Using real-time data to improve application of science concepts in rural middle school students

The integration of real time data into the science curriculum is a response to the need for resources that improve the analytical and problem solving skills of our middle school students. The textbook worked well for vocabulary but was not meeting the need for practical application of scientific data. Simulated inquiry activities improved laboratory skills but students still had trouble interpreting the data and applying it to their conclusions.

The solution to the problem came in the form of real time weather data. The use of weather data fit well in our curriculum since our geographic location made our weather unique. It was also inexpensive and could be integrated easily with one computer, an Internet connection and a printer.

The philosophy behind the integration of technology to improve analytical skills is simple. Weather data gives the students a practical application for use of the scientific method. Obtaining and analyzing real scientific data places emphasizes on the procedure. Students soon realize there is no room for error when someone else is dependent on the outcome. Weather data gives a local use for science concepts studied and application becomes easier when it can be applied to the community the students live in.

In the beginning of the year our focus is on the use of the Internet to provide students with the needed weather data for classroom study. Internet resources we make

use of are those of the National Weather Center, National Hurricane Center, American Meteorological Society and NASA. The major objective is to teach analysis of different kinds of data. The resources provide classes with satellite imagery and surface analysis. These products were compared and used to track the movement of weather systems.

Today teachers have access to data from the NOAA funded *Project Storm*. This site gives teachers and students updated data which is aligned with activities in areas of atmospheric sciences. It is from this site my students begin their journey. The atmospheric science unit begins with classroom instruction and vocabulary review. Students are given a pre- test that consists of a standard textbook diagram of the layers of the atmosphere. Their assignment was to label the layers and discuss the characteristics. In the beginning, seven out of twenty-nine students in my advanced class had some background in this area and could complete this assignment with a passing grade. The mean score was 57. Students were then introduced to upper air data; after being briefed on how to read the data their assignment was to graph the temperature and the altitude. Once the graph was completed students had to label the layers and special characteristics of each. On completion of this exercise twenty out of twenty–nine students were able to complete this assignment with a passing grade with 89 being the mean score.

Students use weather resources from the internet to monitor Atlantic hurricanes.

Today classes have the use of resources that include interactive tutorials, online student projects, live web casts and chats with experts in the field. Weather studies are on going through out the school year. Students observe clouds and report their observation to the NASA *S'COOL* Project. Their data is used to calibrate the *CERES* satellite information. Student collected data is also used professionally on the *GLOBE* site.
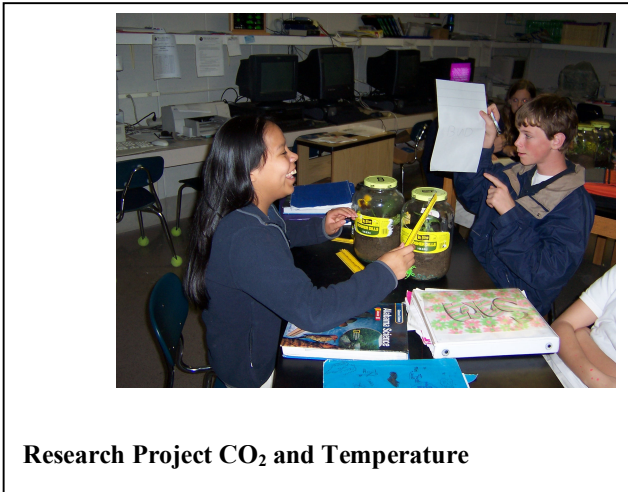

Student Weather Lab 1

Hurricane season brings our laboratory to life. During this time we become a community resource. Sea surface temperatures, upper level winds, and surface pressures are monitored to find areas of possible tropical formation. This data is used throughout the school and is also taken home to

parents. During an active storm, students maintain a weatherboard in the hallway complete with satellite imagery; strike probability, and the latest co ordinance. Archived storm data is also used to conduct case studies on hurricanes that have come close to our areas. Relationships between wind speed, pressure and intensity are studied by graphing the data at various points of the storm track. Storm co ordinances are plotted from formation to landfall to study any relationship between the two. A local television station donated an *Automated Weather Station* to our school and we now provide the community with local weather data via the Internet.

Research Project CO$_2$ and Temperature

Elberta Middle School is classified as a Title school which means a majority of its students qualify for free or reduced lunch and live at or below the poverty line. Is the program helping? Students bring home awards from the Regional Science Fair in areas of Atmospheric sciences, Chemistry, and Botany. The difficulty with test questions, which required an answer based on analysis of data is decreasing as the year progresses. Students score higher on the posttest when compared to the pretest scores in difficult areas such as chemistry and physics. The added bonus is with the standardized test scores. Overall the whole school population does well on the science portion of the test. Inclusion students did better in science than in other areas. The most obvious impact is the self-confidence and true interest student have acquired in science. Difficult tasks are attempted with very little hesitation.

What began with one computer, printer and a dial up Internet connection has blossomed to encompass the whole community. The student impacts are infinite. The main goal of integration of real time data is to improve analytical and problem solving skills. There is a noted improvement in the ability to reach sound conclusions based on the data available to the students. This is most definitely reflected in overall student performance.

Checking weather station data

A comparison study was done in rural Milaca Minnesota schools. AMS colleague Randy Furman used real-time weather data with his middle school students. Following the same STORM curriculum Milaca students performed as well as Alabama students. Minnesota students graphed the layers of the atmosphere using the same pre/post test. The only difference between the two states was the focus in Minnesota being winter storms instead of hurricanes. Students researched data to find the factors that needed to be present for snow, freezing rain and major white-out conditions.

Using data from the newspaper 1

The over all outcomes from both schools was an increase in conceptual understanding in both scientific protocols and factors involved in producing atmospheric conditions.