Project Report: Cooperative Institute for Climate Science Professional Development
Summer Institute in Weather and Climate
July 10-21, 2006

Principal Investigator: Steve Carson (Princeton Regional School Chemistry Teacher)

Other Participating Researchers: 21 participants

Theme #1: Earth System Studies/Climate Research

NOAA’s Goal #2: Understand Climate Variability and Change to Enhance Society’s Ability to Plan and Respond

Objectives:
In support of the Cooperative Institute for Climate Science’s (CICS) intent to train the next generations to deal with the increasing complexity of understanding and predicting climate, the CICS collaborated with a Princeton University program called QUEST on a professional development institute for New Jersey teachers, July 10-21, 2006. QUEST is a long-standing summer program of Princeton University’s Teacher Preparation Program. The two-week Weather and Climate unit in which CICS was involved was for teachers in third through sixth grades and offered a wide range of inquiry-based experience through which the teachers could develop an understanding of atmospheric processes and learn methods to teach about weather and climate. The unit was developed and taught by Dr. Steven Carson who was formerly a scientist and Outreach Coordinator at the Geophysical Fluid Dynamics Laboratory (GFDL) of CICS and is currently a middle school science teacher in Princeton, New Jersey.

Methods and Results/Accomplishments:
In the first week of the unit basic principles of weather and climate were explored by the participating teachers. Experiments and measurements involving pressure, temperature, heat transfer, and humidity laid the foundation. Those ideas were then brought together through exploration of the principles of cloud formation and the origin of wind. Experiments demonstrating the Coriolis effect served as a basis to understand global circulation of the atmosphere and the structure of tropical cyclones. A guest scientist from GFDL expanded on the topic of tropical cyclones by presenting background, research and modeling of tropical cyclones. To further expand understanding of storms, hands-on activities were used to develop explanations for lightning and tornadoes. A guest speaker from the Mount Holly Forecast Office of the National Weather Service provided further insight into principles of weather, data collection, and forecasting. A variety of activities were used to develop understanding of how energy from the sun is distributed over the earth, the cause of seasons, the basis and importance of the greenhouse effect, and optical phenomena in the atmosphere.

In the second week more quantitative approaches were used to expand on some of the previous topics and to introduce other new topics. The drawing of isotherms on maps of monthly average temperature was used to develop ideas of climate vs. weather and relate the patterns to principles introduced in the first week. Weather conditions and patterns were further explored through drawing isobars, plotting fronts, and examining a variety of maps and other resources available on the internet. More quantitative experiments were done with the distribution of light energy over the earth and with different ways to measure and express humidity. These were related to models of weather and climate. A second guest speaker from GFDL further drew on the topics studied to that point to discuss research and modeling concerning causes and consequences of global warming. An additional group of teachers studying the interdisciplinary curriculum of science, math, and literature joined the session to explore snow crystals and the reasons for their patterns.
The program gave teachers an understanding of the basic principles behind weather and climate and the integration of those principles with other dimensions of climate change.

PARTICIPATING SCHOOL DISTRICTS
Weeks One and Two – 21 teachers in grades 3-6 from the following school districts:
- 1 from Bordentown
- 1 from Ewing
- 3 from Lawrence Township
- 1 from Montgomery Township
- 1 from South Brunswick
- 11 from Trenton
- 1 from Washington Township
- 1 from West Windsor-Plainsboro
- 1 from an Independent School

52% participation from high poverty school district (Trenton) and an additional 9% from urban rim/"blue collar” districts (Bordentown and Ewing)
FEEDBACK FROM TEACHERS:
“I gained tremendous content knowledge, practical tips, and ideas that I can use in my classroom. The experience underscored, for me, the importance of varying methods of instruction, activities, locations, etc. in a classroom setting.”

“QUEST gives one the opportunity and time to really/effectively learn about a subject taught by someone who really cares.”

“I knew very little about weather coming into the program. My hope was to learn enough about the subject that I could do a good job teaching it next year. I definitely feel as though I gained not only significant amount of content knowledge, but also a wealth of practical teaching ideas.”

“Steve is very knowledgeable about this topic and enjoys sharing what he knows. He is the best! He taught at a great pace and always made sure we understood.”