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Trends in the AMS Education Symposium and Highlights from 2012

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TRENDS IN THE AMS EDUCATION SYMPOSIUM AND HIGHLIGHTS FROM 2012

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The Symposium on Education, now in its twenty-first year, provides a confluence point for a wide variety of people interested in improving education in the atmospheric and related sciences. Education is considered broadly in the symposium, and encompasses teaching students in kindergarten through 12th grade (K–12) and college, training meteorological professionals, and providing informal educational experiences for the general public. The program usually includes updates on longstanding institutional efforts or programs, descriptions of innovative and sometimes even experimental approaches, suggestions for integrating technology and data, and strategies for including atmospheric and related sciences in existing and new K–12 curricula. Participants include a mix of university professors, K–12 teachers, and informal educators, and recent conferences have seen large growth in the number of students—especially college students.

TWENTY-FIRST SYMPOSIUM ON EDUCATION

WHAT: The 21st education symposium provides a venue for scientists and educators to discuss trends in atmospheric science education and share ideas, strategies, and advances. Persistent themes include the use of data and technology, preparing students for an increasingly interdisciplinary and interconnected field, and the emergence of climate and climate change as educational foci.
WHEN: 23–26 January 2012
WHERE: New Orleans, Louisiana

The 2012 symposium, held in New Orleans, Louisiana, as part of the 92nd Annual Meeting of the American Meteorological Society (AMS), included over 50 posters and 31 oral presentations, and attendance at times exceeded 200 people. A complete list of these papers, with links to the recorded presentations, is available at the AMS education symposium website (http://ams.confex.com/ams/92Annual/webprogram/21EDUCATION.html).

While the symposium over the years has explored a range of education-related issues, the formal presentations, the posters, and the informal hallway conversations point to the continuing evolution of a few core ideas. One is a strong commitment to the use of real data in meteorological education, not just for future scientists and forecasters, but for all students. An early example of this approach is the AMS DataStreme

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project, started in 1995 and continuing today, which allows middle- and high-school teachers to get real-time meteorological data and helps them develop the background knowledge to incorporate the data into hands-on classroom activities [see Weinbeck et al. (2003) as one example]. A more recent example of the commitment to using data was highlighted in this year's symposium as part of a long-running joint session cohosted with the Symposium on Interactive Information Processing Systems (IIPS). Sepi Yalda, of Millersville University, introduced the GEOpod, an immersive, videogame-like analytic tool that allows students to explore meteorological data by "flying through it" (see Yalda et al. 2012, in this issue). The idea of games as tools in meteorology was also explored more broadly: several presentations described forecast contests and forecast games, and two other presentations introduced specific games and simulations as learning tools.

Over the last 10 years, the scope of topics covered in the education symposium has grown to reflect the increasingly interdisciplinary nature of the atmospheric sciences. This trend is most apparent in the discussions and debates about how we train the next generation of AMS members, especially at the college level. A panel discussion in 2010, arranged to provide input into the revision of the AMS policy statement for meteorology degree requirements, brought these issues into sharp focus. The opinions voiced then ranged from a call to reduce the number of core requirements and encourage students to develop complementary expertise in fields such as business, communications, and international relations to a call to return to a more focused core curriculum designed to prepare students for graduate-level research. The liveliest part of this panel was the discussion from the audience, dominated by students, who had a passionate interest in the revision and intimate knowledge of current curricula. These students stressed the importance of internships, the need for specialization, the desire to adapt to future changes in the job market, and the importance of professional skills (e.g., communication, management). The final policy statement, which responds in part to the panel discussion and offers more flexibility and emphasizes essential competencies over specific classes, was approved in September of 2010 and can be viewed online at www.ametsoc.org/policy/2010degree_atmosphericscience_amsstatement.html).

At the same time the symposium has been considering the best way to prepare students for an increasingly interdisciplinary world [see, e.g., the 2012 presentations on An Alliance to Develop a Workforce of Community Climate-Change Advisors, and AASC Recommendations for the Education of an Applied Climatologist (Clark et al. 2012; Nielsen-Gammon et al. 2011)], other presentations have reported on the practical examples of disciplinary integration. At the 2012 symposium, for example, a joint session with the Seventh Symposium on Policy and Socio-Economic Research, the 24th Conference on Climate Variability and Change, and the 26th Conference on Hydrology explored the most effective ways to communicate about extreme events and their changing frequency (see the sidebar for additional information about extreme events).

Finally, the interest and emphasis on climate and climate change education and outreach has grown significantly. In 2012, 33 out of 81 posters or talks included climate in the title, compared to only 5 out of 82 in 2001. Climate change has presented special challenges to the education symposium community because it is connected to and influenced by divergent (and at times even polarized) political, economic, and moral views. While many of the time-honored strategies of connecting students to data and involving them in inquiry [e.g., the presentation on the Global Learning and Observation to Benefit the Environment (GLOBE)'s student climate research campaigns] or connecting to local issues [e.g., Nicolle Weis's presentation on sea level rise in South Florida (Weis et al. 2012)] are still effective, the community is looking at new techniques that borrow from other fields and employ emerging communication platforms such as social media. As an example, Eugene Cordero described how he uses social media to help promote the Green Ninja, a carbon footprint–reducing super hero (see Cordero 2012, in this issue).

While this summary has highlighted the evolution of the symposium, there are several important constants that also define the symposium. First is a set of regular sessions that focus on key audiences, and in particular the K–12 session. In fact, the K–12 session is one of the oldest parts of the education symposium. Originally created to provide a venue for teachers who participated in AMS summer programs to reconnect, share strategies, and describe their efforts, the K–12 session now engages a much broader cross section of AMS members who are interested in ensuring that K–12 students have the opportunity to learn about and explore atmospheric and related sciences. Some of the recent presentations at the symposium have described summer weather camps, after-school programs, and weather clubs, including several linked to AMS local chapters. In formal education, especially in high school, speakers have described a range of

A JOINT SESSION ON EXTREME EVENTS

The special themed session on Extreme Weather and Climate Change provided an outstanding kickoff for the *21st Symposium on Education, the Seventh Symposium on Policy and Socio-Economic Research, the 24th Conference on Climate Variability and Change, and the 26th Conference on Hydrology.* Tom Karl, director of the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC), opened the session discussing the causes of weather and climate extremes and how to communicate this knowledge to the meteorology community and the general public. He noted the record number (14) of billion-dollar events in the United States in 2011 due to extreme weather or climate change, and introduced a parameter used to quantify extreme events (the U.S. Climate Extremes Index, www.ncdc.noaa.gov/extremes/cei/). According to this index, over the last four decades the nation has become increasingly vulnerable to extreme events, which have had a substantial economic impact. Karl concluded by calling for a new cadre of scientists to study these extreme events and how to best cope with their impact on society. Roger Pulwarty, director of the NOAA National Integrated Drought Information System (NIDIS), followed with a discussion of an Intergovernmental Panel on Climate Change (IPCC) special report on managing the risks of extreme events and disasters as part of adapting to climate change. Pulwarty noted that exposed and vulnerable communities, especially in developing countries, can be impacted catastrophically by even "nonextreme" events. He emphasized the importance of educating the public in order to reduce and manage the risks of disasters in a changing climate: while the extremity of the events cannot be controlled, the risks can be managed to reduce the costs and overall impact on society.

The themed joint session concluded with a panel discussing ways to educate the public on coping with extreme weather and climate change. Panelists included James Brey (AMS Education Program), David Easterling (NCDC), and Craig Colton (Louisiana State University); Bill Hooke (AMS Policy Program) served as moderator for the panel. Questions addressed such topics as probability and uncertainty, enhancing public awareness, developing public policy, and funding issues relevant to extreme weather and climate change. Perhaps one of the more interesting comments from the panel was by Easterling who emphasized that regardless of whether we are undergoing climate change, we still need to be prepared to cope with extreme weather events.

strategies for introducing atmospheric and related sciences ranging from brand-new, year-long courses on weather and climate to single-class session units that use weather and climate topics as illustrations of basic chemical or physical concepts—for example, using hurricanes to illustrate the Carnot cycle in a physics class or the Ozone hole as a way to talk about heterogeneous chemical reactions. In the last two years, especially, the talks have focused on efforts to ensure weather and climate are included in the state and national standards that help determine what K–12 students learn. For example, we have heard updates on both the climate and atmospheric science literacy guides, which may influence next-generation standards. In 2010, a detailed and impassioned discussion of how the implementation of Florida's science standards de-emphasized Earth science excited considerable discussion and served as a call to action for AMS members to involve themselves in their own state's implementation of standards. One thing that remains the same with the education symposium, however, is that the K–12 session is still held on Monday mornings so that in-service teachers can minimize their time away from the classroom.

A university session, highlighting innovations and new approaches in and alongside the college classroom, also remains a regular and popular part of the symposium. In recent years, this session has increasingly moved toward presenting not just new teaching strategies but careful evaluation of the efficacy of those strategies. In particular, 2010 saw an entire session devoted to educational research that can guide teaching and career preparation. One noteworthy example highlighted the results of a multiyear study analyzing how people learn to forecast, which suggested that forecasters first learn simple associations and procedures, and the ability to connect these processes to the underlying theory depends on reflection and interaction with more knowledgeable forecasters. Another presentation examined the experience of students who participated in summer internships and found that exposure to multiple careers resulted in a "happy" confusion in the short run and higher career satisfaction in the long run. Both of these talks, and several more, are the first steps in a peer-reviewed research base that can inform effective teaching and career-development strategies.

All this evolution, however, has only added strategies and tactics—the fundamental goal of the education symposium has not changed. It remains true to its original purpose of providing a venue for educators and scientists to share strategies for improving science literacy, developing our future workforce, and ensuring that our science serves society.

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