

Educating the Next Generation:

Sea Grant's Role in Marine Science Education

True or False?

- Americans are concerned about the health of the ocean—to the point that many feel that ocean exploration should be given preference over space exploration.
- Less than half of American adults queried understand that the earth orbits the sun yearly.
- Most people believe that an individual can have an impact on improving the environment.
- The number of people who actively participate in environmental activities is quite small.

These statements are all true, based upon answers given by respondents to recent polls and surveys about science, technology, and the environment.

Such studies, when looked at individually or collectively, often reveal differences between respondents' perceptions and actions. For example, despite widespread concern about the environment, a lack of knowledge and understanding of basic scientific concepts exists.



Photo: Tom Kleindinst, WHOI

And, while many people express a desire to improve the environment, a substantial number feel that it is someone else's responsibility.

These inconsistencies underscore the need for increased support of science education at all levels. Through education, students will develop a better understanding of scientific principles and become more prepared to apply that understanding to real-life decisions.

By improving the education of and accessibility to scientific information by students of all ages and vocations, we will have knowledgeable citizens, voters, policy-makers, regulators, and decision-makers.

Sea Grant's Role in Marine Science Education

Sea Grant has played a role in marine and environmental education since the inception of the program in

1968. That Sea Grant figures prominently in the education of future scientists and others was even referred to in Sea Grant's authorizing legislation in 1966.

In the *National Sea Grant Program Network Plan, 1995-2005*, commitment to education plays a dual role: developing a citizenry that is informed about environmental issues and training highly qualified professionals for the 21st century. Educational

programs are conducted through partnerships with academic institutions, government agencies, citizen groups, and businesses.

Rationale for Marine Science Education

Recently, the National Research Council published the *National Science Education Standards*, designed to achieve scientific literacy for

Achieving scientific literacy for students—and adults—is an important goal. Among the many sound arguments for science education, Sea Grant has invested in educational programs designed to accomplish the following:

- To improve the science and technology skills of students;
- To prepare today's students for a technologically advanced society;

WHOI Sea Grant's Involvement in Marine Science and Technology Education

WHOI Sea Grant supports marine science and technology education by offering formal and informal educational opportunities and products to several different audiences. Listed below are some of the current programs, grouped by audience:

duce children to the wonders of science and the environment, while making the most of their inquisitive nature and desire to find out how things work.

Supplemental Curriculum Materials: WHOI Sea Grant produces a broad range of materials intended for use by classroom teachers, informal educators, and students to supplement existing curricula or field studies. Examples of recent publications include: *All About Oceanography: A Fun Filled Activity Book*, *Field Guides for New England Marine Environments*, and *Tips on Preparing a Scientific Research Paper*.

Some publications are produced in collaboration with other organizations. Examples include: *Marine Science Reading List*, *Raindrop Journey* (poster and narrative describing the water cycle), *Over the Wedge* (saltmarsh poster), and the WHOI Teacher Packet. In 1996, WHOI and UNH Sea Grant communications staff published *Marine Science Careers: A Sea Grant Guide to Ocean Opportunities*, aimed at middle and high school students, teachers, parents, and guidance counselors interested in pursuing or informing students about a career in the marine sciences. Based on the success of that publication, now in its second printing, the creation of a national Sea Grant marine careers web site is underway (www.marinecareers.net).

Partnerships: Partnering with other organizations to address K-12 needs allows WHOI Sea Grant to extend its financial and staff contributions. Locally, we are very involved in the Woods Hole



Photo: Tom Kleindinst, WHOI

all U.S. students in the 21st century. The *Standards* state: "scientific literacy enables people to use scientific issues and processes in making personal decisions and to participate in discussions of scientific issues that affect society." Among other things, the *Standards* provide guidance for schools, educators, parents, communities, businesses, scientists, and other organizations and audiences to work together to achieve this overall goal.

- To help students compete in the job market;
- To create a more knowledgeable and scientifically literate public;
- To better prepare citizens to effect change and protect marine ecosystems;
- To prepare and/or re-train today's workforce to compete in tomorrow's workplace as certain jobs disappear or change; and
- To create a public that can compete successfully in the global marketplace.

K-12:

At the K-12 level, WHOI Sea Grant contributions to marine science education fall under the informal education umbrella and can be divided into three categories:

"Sea Urchins" Summer Program: Billed as a 'hands-on, get-wet-and-muddy exploration program,' the "Sea Urchins" summer program is for children ages 5-7. The activities consist of several interactive field trips designed to intro-

Science and Technology Education Partnership (WHSTEP), a partnership among the local schools, scientific institutions, businesses, and community resources to support, promote, and expand science and technology education and science literacy in the participating communities. Other groups with which we share an interest and collaborative role in K-12 education are: the Waquoit Bay National Estuarine Research Reserve (WBNERR), the Association for the Preservation of Cape Cod, the Massachusetts Marine Educators (MME), the National Marine Educators Association (NMEA), and the National Science Teachers Association (NSTA), to name a few.

Undergraduate Education:

WHOI has supported an undergraduate summer research opportunity for over 30 years and it has served as a model for the National Science Foundation's Research Experience for Undergraduates as well as other summer undergraduate programs. The fellowship awards are highly competitive and recipients have generally completed their junior year in college. WHOI also supports a Minority Traineeship for undergraduate students at all levels. In each of these programs students are matched with mentors according to their academic and research interests. Many students are placed in laboratories that are supported by WHOI Sea Grant projects.

Graduate Education:

Undergraduate and graduate students have been associated with WHOI on an informal basis since its found-



Photo: Tom Kleindinst, WHOI

ing in 1930 and many well-known names in oceanography began their careers in Woods Hole. In 1968 the Institution established a formal joint doctoral program in oceanography with the Massachusetts Institute of Technology and together the two institutions have granted over 500 graduate degrees in oceanography and ocean engineering. WHOI Sea Grant has provided support to many graduate students over the years. This is reflected by WHOI Sea Grant acknowledgment on over 35 dissertations and theses. WHOI Sea Grant has also participated in the Sea Grant Intern program, now called the Dean John A. Knauss Marine Policy Fellowship, and the Coastal Services Center Coastal Management Fellowship Program.

Teacher Education:

Modeled after our summer fellowship program for

undergraduate students, WHOI Sea Grant and WHOI's Education Program have initiated a two-year teacher fellowship program that attracts teachers from throughout the Commonwealth of Massachusetts. Teacher fellows participate in an 8-week summer research experience during their first year to learn how research projects are conducted. During their second summer, teacher fellows will continue their research projects and begin to develop curriculum materials that can incorporate their research experience into their teaching.

Education of the General Public:

Locally and regionally, WHOI Sea Grant educates the general public using the following vehicles:

Publications: One of the ways that Sea Grant programs across the country reach out to their audiences is via publications. WHOI

Sea Grant is active in the publication of a newsletter, *Two if by Sea*, produced jointly with the MIT Sea Grant College Program (three issues/year), and *Nor'easter* magazine, a publication of the six northeast Sea Grant programs (two issues/year). In addition to these periodicals, we produce the "Focal Points" fact sheets, Marine Extension Bulletins, and contribute to numerous newsletters and periodicals published by other organizations. In 1995, WHOI Sea Grant made its debut on the Internet with a comprehensive and frequently updated web site (www.whoi.edu/seagrant).

Outreach Events or Activities: To remain visible in the public eye, WHOI Sea Grant organizes and/or participates in several outreach events or activities throughout the year. Examples include our "Oceans Alive" lecture series, de-

signed to excite the public about current topics in marine science; annual "Coastweeks" activities to celebrate the coast (we have organized guided beach, botany, and bird walks, kayaking ecotours, art contests, Coastweeks lectures, and a special evening of marine-related poetry and verse); and an annual storm drain stenciling project designed to educate people about the dangers of non-point source pollution and runoff. WHOI Sea Grant has a number of travelling displays for conferences and workshops and a permanent informational exhibit in the WHOI Visitor Center where annual attendance exceeds 30,000.

Media: Working with the media, through the distribution of press releases, invitations to special events, and facilitating reporter-source relationships for articles is an ongoing process. Helping the media gain access to accurate and current scientific information is crucial, as it is the only link that many people have to scientific information.

Technical Audiences

Education:

Many Americans see the development and implementation of new technology as a remedy for environmental woes. In a recent survey conducted by EarthView for the National 4-H Council and Honda, 81 percent of teens and 76 percent of so-called 'baby boomers' believe that advances in technology will help solve environmental problems. Both groups also agreed that teens will have the greatest impact on the future environment.

While WHOI Sea Grant believes that technology training is imperative to the education of our youth, most of our programs address adults engaged in occupations that involve or depend on technology. Some examples of audiences targeted by current WHOI Sea Grant programs include: fishers and shellfishers, aquaculturists, harbormasters, conservation commissioners, beach managers, local and state policy-makers and decision-makers, and regulatory officials.

Most of our efforts in technology training and education are accomplished by WHOI Sea Grant Extension staff using the following tools: workshops, courses, publications, financial support, and responding to requests for assistance and expertise.

WHOI Sea Grant's Participation in Regional and National Marine Science Education

Sea Grant's role in marine education for diverse audiences has made a difference at the local, regional, and national level. Sea Grant's continued participation in this arena will play an important role in helping the nation fulfill its goal as stated in the *National Science Education Standards*, namely, to create a scientifically literate public. As a federally sponsored and state and locally-matched program, Sea Grant can help make connections between government, the academic research community, schools, and communities. This need was unanimously expressed by participants at the 1996 Workshop on Ocean Sciences and K-12 Education, sponsored by the National Science Foundation and led by the Consortium for Ocean Research and Education (CORE).

Sea Grant's successful history in establishing partnerships and creating linkages between informal and formal education will continue to be used as a national model. It is imperative that continued federal, state, and local support be invested in Sea Grant's educational efforts.

For more information about the research or outreach projects profiled in *Focal Points*, contact WHOI Sea Grant at the address listed above.