

# ARM Education and Outreach: A Variety of Tools for Climate Change Education

*J. K. Lynch, A. M. Maestas, M. H. Ebinger, M. Bachman,  
F. J. Barnes, L. C. Sommer, and C. E. Talus  
Los Alamos National Laboratory  
Los Alamos, New Mexico*

## Background

The Atmospheric Radiation Measurement (ARM) Education and Outreach Program supports ARM Operations in ways that are relevant to the needs of the communities and regions that host ARM program sites. The goal of the ARM Education and Outreach team is to develop basic science awareness and critical thinking skills while enhancing environmental science knowledge for teachers, students, and the community in regions hosting ARM sites. We accomplish this goal through a variety of weather and climate educational tools and activities.

These tools and activities include:

- Teacher workshops in ARM host regions;
- The development of classroom activities and other relevant curricula;
- The development and installation of educational kiosks;
- Educational newsletters that include climate information for ARM host regions;
- An interactive website regarding climate change;
- Mascots to introduce students to different regional climates;
- Participation in Weatherfest, Expanding Your Horizons, and local science fairs.

## Teacher Workshops

To support capacity building in the regions hosting ARM research facilities, ARM Education and Outreach develops teacher workshops and in-service days in collaboration with the local education departments. The workshops are four to five days long in the Tropical Western Pacific (TWP) and typically one-day trainings on the North Slope of Alaska (NSA). Since 1998, we have held nine workshops and trainings and are currently planning the next workshops for the NSA in May 2005.



**Nauru teachers tour ARM site during 2001 workshop.**



**Barrow teachers learn about the insulating properties of sea ice at 2000 workshop.**

The workshops include a review of basic science concepts for the curriculum topics and extensive practice of classroom presentations and activities. Teachers tour the ARM research facilities and learn about ARM Program goals and research. Furthermore, workshops provide excellent opportunities for teachers to express their needs for curriculum enrichment and materials to support science teaching. Participant evaluations provide direction for revisions of curricula and plans for new workshops.

Compiled evaluations show that teachers prefer longer workshops (two to three weeks), more materials for K-6 students, and an expanded curricula that includes additional aspects of environmental science.

## Curriculum

An important goal for our program is to develop relevant curriculum enrichment materials for each region. Starting from an initial request from the Nauru Department of Education in 1995, ARM Education and Outreach collaborated with numerous agencies and universities to publish two books, entitled *Climate Change and Sea Level*, for the teachers in the TWP. The modules contain background information on basic science concepts and climate change, as well as relevant hands-on classroom activities.

Currently, in response to requests at local and regional levels, we are developing a new curriculum modeled after the highly successful *Green Road Show* program from Federated States Micronesia for grades 3-6 students. The student workbooks will be colorful, attractive, and very user friendly. Teachers will receive a corresponding teacher's guide with step-by-step instructions on how to use the workbooks with their students as well as a teacher's kit with principle equipment and classroom posters. ARM Education and Outreach plans to present the new workbooks at the upcoming TWP teacher workshops, where teachers will be trained how to use the workbooks in class.

## ARM Public Education Outreach



Two students stop to view the NSA museum kiosk at the Iñupiat Heritage Center.

ARM Education and Outreach installed its first interactive, educational kiosk entitled "Climate Change: Science and Traditional Knowledge." The kiosk was installed in October 2003 at the Iñupiat Heritage Center in Barrow, Alaska. Based on discussions with the local communities and review of published research, it became evident that community education depends on integration of scientific and traditional knowledge—particularly in indigenous communities that value culture, traditions, and elder know-

ledge in the education of their youth.



Film crew interviews Mr. Pene Agadio of Nauru for the TWP interactive kiosk.

The NSA kiosk features interviews about climate change with educators, subsistence hunters, and elders from the Barrow community as well as interviews with anthropologists, ARM researchers, and other scientists. The variety of perspectives presented in the kiosk provides a diverse look at climate change as well as a review of community knowledge and concerns. The success of ARM's first interactive kiosk encouraged us to begin work on a similar kiosk for the TWP communities.

## Newsletters

The ARM Education and Outreach newsletter, originally titled *Tropical Winds*, was first distributed to students and teachers in the TWP region in 1999. The newsletter, now called *Climate Education Update*, is distributed to all three host regions: TWP, NSA, and the Southern Great Plains (SGP). *Climate Education Update* contains basic science, climate change, and environmental news from all three sites as well as updates about the happenings in the ARM Education team. An activity for K-12 students and a *Critical Thinking Question* centered on one or more of the articles are also included in every issue. A new section centered on traditional knowledge and culture from each region will be debuted in the first newsletter of 2004, which will be distributed in April.

## Interactive Website



In cooperation with Rolanda Jundt at Pacific Northwest National Laboratory, ARM Education and Outreach maintains a website (<http://education.arm.gov>) with information on climate and environment news, lessons for teachers, and hands-on activities for kids. The website provides an opportunity for students and teachers all over the world to learn about climate change and weather. One unique feature is the *Ask a Scientist* page in which users can submit a question regarding climate change or weather and receive a response from an ARM scientist or educator.

## Mascots

The ARM Education program has three mascots, who represent the three ARM sites. Professor Polar Bear lives on the NSA just north of Barrow, Alaska. Barrow is located at the northernmost point on the continent, 330 miles north of the Arctic Circle, and it is Alaska's largest Eskimo village. Teacher Turtle lives in the TWP in what is commonly referred to as the "warm pool." This body of water, located off the coast of Papua New Guinea, has the warmest sea surface temperatures in the world. Principal Investigator (PI) Prairie Dog lives on the SGP in a large prairie dog colony. The colony, commonly referred to as a town or village, is located right near the ARM research facility. These mascots all live in very different climates and make appearances in our newsletter and on our website.

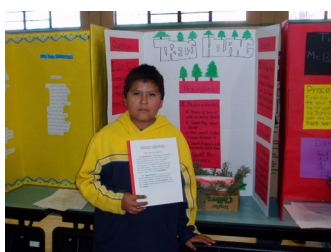


The purpose of creating these mascots is to give students an icon that identifies their region, culture, and weather patterns. For example, a student from the NSA will recognize Professor Polar Bear as being representative of ARM and everything they have learned about climate change in their region. The mascots provide a fun way for students to feel connected to the sometimes-overwhelming concepts of global climate change, global warming, and other fields of scientific research.



## Local Outreach and Weatherfest

ARM Education and Outreach team members are helping expand outreach efforts to surrounding areas. Activities include acting as science fair judges (Santo Domingo Pueblo and McCurdy schools) and participating in Los Alamos National Laboratory's annual Expanding Your Horizons Workshop. This workshop promotes women in science and mathematics to female students in grades 8-12 from the surrounding area. We use these opportunities to test classroom activities and lesson plans for schools near ARM research facilities.



Santo Domingo Pueblo  
Science Fair, NM



McCurdy Science Fair, NM



The ARM Education Team at Weatherfest 2004, in  
Seattle, WA



In January 2004, ARM Education and Outreach participated in Weatherfest, an annual event hosted by the American Meteorological Society. Students, teachers, and interested community members were able to observe science experiments (taken from ARM developed lesson plans), view the NSA kiosk, and pick up educational materials such as newsletters and lessons.

## Corresponding Author

Andrea M. Maestas, [andream@lanl.gov](mailto:andream@lanl.gov), (505) 667-1186