American Meteorological Society Education Programs: Peer Training at its Best

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Introduction

For thousands of Earth Science teachers, the best way to learn about the atmosphere and hydrosphere has been through the American Meteorological Society' (AMS) educational programs. During the past fifteen years, the AMS has developed a suite of exemplary programs about weather, ocean, and hydrologic topics, trained hundreds of classroom educators to serve as "peer trainers", reached thousands of teachers and, through them, hundreds of thousands of students across the U.S., Canada, and other countries. Beginning with printed modules presented through workshops by a small group of classroom teachers, AMS programs now reach wide audiences in a variety of Internet-based, print, scientific conferences, special public programs, and other formats.

The highlights of Project Atmosphere and DataStreme (weather education), the Maury Project (ocean education), and "Water in the Earth System" (hydrology) described below provide examples of what can be accessed in classrooms and conference workshops. "Project Atmosphere Canada" and "Project Atmosphere Australia" represent examples of how materials have been adapted for use in non-US educational formats.

The AMS Educational Programs succeed also in connecting classroom teachers and students with such government agencies as the National Oceanic and Atmospheric Administration (NOAA); the U. S. Navy; National Aeronautics and Space Agency (NASA); and the National Science Foundation (NSF). Links to all of the AMS programs described below are provided at the end of this article.

Project ATMOSPHERE

Project ATMOSPHERE (PA) is the American Meteorological Society's education program that promotes studies in the atmospheric sciences at elementary and secondary school levels. PA is designed to encourage teachers to use weather concepts–the science whose data and products are most frequently reported to the public–in classroom learning activities across the curriculum. The main goals of PA are to promote interest and literacy in science, technology, and mathematics at the precollege level. Begun in 1991 with NSF grant support, Project Atmosphere has developed an international network of "AERAS"—"AMS Educational Resource Agents"–who work with AMS Staff Members, university professors, and others to develop high quality instructional materials and deliver these through teacher-training seminars. Project Atmosphere AERAs are selected from participants in two-week programs held at the National Weather Service Training Center in Kansas City, MO. Teachers from Great Britain, Canada, Australia, South Africa, Belize, Japan, and other nations exemplify the international nature of weather study, and have helped create a network of educators who continue to interact long after their initial training.

PA modules include "Hazardous Weather," "Jet Streams," "Clouds," and "Weather Satellites," which are distributed only through teacher-training programs conducted by AERAs. Other educational books and materials for hands-on investigations–such as liquid crystal display thermometers useful for studying cloud formation in a bottle, and plastic blocks to demonstrate the impact of pressure differences in the atmosphere and ocean–can be purchased through the AMS website (see links at the end of this article)..

The Maury Project

The success of Project Atmosphere led to creation of a similar program focusing on aspects of physical oceanography. Training in two-week programs based at the U. S. Naval Academy enables Maury Project AERAs to provide workshops on such topics as tides, waves, currents, and measuring sea level from space. This program commemorates the seminal work of Lt. Matthew Fontaine Maury, whose 1855 book, The Physical Geography of the Sea, is recognized as the beginning of oceanographic research. Like PA, the Maury Project has helped create a national network of master teachers who have impacted thousands of classrooms through their presentations.

Maury Project peer-trainers conduct workshops based on a set of teacher-training booklets dealing with tides, waves, wind-driven and density-driven currents, coastal upwelling, and other aspects of the marine sciences. Many teachers gained greater understandings of the El Nino-La Nina phenomena through an informative two-sided "pull-out" slide chart that compares conditions during average and change events.

The DataStreme Program

DataStreme Atmosphere was one of the first programs to recognize the Internet's potential for providing professional development materials utilizing timely, changing atmospheric conditions. Local Implementation Teams composed of PA and Maury Project AERAs, university and government scientists, and others, serve as regional contacts for teachers participating in a 13-week course that combines readings from the textbook designed for the program with realtime, web-delivered activities and data. The web site offers a variety of data and images and is available to students and teachers throughout the year.

Participants meet as a group three or four times during the semester, but mostly complete work through readings and Internet-based investigations, then submit their answers to their LIT Mentor. In this way, many classroom teachers have received their first formal study of weather concepts, or enhanced their understanding well beyond what they learned years earlier in college. Successful completion of these courses earns participants three graduate credits through State University of New York at Brockport, with all costs covered through the supporting grants from the NSF and other sources.

The AMS Education Program expanded the impact of DataStreme Atmosphere through Online Weather Studies, an undergraduate level course now offered at hundreds of institutions. Some of these were able to expand their science offerings without expanding their faculty, especially many institutions serving groups traditionally underrepresented in the sciences, such as Blacks, Hispanics, and Native Americans. The colleges offer this as a regular course, and support the AMS Education Program through purchase of textbook and web-based resources.

Water in the Earth System (DataStreme WES)

"WES" followed the successful format of DataStreme to provide a web- and print-based course that incorporates inquiry-based instructional strategies to present a holistic concept of Earth from atmospheric, oceanic, and terrestrial water and problem-focused perspectives. Understandings first developed through readings in the WES textbook are expanded and explored further through investigations and data provided through the website. Smaller in size than DataStreme Atmosphere, this program has been especially useful for teachers seeking to understand and explain the interactions of energy and moisture through the Earth System. WES expanded the range of resources available to classroom teachers by tapping into online materials created by the U.S. Geological Survey, Environmental Protection Agency, NASA, and other geoscience agencies. WES has been very helpful for teaching concepts related to groundwater, drought and flood, and lithosphere-hydrosphere-atmosphere interactions.

DataStreme Ocean

The AMS has long been involved in studying physical aspects of the ocean system, so it built

on DataStreme Atmosphere and WES by adding a third course called DataStreme Ocean. This precollege teacher enhancement course seeks to explore the ocean in the Earth system with special emphasis on: (1) the flow and transformations of water and energy into and out of the ocean; (2) the internal properties and workings of the ocean; (3) interactions between the ocean and the other components of the Earth system (hydrosphere, atmosphere, lithosphere, and biosphere); and (4) the human/societal impacts on and response to those interactions. DataStreme Ocean includes marine biology topics, going beyond the traditional areas of study by the AMS. Special emphasis is placed on how ocean life is impacted by climate changes and new technologies.

DataStreme Ocean is one of the efforts of the Cooperative Program for Earth System Education. CPESE is a collaboration between the AMS and NOAA to enhance public understanding of the Earth system, emphasizing the atmospheric, oceanic, and hydrologic sciences. It supports the AMS national teacher leadership training programs by facilitating collaboration among science educators and NOAA scientists.

Building on the success of the Online Weather Studies program, Online Ocean Studies enables colleges to offer a second basic course at little expense to the institution. Summer training for faculty has expanded the number of minority serving institutions providing training in these sciences to their students.

International Educational Activities

PA and Maury Project participants from other countries have received support from the home meteorological societies and governments to attend the training programs, and then establish educational training for colleagues. One of the most successful of these resulted in Project Atmosphere Canada. PAC is a collaborative initiative of Environment Canada and the Canadian Meteorological and Oceanographic Society (CMOS) directed towards teachers in the primary and secondary schools across Canada. It is designed to promote an interest in meteorology amongst young people, and to encourage and foster the teaching of the atmospheric sciences and related topics in Canada in grades K-12.

PAC is delivered through web-based materials duplicated or adapted with the permission of the American Meteorological Society (AMS) from its Project ATMOSPHERE teacher guides. Since little of the PA or Maury Project teacher training guides are available other than through AERA workshops, PAC is the best resource for teachers to obtain such activities electronically. The fourteen units include studies about “Sunlight and Seasons,” “Hazardous Weather,” “Acid Rain,” “Westerlies and the Jet Stream,” “El Nino: The Atmosphere-Ocean Connection,” and other topics. In some of the units, Canadian examples have been used in place of the original USA-based case studies. All materials are available in both English and French versions.

Beginning in 1996, Australian teachers, university professors, and others have created and expanded Project Atmosphere Australia Online. This teacher-developed, web-based project connects school communities in Australia and around the world through its collaborative web site and email discussion lists. The email lists support the communication of teachers, students, academics and meteorologists from different parts of the world. One goal is to use learning about the weather the way to help shapes each other's lifestyles, and gain greater understanding of other cultures and the way people live. The project relies on volunteer time and the generosity of people from academic institutions, meteorology bureaus and schools.

Project Atmosphere Australia Online began with seven teachers in schools in 1996, and now involves hundreds of teachers and schools around the world. In addition to Australian schools registered in a weather-sharing database, university academics, scientists and meteorologists from around the world participate in the online community of cooperation. There are many other users of the resources that look in on their community; as of July 2006, the project web site attracts more than 30,000 page visits and 500 search queries per month. The website provides online, classroom, and other activities; a virtual field trip

to Elimbah, the home of PAA; school webpages; images of clouds and other weather phenomena; weather questions; teacher support; interactive forum; and much more. PAA has been very successful at effectively bringing together educators and their students in a country as large and as sparsely populated as Australia.

Other Programs Supporting AMS Education Efforts

AERAs from across the country have gathered each year at the AMS Annual Conferences to continue their networking efforts and disseminate information to thousands of visitors to the WeatherFest. This is a hands-on science and weather show that gives visitors a chance to learn new things about weather and science. Joining the teachers are TV, radio, and newspaper weathercasters from the local area, NOAA and other government meteorologists, and many others. Weather-based games, books, equipment, and career and scholarship information are available.

Opportunities for current, past, and future participants in AMS courses to share information and activities have been provided through special Earth2Class Workshops at the Lamont-Doherty Earth Observatory of Columbia University. These programs provide PA and Maury Project teachers with the chance to fulfill their obligation to present teacher-training to colleagues, as well as an online resource for sharing classroom activities they have created.

Getting Involved with AMS Education Initiatives

DataStreme courses are conducted through Local Implementation Teams, so teachers interested in taking any of these should find their local LIT leaders through the program web site and submit the online application. Those interested in participating in the summer PA training in Kansas City or Maury Project training in Annapolis should submit the application available through the AMS Education Initiative homepage. Teachers from underrepresented groups or who serve large populations of students in minority groups are especially encouraged to consider these professional development opportunities.

References

AMS Education Initiatives: http://www.ametsoc.org/amsedu/

Project Atmosphere: http://www.ametsoc.org/amsedu/project_atmosphere.html

Project Atmosphere Classroom Support Materials
http://64.55.87.13/amsedu/aera/ed_mats.html

Maury Project: http://www.ametsoc.org/amsedu/maury

DataStreme Atmosphere: http://www.ametsoc.org/dstreme

Online Weather Studies http://64.55.87.13/amsedu/online/info/

Water in the Earth System (WES): http://www.ametsoc.org/amsedu/wes

DataStreme Ocean: http://www.ametsoc.org/amsedu/ds-ocean

Project Atmosphere Canada: http://www.msc-smc.ec.gc.ca/education/teachers_guides/index_e.html

Project Atmosphere Australia Online: http://www.msc-smc.ec.gc.ca/education/teachers_guides/index_e.html

AMS Weatherfest: http://www.ametsoc.org/meet/annual/weatherfest.html

Earth2Class “AMS@LDEO”: http://www.earth2class.org/amsldeo/index.php

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