THE 15TH AMS EDUCATION SYMPOSIUM

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The 15th Education Symposium, held as part of the 86th American Meteorological Society (AMS) Annual Meeting, addressed the scope of education and outreach efforts within atmospheric and related sciences. The symposium was animated by the participants’ deep commitment to the goal of broadening the impact of science and contributing to the development of a literate scientific population. The goals of the symposium were to share the innovations and lessons learned, and to energize the participants to continue as change agents in atmospheric education. These goals were realized through formal presentations and posters, and, equally important, informal conversations.

This year, the program focused on innovations in K--16 education, the growing opportunities in the arena of space weather, and the role of data in the classroom. The program consisted of 58 posters and 39 oral presentations. Posters were emphasized because the symposium organizers wanted to focus on a venue that encouraged greater interaction between the presenters and their audience.

Three themes emerged from the symposium. The first theme was the notion that K--12 education, particularly in the atmospheric and related sciences, is a shared responsibility—that universities, government agencies, and even publishers can and should play an active role in supporting K--12 education, both nationally and internationally. A second crosscutting theme emphasized the need for students and citizens to experience science not only as observers, but also as participants. For example, two programs—Global Learning and Observations to Benefit the Environment (GLOBE) and the Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS)—involve either students or citizens in collecting atmospheric data. A third, and related, crosscutting theme was centered around the development and use of tools, especially visualization tools, that can involve students in scientific exploration of atmospheric data. As one presenter noted, real learning occurs not from a textbook, but from real investigations driven by data.
K–12 EDUCATIONAL INITIATIVES. The K–12 session emphasized the shared responsibility for reforming atmospheric education and bringing learning communities into the new millennium. The first presentation outlined the critical need for reform, noting that the recent assessment “Trends in international mathematics and science study” indicates that U.S. students are not performing well in math and science, and that many science teachers, especially Earth science teachers, have not had opportunities to develop deep content knowledge or engage in research.

The rest of the talks focused on international and national efforts to address this critical need by better supporting K–12 educators and programs. On the national level, the National Oceanic Atmospheric Administration (NOAA) actively promotes environmental literacy through its outreach programs and provides students and teachers with meaningful research experiences. Information about literacy grants and educational tools is available online at www.noesd.noaa.gov/index.html. The National Geographic Society sponsors a field study in the National Marine Sanctuary of Hawaii to help teachers and students gain a better understanding of oceanic stewardship. The CoCoRaHS network features volunteers who record daily observations of precipitation in 10 different states as of January 2006. The University of Wisconsin—Madison described how scientists and K–12 teachers collaborated to develop a satellite meteorology course. The collaboration produced interactive applets for university and K–12 classrooms and contributed to the formal professional development of the participating teachers.

The K–12 session concluded by describing activities with an international focus. In the GLOBE program (see information online at www.globe.gov), teachers from around the world are learning about the tools that can be used to make observations of the local environment and sharing those observations with the global community. The AMS sponsored an international conference [Education: Weather, Oceans, Climate (EWOC) 2006] in July to promote meteorological and oceanographic education. Teachers from around the world shared their strategies and expertise with one another. [Additional information thereon can be found online at www.ametsoc.org/meet/fainst/ewoc2006.html.]

UNIVERSITY EDUCATIONAL INITIATIVES. Two themes were central to this year’s University and Professional Education Session. The first set of presentations focused on outcomes of outreach courses offered to members of the private and professional sector. The second set addressed ways to enhance understanding of meteorology in the university classroom through the use of a diverse array of technological and educational tools and techniques.

The first presentation described an innovative evaluation of a Weather Surveillance Radar-1988 Doppler (WSR-88D) distance learning online course, where the participants’ ability to apply materials from the course was used to measure retention. Next, feedback received from course participants in both a 1997 and 2005 Oklahoma First (OK-First) course for public safety officials was compared, and the use of andragogy (the idea that certain learning styles are unique to adults) to address the needs of the adult learners in the class was discussed. A presentation on the Cooperative Program for Operational Meteorology, Education and Training (COMET) Residence Program described the successful strategy of pairing instructors from academia and the operational community. Next, a pair of presentations described the history of the AMS Online Weather Studies and Ocean Studies at minority-serving institutions, and key ways to increase diversity in undergraduate programs, demonstrated through examples from Jackson State University.

After a formal poster-viewing break, five presentations focused on student learning and the use of technology in the classroom, including the students’ responses to the use of an interactive personal computer (PC) Tablet by instructors in the meteorology classroom; the use of an active-learning quiz in Introduction to Meteorology, using the “Who Wants to be a Millionaire” approach; tools for teaching climate change science, including a pre- and postcourse questionnaire; an exercise on creating and distributing a survey focused on students’ understanding of relative humidity; and educational tools to enhance a student’s ability to go from coursework to applications using meteorological instrumentation.

SPACE WEATHER. A joint session with the Third Symposium on Space Weather highlighted several educational outreach activities that spanned the K–12, public, and university levels. For example, the Air Force Research Laboratory and the Air Force Academy are partnering to produce a new introductory undergraduate-level textbook. The text (Space Weather and the Physics Behind It) will be directed toward students with a knowledge of core physics: sophomore-level Newtonian mechanics and electricity and magnetism.

Another presentation described how space weather has also been included as part of cardiopulmonary
resuscitation (CPR) classes. Because many in the medical community have no idea about space weather issues or even that there can potentially be associated health concerns, these kinds of efforts present unique opportunities for the space weather community to offer decision support, research and development, and information to the medical community.

The session also reinforced the importance of teacher workshops and scientist visits to enhance K–12 science education. The National Aeronautics and Space Administration’s (NASA’s) Living with a Star (LWS) program, for example, has been running teacher workshops to enhance the teaching of space weather in our schools. More information can be found online at http://education.gsfc.nasa.gov.

Roberta Johnson [University Corporation for Atmospheric Research (UCAR) Education and Outreach] was the session’s keynote speaker. She described UCAR’s Windows to the Universe (online at www.windows.ucar.edu) Web site, which is dedicated to Earth and space science education. Most of the site has been translated into Spanish, and has thus become a major science education resource for Spanish-speaking and bilingual users, both in the United States and abroad.

**TOOLS TO ENHANCE WEATHER AND CLIMATE DATA USE IN THE CLASSROOM.**

This joint session with the 22nd Conference on Interactive Information Processing Systems consisted of 13 papers describing tools and strategies designed to let students and educators easily use Earth data. All of the authors began with the premise that the most authentic learning happens when students participate in their own data-driven investigations. Taken together, the presentations suggested that student success is encouraged by providing not only data but also tools to analyze the data and supplementary resources that can provide a framework for interpreting the data.

The most common method was to visually analyze the data. One presentation asserted that “all students are visual learners,” and described how a prepared high-end video in the classroom was used to illustrate El Niño–Southern Oscillation. In this case, students were presented with a carefully constructed view of the data designed to illustrate key physical insights in a nearly intuitive way. At the other end of the spectrum is a visualization tool that allows students to construct their own views of the data. To help students learn to construct effective views, the Linked Environments for Atmospheric Discovery (LEAD) project uses a blended approach. In this approach, the visualization tools open to a prepared view of the data, and students can use the visualization tool to modify that view and construct other visualizations of the same data.

The papers also described resources that provided a framework for interpreting and using data. These covered a broad spectrum of approaches, depending on the audience for whom they were intended. At the most abstract, the framework for understanding the data took the form of carefully constructed ontologies, which are formal representations of technical concepts and their interrelations. More concretely, one presentation described how NASA worked with teachers to prepare step-by-step lesson plans and Excel spreadsheets that can be used directly in a seventh grade classroom.

The session concluded with a presentation describing how meteorologically relevant music might contribute to student learning. According to student surveys, most students felt the music benefited the class, and missed it when it was absent. Judging from the attendance in the session, music is also popular with AMS annual meeting attendees.

**NEXT YEAR’S SYMPOSIUM.** The Education Symposium continues to be a vehicle for describing and exploring the impacts of meteorology on the educational community and how atmospheric and the related sciences can contribute to the development of a scientifically literate society. This year, the conversation focused on the use of data, the importance that students at every level have the opportunity to experience “doing science,” and the need for a shared commitment to K–12 education, where universities, agencies, and schools work together to develop the next generation of researchers and scientifically literate citizens.

Next year’s conference will continue to explore these themes, with special emphasis on the integration of research and education within college settings, and the influence of high-stake math and literacy testing on K–12 education. In addition, the Education Symposium will host a joint session with the 35th Conference on Broadcast Meteorology.

**REFERENCES**

SESSION TOPICS

Congressional Legislation—Authorization Committees
House and Senate staff will provide an outlook on legislation and discuss issues associated with programs and pending legislation that may provide opportunities for AMS members.

Congressional Legislation—Appropriations Committees
House and Senate staff will provide an outlook on Federal budget appropriations for NASA, NOAA, NIST, and NSF for weather and climate related activities.

Agency Initiatives, Plans, and Opportunities
Senior staff from NOAA, NASA, and DHS will look ahead and provide updates on current meteorological, climatological, and oceanographic programs and provide insights on new science initiatives and directions.

New Sources of Weather & Climate Data
This session will provide an opportunity for industry, research, and government sectors to learn about, plan for, and be involved in exploiting new Earth system datasets.

Climate Change—Provision of Improved Climate Services
NOAA is exploring options to improve the provision of climate information and is seeking input on this topic from the weather and climate community. This session will provide an opportunity to learn about and discuss this initiative.

Weather, Climate and Water Resources
This session will focus on how water resource management entities utilize weather and climate information in their daily operations and their unmet needs for weather and climate services.

PURPOSE
To provide an opportunity for weather and climate enterprise stakeholders to meet with senior Federal agency officials and Congressional staff to hear about the status of current programs, learn about new initiatives, discuss issues of interest to the enterprise, and identity business opportunities.

WHO SHOULD ATTEND
AMS Corporate Members, private sector executives, federal agency and laboratory managers and scientists, university faculty, and other interested AMS members.

Dinner Banquet and Speaker Introductions by AMS President, Dr. Richard Anthes

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SEATING IS LIMITED: Watch for registration details…