

A call to outreach

Life in the 21st century requires an understanding of science and technology. Earth Science Week is an opportunity to bring the geosciences to the wider public.

American students, educators and scientists will be celebrating the eleventh annual Earth Science Week from 12 to 18 October, with the theme 'No child left inside'. The event, organized by American Geological Institute (<http://www.earthsciweek.org/>), aims to bring to life the relevance and importance of the science of the Earth and engender a lifelong interest in the topic.

The goal of this event is to engage students and their families in the geosciences, which are all too often relegated to early school years or removed from elementary and secondary school curricula entirely. The lack of exposure to the Earth sciences in school may be partly to blame for shrinking numbers of graduates with concentrations in geology, and it is probably compounded by the increasing tendency to rely on PowerPoint lectures and mail-order mineral kits instead of field experiences.

But the need for outreach goes much further than convincing the best students to take up a career in the geosciences. Earth science issues ranging from climate change to earthquake risks and from ocean acidification to sinking coastal cities confront politicians and voters alike. The science underlying these questions is complex, the impacts are potentially devastating and there are no quick fix solutions. It is impossible to make rational decisions on any of these issues without at least a basic understanding of the science behind the problems.

Unfortunately, the 2006 Program for International Student Assessment (PISA) suggests that many young people advancing through the educational systems of their countries are essentially scientifically illiterate (<http://www.oecd.org/dataoecd/15/13/39725224.pdf>). The report shows that almost 20% of 15-year-old students, distributed equally across industrialized and developing nations, do not understand the most basic science.



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Science literacy can be defined as having an understanding of key concepts in science, mathematics and technology, and knowing that the fields are intertwined human enterprises that have both strengths and limitations. In addition, to be truly science-literate, a person must be able to use scientific knowledge and to apply a scientific manner of thinking to problems of personal and societal relevance. But of course, if the majority of people were scientifically literate in this latter sense, vulnerable stretches of coastline that are endangered by flooding, storm surges, sea level rise and hurricanes would not be inhabited where the levels of affluence allow people to live elsewhere.

Knowledge of key scientific concepts is found lacking in the PISA study. As Jorge E. Allende notes (*Science* **321**, 1133; 2008), this is a sad diagnostic of a generation of young people who are ill-prepared for modern life. In order to counter this pervasive scientific illiteracy, Allende calls for renewing the worldwide

push for inquiry-based education. This proposal builds on smaller-scale programs and has a lot of promise. Furthermore, scientists can accelerate the spread of science through society at a more personal level.

In addition to the occasional open days offered by more and more universities and research institutions, much can be done by individual scientists. Local and national programmes such as TRIO and Upward Bound (<http://www.ed.gov/programs/triomathsci/index.html>) are looking for volunteer scientists to host secondary level students in their lab for a few weeks during summer. Meanwhile, programmes like ScienceQuest (<http://www2.edc.org/sciencequest/>) need scientists and graduate students to be interviewed, or to provide materials and guidance for projects and experiments. Secondary and elementary school teachers are often pleased if researchers bring experiments into their classrooms or offer to guide field-trips for a day. Your child's teacher is a great place to start. You could also volunteer to give a presentation at a museum or a school's career day, or spend an afternoon with a scouting troop earning their geology badges.

Improving scientific literacy does not always require years of commitment. Personal encounters with a live researcher are likely to be more memorable than a long succession of school classes. Ultimately the hope is that these students, faced with media coverage of issue such as climate change, will use scientific reasoning, rather than dismissing or ignoring it. And as young people share their questions with their families and friends, the individual efforts of each scientist can go a long way in creating a society that responds intelligently to the problems that science can help to solve.

Let's make Earth Science Week global and ensure that no child in our neighbourhood is left inside.