P1. 9 BRINGING CUTTING-EDGE RESEARCH TO THE CLASSROOM: EARTH2CLASS

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1.1 INTRODUCTION

The Earth2Class Workshops for Teachers (E2C) at the Lamont-Doherty Earth Observatory of Columbia University (LDEO) in Palisades, NY, provide an effective format for bringing cutting-edge research into K – 13 classrooms. Through monthly workshops featuring LDEO investigators, summer professional development opportunities, and an ever-expanding web site (http://www.earth2class.org), the E2C program provides teachers and students with access to recent discoveries in a wide variety of geoscience areas. Earth2Class also connects teachers with pertinent online and print materials from the AMS DataStreme Atmosphere, Ocean, and Water in the Earth System programs. Participants in the DataStreme courses have been able to expand their understanding through visits to the LDEO facilities.

Descriptions of various aspects of the E2C have been presented at the 9th – 14th AMS Symposia on Education. New in this year's poster are examples of products from the 2nd New York State Earth Science Teachers Conference and expanded opportunities for E2C participants to learn about AMS Education Program resources during our "AMS@LDEO" programs.

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1.2 EARTH2CLASS WORKSHOPS FOR TEACHERS

Earth to Class is a unique science/ math/technology learning resource for K-12 students, teachers, and administrators. It has been created through the collaboration of LDEO researchers, curriculum and technology integration specialists from Teachers College, Columbia University, and classroom teachers from the New York metropolitan area. E2C is supported in part through NSF Geoscience Education Grant 0331232.

Each "live" Saturday Workshop follows this format:

09:30 – 10:15 Background Information on the Workshop Topic
10:30 – 12:00 Guest Scientist(s) presentation(s)
12:00 – 13:00 Working Lunch
13:00 – 15:00 Curriculum and Educational Technology Development Projects

Themes for the sessions have varied widely over the nine series of E2C programs, but many not only provide teachers and their students with insight about the cutting-edge investigations of the LDEO scientists, but also an opportunity to see demonstrations of pertinent instructional materials based on the AMS DataStreme Atmosphere, Ocean, and Water in the Earth System programs. Also included as appropriate are teacher-training materials developed as part of Project Atmosphere and the Maury Project.

E2C programs also provide opportunities to share educational materials developed by NASA, NOAA, USGS, EPA, and other federal science agencies. For example, the 2005 – 2006 series includes a session

featuring the Educational Global Change Model (http://www.edgcm.org/) developed at the NASA Goddard Institute for Space Studies. The classroom application portion included climate change materials developed for DataStreme courses. Another session includes phytoplankton studies conducted in part using satellite observation technologies, and includes activities created for the DataStreme Ocean course.

Other sessions focus on hurricane and hazard response, remote sensing studies, the Integrated Ocean Drilling Project, and additional areas of LDEO research investigation in the atmospheric and oceanographic sciences. The complete list of E2C session themes is available at http://www.earth2class.org/sitemap/e2cthemes.php

One of the highlights of the 2004 – 2005 series was a presentation by Dr. Maya Tolstoy, one of the featured scientists in the James Cameron 3-D IMAX feature film "Aliens of the Deep." The interaction of middle school students with Dr. Tolstoy at this program was reported in regional newspaper articles.

1.3 NYS EARTH SCIENCE TEACHERS CONFERENCES

Over the past few years, networking among science teachers has increased significantly through list-serves created by the State University of New York at Oneonta (http://external.oneonta.edu/mentor/esprit.html). The Earth Science list-serve has grown to more than a thousand educators, a number from out of New York State.

Two years ago, one discussion thread indicated the need for curriculum guidance and resources that would assist teachers anywhere and with any amount of background experience to create effective geoscience programs at the middle and high school level. Out of such discussions and the existing E2C format came the 1st and 2nd Earth Science Teachers Conferences. Supported in part through the NSF Geoscience Education grant, these have provided opportunities to bring together at LDEO teachers from across NYS, plus some from NJ and CT.

The 1st Conference in August 2004 included presentations by Wallace Broecker, Klaus Jacob, and David Goldberg (http://earth2class.org/er/conferences/1NYSESTC/1nysestc.php). Participants discussed what they perceived as the most important issues facing middle and high school Earth Science teachers.

Based on these discussions, participants in the 2nd Conference (July 2005) divided themselves into groups to construct curriculum resource units. This process is still a work-in-progress, but what has already been posted at http://earth2class.org/curr_units/index.php includes: key vocabulary terms (arranged alphabetically and grouped into sub-topics); statements of key ideas; selected labs and activities available on the web; selected websites; links to pertinent pages in the NYS Earth Science Reference Tables (used for the state Regents Exams); and selected NYS science education standards.

Topics include:

Observation And Measurement
Models Of The Earth
Minerals, Rocks, And Resources
Earthquakes, Volcanoes, and Plate Tectonics
Shaping The Earth's Surface
The Water Cycle and Groundwater Systems
New York State
Weather And Climate
Earth And Space (Astronomy)
Oceanography
Environment And Change
Educational Organizations
Miscellaneous Resources

Web-based resources include numerous links to educational and scientific materials created by the AMS, NOAA, NASA, and other agencies. DLESE searches were utilized to expand suitable resources beyond what NYS teachers have created.

1.4 SUMMER CURRICULUM DEVELOPMENT PROGRAMS

During the summers of 2004 and 2005, E2C participants have gathered to work on classroom-ready curriculum materials based on the themes for E2C workshops.

Projects developed in 2004 included units about weather, watershed, impact craters, and earthquakes. These were developed working with Dr. Pearl Solomon, Emita Professor of Science Education at St. Thomas Aquinas College, Sparkill, NY.

In July 2005, participants worked with Dr. Neil Pederson to create a "virtual tour" of the forest around the Lamont campus. This focused attention on the use of dendrochronology (tree-ring studies) to reveal climate change, one of the major themes of AMS Education programs.

[Larry Hoard, Frederico Baggio, Donald Goldstein, Michael Labat, Carmen Alex, and Cristiana Assumpcao developing the "virtual tour" of the Lamont campus curriculum activity, July 2005.]

1.5 "AMS @ LDEO" PROGRAMS

The E2C Workshops have also been used to provide additional exposure to AMS Education Program courses and materials. The first of these sessions were described at the previous AMS Symposium on Education (http://ams.confex.com/ams/Annual2005/techprogram/paper_82607.htm.)

A third "AMS @ LDEO" program occurred in December 2005. This featured presentations by E2C participants who have now gone through the training provided through the AMS Project Atmosphere (http://64.55.87.13/amsedu/project_atmosphere.html) and Maury Project (http://64.55.87.13/amsedu/MauryFrames.html).

Such presentations by peers significantly enhance the impact of such Workshops for E2C participants, as well as expanding the use of AMS Education Initiative resources in the classroom. More about these impacts is available in the accompanying paper in this Symposium, "AMS DataStreme Programs in

the Empire and Garden States" (Poster P1.10.)

2. E2C AS A MODEL FOR OTHER EDUCATIONAL PROJECTS

The Earth2Class format was also utilized during the past year for a three-day teacher training program held at LDEO in conjunction with "Collaborative Research: An Investigation of Gas Blowouts offshore Virginia/North Carolina" (NSF OCE Award 0242426.) The Co-PIs, Dr. Jeffrey Weissel and Dr. Marie-Helene Cormier, and graduate student Kori Newman provided selected teachers with information about their research into structures discovered on the continental shelf that appear to have been created by methane hydrate blowouts.

Then the teachers worked with the scientists to create curriculum materials. More information about this project is available at http://earth2class.org/er/Gas%20Blowout/Logistics/gasblowoutsummary.php.

The E2C format is also being proposed in conjunction with at least two proposals submitted by LDEO scientists with Passow to the NSF that are now under consideration. The format is also being used for programs aimed at improving the content knowledge and skills of New York City public school Earth Science teachers.

During the past year, Passow has provided presentations about the E2C format to others seeking models for educational outreach programs at meetings of the Earth Systems Processes-2, Geological Society of America, National Science Teachers Association, New Jersey Science Convention, Science Teachers Association of New York State, Science Teachers Association of Ontario, New York State Marine Education Association, and other organizations.

1.6 FUTURE OF THE EARTH2CLASS PROGRAM

Over the next year, reports and publications based on the first two full years of NSF support will be prepared and disseminated. The Workshops will continue to be offered, hopefully with continuing sources of support to bring classroom teachers and cooperating research scientists together.

We also will continue to expand the E2C web site offerings, and perhaps even find support to create an asynchronous learning environment based on E2C resources.