

In the Oceanography Classroom

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LET'S BEGIN WITH SOME QUESTIONS

This column will look at education in oceanography. It will ask questions and pose problems for discussion, proffer a few answers, act as a guide to educational literature and resources, and, I hope, entertain as well as inform. Now and then, its contents may even bother us. It will cover all the education sectors of oceanography—informal, K-12, undergraduate, and graduate—but the emphasis will be on the last two. First, though, who am I to be writing about oceanographic education?

Although I began teaching oceanography at the University of Washington almost forty years ago, it was with no training in either how to teach or how students learn. Then, as now—and still much to be deplored—one just “did it” and justified the often disappointing results with the adage: “Well, I can’t learn it for them.” Then in the fall of 1994, and quite by chance, I learned how to teach in ways that were fun. To my delight, they were fun for the students, too. What’s more, the students truly learned the material. Thus began my career as an educator.

I was astonished to discover that I was teaching amidst the reform of science education. The thought that I could help students learn better exhilarated me. I took part in a seminar in the College of Education at the University of Washington that examined a draft copy of the *National Science Education Standards*; became a Distinguished Speaker and a workshop leader in innovative teaching for the National Association of Geoscience Teachers; was invited to participate in National Research Council town meetings on science education; gave papers and organized sessions on geoscience education at national meetings of the American Geophysical Union (AGU), Geological Society of America (GSA), and Ocean Sciences; became a member of the AGU Committee on Education and Human Resources; and in 1998 became the first Faculty Associate in the Center for Instructional Development and Research at the University of Washington. In May of this year I co-chaired with Sharon Walker of the University of Southern Mississippi a National Science Foundation (NSF) workshop that recommended the NSF establish a Center for Ocean Sciences Education Excellence (COSEE)—more about this workshop later.

These six years have provided me with a rich education in teaching and learning.

In this, the first, column I want to raise some questions for us to consider about oceanographic education in this country. Let's begin with informal education, that is, with the education of the general public, away from the campuses of formal education. I have been told that two-thirds of the people in the U.S. visit an aquarium, museum, zoo, or science center each year. This amazing network is the forum for the general public to learn what the oceanographic researchers have discovered about the ocean and what they understand about its processes. Now, some questions! Do you visit the informal science education institution nearest to you? Does it display the results of oceanographic research or, more broadly, ocean sciences research? By contemplating the display, can the public value the results as an investment of their tax dollars in the scientific study of the ocean? Are the results related to their interests? For instance, are the latest findings on beach processes in the region presented in a way that is useful to the owners of beachfront property? Is the latest understanding of marine and estuarine habitats presented so that citizens can judge the value of these habitats in the quality of their lives and the economy of their region? Are the more esoteric aspects of oceanographic research mentioned for the enlightenment of the public about what researchers are doing at “the cutting edge” and what careers are awaiting their children? Are oceanographic researchers collaborating with these institutions? Unless the public knows and cares about what oceanographers are doing, why should they care whether oceanographers are funded to do the research?

In precollege education (grades K-12) oceanography suffers from two main disadvantages: first, the study of the ocean is not presented in the *National Science Education Standards*, either as science content or as a context for learning fundamental scientific principles, so students are not required to learn about the ocean, and second, most teachers who teach about the ocean did not major in oceanography. Their knowledge of the ocean and their confidence in teaching about it can be very weak. Are any of the oceanographic researchers

whom you know trying to alleviate this situation by working with K-12 teachers, either to tell them about the ocean or to convert research results into educational materials for the classroom? Programs in the NSF Division of Elementary, Secondary, and Informal Education can help them. Finally, is your undergraduate oceanography program providing preservice teachers with courses that build self-confidence for teaching about the ocean?

What is our notion of today's undergraduate major in oceanography? Does it resemble ourselves remembered, whatever our major was? Statistics from the U.S. Department of Education and the NSF should give us pause. When I entered college from high school in 1950, only 20% of high school graduates went to college or university. It was a very homogeneous population, much like the professoriat of today. But today, 70% of high school graduates take some form of higher education within two years of graduation. This population is not homogeneous. We are told that we learn by connecting new information to what we already know or have experienced. A diverse population will not possess the same experiences and knowledge for connecting the new information. Nor will all members of this population possess the same learning style. Are we using innovative methods that can help these students learn oceanography? Or is our teaching of the kind documented as the "poor teaching" that drives undergraduate students away from science? Of *all* the sciences, the ocean sciences community has made the least use of the funding programs in the NSF Division of Undergraduate Education to enhance its curricula.

The goal of graduate education has been to produce an oceanographer who is expert in a narrow specialty. Yet when we hire a new researcher to the faculty, we seek someone who can work with other researchers. To work jointly, one has to be able to communicate one's science to the other members of the group, or as the president of the Carnegie Foundation for the Advancement of Teaching and Learning puts it, "to teach one's science" to the others. This skill we value, but does your department teach graduate students how to teach? Is your department part of the system for preparing future faculty? As Margaret Leinen, the Assistant Director of the NSF, Directorate for Geosciences, has said: "Every community except the graduate education community is thinking deeply and proactively about the way that learning and education

take place among their learners." Is your department the exception to this statement?

A particular challenge for higher education is to include more members of underrepresented groups in the study of the ocean. Fifteen years from now, 40% of the traditional undergraduate-age population will consist of these underrepresented groups, but today the ocean sciences have the lowest participation by underrepresented groups of any science. Does your department actively recruit and retain members of this population? Does it even know how to do this? In the U.S., programs for underrepresented groups are offered by the NSF Directorate for Education and Human Resources, the NSF Directorate for Geosciences, the Office of Naval Research (ONR), and other agencies.

If you answered these questions "no," you are not alone. The entire oceanography community has missed many opportunities to educate the citizens of the U.S. and to help gain support for itself. Even today we overlook available resources. We have much to do. A plan for converting educational opportunities into accomplishments for the oceanography community is presented in the report of the COSEE Workshop. The workshop recommended that the NSF establish regional centers of ocean sciences education excellence, as part of a nationally coordinated program. According to the workshop report, COSEE is expected to foster the integration of oceanographic research into educational materials that will engage both students and the general public in the excitement of discovery and maintain their interest into a mature understanding of the influence of the ocean on the quality of their lives and the prosperity of their nation. It should also assist in developing curricula; foster the inclusion of underrepresented groups; encourage the sound preparation of teachers in the ocean sciences; provide opportunities for professional development; assist in improving the reward structure for faculty and graduate student teaching; encourage the use of information technology; establish internships; provide career information; effect many of these changes by fostering collaborations and partnerships; and formulate strategies to evaluate these initiatives. The complete report can be found at www.ocean.washington.edu/cosee/.

In future columns, I'll probe these and other questions that affect the oceanography classroom, seeking answers and identifying resources. I hope you will join me. 