California State Parks.

The poster display forms the basis for an ocean science educational program. The program uses Cal Poly's famous "Learn-by-doing" educational approach. The immediate objective is to provide educational seminars and workshops for current and future science teachers in middle and high schools. Since each teacher will reach several thousand students throughout the state during their professional careers, the very first workshop may influence 50,000 students. By changing how people think, the Ocean Science Quest program can start a virtuous circle in which some students and teachers are inspired to develop their own educational programs that eclipse the original program.

The program culminates in the production of a student edition of the "Natural Enquirer" tabloid newspaper. Participants write and illustrate the paper. This produces a visible product, encourages student engagement, and provides a way to attract a larger audience with the finished product.

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Dr. Bob Field's Ocean Science Quest Project can provide ocean science educational opportunities to underserved audiences throughout California. The current project is directed at high school and college science students and teachers as well as an adult general audience. The techniques developed appear to be suitable for middle school and lower grades as well.

The Ocean Science Quest educational program has been developed over a five-year period with frequent small scale testing in schools, libraries, "museums", and a variety of community settings. The next step is to train a group of teachers to use its themes, content, and methods in the classroom and the community. Ocean Science Quest provides educational themes, science content, and teaching methods that flow seamlessly from an understanding of natural processes. The highly adaptable approach integrates the natural with the cultural and taps into people's natural curiosity and creativity to provide relevance and motivate participation.

One of the problems faced by current environmental educators and science educators alike is that a significant portion of the general public does not understand the nature of science and does not trust scientists or educators to present unbiased information. A great deal of education appears to conclude with advice about environmental behavior. While this may be beneficial for many recipients, it does not serve the entire population uniformly. The Ocean Science Quest Project tries to help people understand how to think not what to think. The idea of the "Quest" is to ask questions. In an atmosphere where one's basic desires and choices are not under assault, some people may be receptive to alternate ideas and may make an effort to think things through on their own. One way to achieve this objective is to emphasize natural history and natural science and to focus on natural processes rather than human behavior.

Like it or not, much of the general public believes that the California Coastal Commission enforces state laws for the benefit of one interest group at the expense of another group. The resulting politicization of coastal problems is divisive, undermines good will and trust, does not facilitate the resolution of conflicts, and heightens the competition of interest groups. When their side is "winning", they may be pleased with this process, but when the pendulum swings, their victory may prove short-lived. Partisanship does not produce consensus and commitment; it produces temporary victories.

In reality, the Commission is highly constrained by the laws of nature that regulate the interactions of energy and matter in the oceans, atmosphere, solid Earth, and Sun. These interactions control the diversity, abundance, and distribution of life that bring about the inevitable competition and/or conflict between environmental and commercial interests. Fortunately, the people of the state of California have had the wisdom to support a voluntary funding vehicle that promotes innovative approaches to coastal marine science education.

Impartial science education and research are the only processes that have proven to produce long-term solutions to complex and seemingly intractable problems. The general public, the mass media, students, and science teachers are not trained or prepared to wade through complex solutions to complex problems.

The first test was conducted in October in conjunction with the library exhibit. Cal Poly's Department of Continuing Education helped organize a 12-hour Ocean Science Quest workshop with a grant from the Osher Institute for Lifelong Learning in retirement. The Cal Poly library provided a smart classroom for the students. Cal Poly's University Center for Teacher Education provided access to students in an education methods class to help evaluate the project. Several local high school science teachers and Cal Poly's Central Coast Science Project director saw the exhibit.

Portions of the display were based on PowerPoint slide shows and poster displays previously used at the Morro Bay State Park Natural History Museum, as well as at the Guadalupe Dunes Center, and the local Retired Active Men's Club, among other organizations. Portions of the display were inspired by physics student senior projects related to marine photobiology and optical oceanography supervised by Dr. Field in his role as adjunct professor at Cal Poly. Many of the investigation techniques used were based on methods used for developing advanced laser optical systems for military programs.