

P1.14      **EARTH2CLASS: CONNECTING CUTTING-EDGE SCIENCE  
WITH THE CLASSROOM**

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**1. Introduction**

“Earth2Class (E2C) Workshops for Teachers” provide an effective format that allows research scientists at the Lamont-Doherty Earth Observatory of Columbia University (LDEO) to share their cutting-edge investigations with classroom teachers. Monthly workshops held at the Palisades, NY, campus give teachers insight into a wide range of current areas of investigation. Before each session, Dr. Michael J. Passow provides summary background information to assist teachers in understanding the scientist’s presentation. Following each talk, teachers have the opportunity to work through classroom investigations or educational technology applications based on the theme. Many of these utilize resources from “Water in the Earth System,” “DataStreme Atmosphere,” “DataStreme Ocean,” and other AMS Educational Initiatives. Pertinent NOAA, NASA, Navy, and other government web-sites have also been utilized.

The web site, <http://www.earth2class.org>, provides additional supporting materials. These include archived versions of presentations; a wide variety of resources, including links to AMS Education Initiatives; mentoring suggestions; virtual tours; index of session themes, and other instructional materials. Various aspects of the E2C program have been described in Symposia on Education at previous conferences (Passow et al., 2000 - 2003.)

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**2. Format of Earth2Class**

The basic format involves:

9:00 – 9:30 General announcements,  
technology set-up  
9:30 – 10:15 Background Information about  
the theme  
10:30 – 11:30 Guest Scientist(s) Presentation  
11:45 – 12:30 Classroom/Educational  
Technology Applications  
12:30 – 1:00 Wrap-up activities for course  
participants and future planning

Background information and scientist presentations utilize PowerPoint and web-based programs, augmented when possible by AMS-developed and other teacher-training materials. Participating teachers have been able to obtain Professional Development and/or graduate education credit. Field experiences have extended the benefits of E2C, highlighted by kayaking trips on the nearby Hudson River. The “Virtual Tour” section of the web site provides information about geological, hydrological, and historical aspect of this and other regions.

**3. Workshop Topics and AMS Educational Resources**

Workshops themes vary in each series, reflecting the wide range of investigations conducted at Lamont and the Science Education Content Standards guiding participants’ curricula. Some of the recurrent general areas include climate change, physical oceanography, water resources, natural hazards, and remote sensing. A complete listing is available at <http://www.earth2class.org/sitemap/themes.htm>.

Selected examples of how AMS instructional materials are incorporated into the current themes follow.

**3.1 Project Atmosphere and DataStreme Atmosphere**

“Hazardous Weather,” one of the first AMS teacher-training modules, has served to supplement presentations by Arthur Lerner-Lam, such as [“Living with Earthquakes”](#) and

["Earthquakes and Other Hazards."](#) Training materials illustrating collecting and analyzing data, such as "Today's Weather" and "Highs and Lows," have often been used in conjunction with presentations about how scientists [work with data](#).

Resources available on the [DataStreme Atmosphere](#) web site often provide examples for incorporating educational technology into curricula. Of particular value are the current weather maps, satellite and radar images, and upper-air data. Copies of selected "Supplemental Summaries" on pertinent topics have also been used to help train participants.

### 3.2 The Maury Project

Many Maury Project modules have been used over the years, including "Wind-Driven Currents" and "Density-Driven Currents" for sessions about [Air-Sea Interactions](#) and using [satellites wind observations](#). "Measuring Sea Level from Space" and "Ocean Sound" have accompanied talks about [remote-sensing](#). Programs about "Change" have utilized the "Tides" module. At one time or another, all of the Maury Project modules have been presented in E2C sessions.

### 3.3 Water in the Earth System (WES)

Many resources from the [WES](#) web site have been included in E2C training programs. "Weekly Water News" has been cited as an effective way to get students information for current events reports, and has been so used according to feedback from participants. Print and on-line resources from this program have been especially useful in presentations about [water resources](#) and [groundwater contamination](#).

### 3.4 DataStreme Ocean

[DataStreme Ocean](#) is in its pilot-test phase during the Fall 2003 term, but we have already been able to use print- and web-based resources for some E2C programs. Resources about mapping the sea floors (Benchmark Investigation 2A), ocean bottom topography (Investigation 2B), and deep-sea sediments (Investigations 4A and 4B) were used as follow-up to [Gerard Bond & Rusty Lotti: "Studying Climate Change Using the LDEO Deep Sea Sample Repository"](#) (September 2003). We anticipate using other components of the course materials as they are developed and distributed.

Resources available through the web site have and will be utilized in many future workshops, as they provide excellent links about the themes for teachers and their students.

## 4. NOAA, US Navy, NASA, and Other Government Web Resources

E2C has extensively used government web site in developing the background PowerPoints and classroom-ready activities. Selected examples follow.

National Weather Service sites provide satellite images and current weather, including hazardous weather statements. Many of the [National Centers for Environmental Prediction](#) also provide useful curriculum development resources.

Tide predictions and related data from the [National Ocean Service](#) provide the basis for the ["Moon and Tide Patterns"](#) activity. This also uses data from the [U.S. Naval Observatory](#). Data from the Navy's [Meteorology and Oceanography Command](#) web pages also provide curriculum ideas.

NASA provides extensive resources through its Internet sites. Materials developed through the [Jet Propulsion Laboratory](#) have frequently been incorporated into E2C ENSO-La Nina workshops. Of special value have been [TOPEX-Poseidon](#) posters, CDs, and related educational materials provided in sufficient quantities for distribution during E2C programs.

The [Tropical Rainfall Measuring Mission \(TRMM\)](#) web site effectively demonstrates many aspects of research that mesh with the goals of E2C. Classroom-ready activities based on TRMM data were developed by the [Institute for Global Environmental Strategies](#), and used in several E2C sessions to demonstrate implementing educational technology.

Links to other government-supported programs often used in E2C include the EPA's ["Surf Your Watershed"](#). We draw also on resources created by many projects supported by the NSF, such as the [Ocean Drilling Program](#) and the newly-begun [International Ocean Drilling Program](#).

### 4. Support from the Lamont-Doherty Earth Observatory

LDEO has supported E2C in many ways since Passow first approached them with the idea for Saturday workshops in 1998. The scientists have generously provided their time and expertise, with little or no financial return; however, E2C provides a very effective way to expand the impact of their research to the general public. Each classroom teacher gaining information from a scientist will share that with an average of one hundred students in the current year, and if the

concepts are repeated year after year, the scientist has indirectly made an impact on hundreds of students.

LDEO has provided access to the Seismology Building Seminar Room, computer network, and such unique facilities as the Deep-Sea Sample Repository, Remote Sensing Laboratory, and Borehole Research Group.

Through the Education link on the LDEO Home Page, teachers can access the E2C web site, which, in turn, provides direct links to many [LDEO programs](#) of special value to teachers.

## 5. Assessment of E2C

Each session includes opportunities for participants to provide feed-back through the web site. These prove valuable for developing programs that meet teacher needs, as well as giving us necessary data

More formal evaluation was undertaken by Assumpcao (2002) for her Teacher College, Columbia University doctoral dissertation. Among the conclusions, she notes that E2C provides a model for “understanding the power of building partnerships between the research institutions, the teachers as classroom experts, and the content professionals as content experts, each one contributing equally within their area of expertise” (pp. 184 –185.)

Workshops and the website provide participating teachers with:

- authoritative content;
- organized links that became useful tools for direct use in the classroom;
- review notes;
- an opportunity to share lesson ideas through interactive forms;
- a model of technology integration that they could imitate in their own classrooms;
- a source of ideas and model lessons they could test out and comment with other teachers at the next workshop or their own schools;
- a model for professional development opportunities; and
- an opportunity to increase their own comfort level with the technology as they had time to practice using it and

had a chance of seeing it being used during the workshop.

For the research scientists, the E2C program was instrumental in helping get their work more widely known to a non-scientific audience. Reaching out to the teachers meant consequently reaching the teachers’ students. Putting materials on the website made these materials more available to teachers and students even after the workshop was over. Providing a common working space for scientists, teachers, and program facilitators through development of the website narrowed the communication gap between these groups, and made the website useful to each in their unique necessities.

Among the lessons learned from E2C research were:

- Importance of bridging the gap between the work of the researcher and the classroom teacher
- Need teachers feel for professional development in technology in education
- Need teachers feel to network with different professional to share experiences
- Scientists’ and researchers’ needs for an educational outreach channel
- Need for developing a structured, consistent PD program
- Need for developing readily accessible materials that teachers can use in their daily lessons
- Need to include teachers as research partners, as specialists in their classrooms
- Need to design a program that is flexible and tailored to each teacher’s school culture and specific needs
- Need to develop formal partnerships between higher education institutions and secondary schools
- Need to take advantage of what technology allows us and create a more collaborative model of work, with all participants having a more active voice in the process (ownership of the learning process)

Future studies could examine:

- The impact of the E2C model on how much Earth Science content teachers actually acquire, perhaps by measuring before and after content knowledge differences;
- Analyzing the efficiency of such online course offering
- Measuring the impact of the participation in this professional development on the teachers' students, to see how much of what E2c does effectively helps the ultimate target audience
- Measuring how replicable this model is by identifying which components are generalizable and which are limited to the specific context of the E2C program
- Exploring how learning occurs in such adult education programs that utilize digital technologies to develop effective strategies

References:

[Assumpcao, C.M., 2002, "Earth2Class: The Role of Technology in Providing Science Content Delivery from the Research Scientist to the Secondary \(6 – 12\) Classroom Teacher." Ed. D. dissertation, Teachers College, Columbia University, 272 pp.](#)

Passow, M.J., et al., 2000 – 2003, available at <http://www.earth2class.org/mentoring/>.