Engaging Geoscientists in Outreach

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According to a survey reported by the National Science Foundation, only 51 per cent of high school graduates and 76 percent of those with advanced degrees can correctly answer the question, "How long does it take for the Earth to go around the Sun?" Science literacy in the United States and elsewhere has reached very low levels. In spite of spectacular advances in science and engineering over the past few decades, the wonder and excitement of scientific discovery is not effectively reaching students in the classroom. Scientists can play a critical role in outreach efforts at their home institutions and through other organizations, both public and private. NASA has a very clear mission to advance young people's scientific knowledge and, at the same time, "to inspire the next generation of explorers...." While acknowledging that doing science is different from teaching science, outreach efforts can support scientists to help convey the marvels of science to students, educators, and the public. The scientific method can serve as a model by raising fundamental questions to engage students and establish a baseline of inquiry. Planning and implementing experiments can then tap into prior knowledge of students challenged with answering scientific questions. These are a few of the ways that the essential knowledge of scientists can be passed on to the next generation of scientists. Some of the specific roles scientists can play in the outreach effort include classroom visits, public lectures, high school science curriculum development, media interviews, and Web site content, to name only a few. Research directorates of funding agencies like NASA and NSF are increasingly encouraging (and in some cases requiring) the integration of science and education and greater scientist involvement in Education and Public Outreach.

For more information;
http://sealevel.jpl.nasa.gov
http://www.spacescience.org
http://education.nasa.gov/

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U.S. Science Literacy

A scientist participating in a NASA–NSF-sponsored workshop about K–12 education interacts with school children who are using exemplary, inquiry-based activities in their classroom. (Photo used with permission.)

Disturbing facts are emerging about the state of science literacy in the United States. The table below, from the 2002 National Science Foundation report on Science and Engineering Indicators,[3] aptly demonstrates that the state of literacy in science facts and concepts in the sample population is deficient at best, by reasonable measures. If the scores below were test scores, most respondents would receive failing grades. Even the few "high grade" scores are not comforting if you consider that, for example, 8 percent of people with graduate or professional degrees think that the Sun revolves around the Earth, and 33 percent of this same population thinks that the earliest humans lived at the same time as the dinosaurs.

Science Literacy in the U.S. — 2001

Statement	*% of Correct Answers*						
	All Adults	*Male*	*Female*	*Less than High School*	*High School Graduate*	*College Graduate*	*Graduate/ Professional*
A.The center of the Earth is very hot. *(True)*	80	85	76	71	79	90	92
B. Electrons are smaller than atoms. *(True)*	48	52	43	29	45	66	70
C. The universe began with a huge explosion. *(True)*	33	43	24	20	32	44	59
D. The earliest humans lived at the same time as the dinosaurs. *(False)*	48	50	45	36	46	58	67
E. Does the Earth go around the Sun, or does the Sun go around the Earth? *(Earth around the Sun)*	75	86	66	52	76	92	92
F. How long does it take for the Earth to go around the Sun: one day, one month, or one year? *(One year)*	54	66	42	31	51	77	76
Sample Size	1,574	751	823	116	834	393	221

SOURCE: National Science Foundation, Division of Science Resources Statistics (NSF/SRS), NSF Survey of Public Attitudes Toward and Understanding of Science and Technology, 2001. Appendix table 7-10 (See Figure 7-4 in volume 1). Science & Engineering Indicators — 2002

The need is clear. Scientists can participate in educating students and the public in a variety of ways.

Geoscientists as Teachers

Though doing Earth science and teaching Earth science are fundamentally different, the scientific method can be viewed as a corollary to educational activities in the classroom.[4]

Scientific Method

- Raise fundamental question of interest
- Research what is already known
- Plan and implement experiments
- Reflect on results and how they affect what was known before
- Communicate learning via talks and papers

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Education Analog

- Engage students, establish inquiry
- Assess prior knowledge of students
- Plan and implement a hands-on activity
- Reflect on results and how they affect prior knowledge
- Communicate learning via assessment methods

What Scientists Have to Offer[5]

- Respect and influence in community
- Deep knowledge of science and scientific process
- Exciting connections to real-world exploration and intern ships
- Access to data and facilities
- Role modeling for students

Research directorates of funding agencies like NASA and NSF are increasingly encouraging (and in some cases requiring) the integration of science and education and greater scientist involvement in Education and Public Outreach.[5]

A JPL earthquake fault presentation to Cub Scout Troop 519. Dr. Tom Farr is an exemplary scientist in his ability and willingness to communicate Earth science to young and old alike. He regularly participates in outreach and educational activities for students and the general public. Here Dr. Farr describes the mechanisms and characteristics of an earthquake fault that runs through the JPL facility. The "JPL fault" is an offshoot of the Sierra Madre fault system that is partly responsible for the formation of the San Gabriel mountain chain in Southern California. These types of "field presentations" by professional Earth scientists make lasting impressions on participants, and are an important and valuable supplement to classroom instruction.

How Can Scientists Help?[1,5]

- Be an advocate and collaborator of sound policies and standards in science education.
- Be a partner between science community and outreach efforts
- Presentations/mentoring to students, at teacher workshops, or to the public
- Contribute to science curriculum elements for schools
- Collaborate on content for museum exhibits
- Participate in television or radio productions
- Write articles for popular science magazines
- Develop demonstrations or lab equipment
- Develop slide shows, CD-ROMs, giveaways
- Contribute to ongoing Web site development

Dr. Bill Patzert, also affectionately known as "Dr. El Niño" and "the People's Oceanographer," is particularly popular with local and national news media outlets because of his extraordinary ability to explain the complex interaction of ocean phenomena and global climate and weather. Dr. Patzert gives hundreds of media interviews every year, in addition to regular public lectures. Because of his wide media presence and ongoing research activities, classroom students at all levels as well as concerned citizens appreciate and respect that scientists of Dr. Patzert's caliber take the time to provide them with beneficial scientific information in a down-to-earth manner.

Science content should be taught so that students have the opportunity to build connections that link science to technology and societal impacts.[2]

1 Worthey, Guy, and Danner, Rolf, SIM Public Engagement Update & Planning, 21 August 2002.
2 Content Standards for California Public Schools, Kindergarten Through Grade Twelve (Science), http://www.cde.ca.gov/standards/.
3 Science and Engineering Indicators 2002, National Science Foundation, http://www.nsf.gov/sbe/srs/seind02/start.htm.
4 Morrow, Cherilynn A., What Are the Similarities Between Scientific Research and Science Education Reform?, http://www.spacescience.org/Education/ResourcesForScientists/Workshops/Four-Day/Resources/Articles/Research_Ed_Sim.pdf.
5 Morrow, Cherilynn A., The Diversity of Roles for Scientists in K–14 Education and Public Outreach, Space Science Institute, Boulder, CO, http://www.spacescience.org/Education/ResourcesForScientists/Workshops/Four-Day/Resources/Articles/Roles_M.pdf.