



EarthStorm

PROGRAM DESCRIPTION

EarthStorm, a teacher enhancement program, allows K-12 teachers in Oklahoma to incorporate real-time weather data into classroom activities. The program could be replicated in other states. The multidisciplinary project combines meteorology, climatology, computer graphics, telecommunications, geography, and agriculture in applied environmental experiments. Staff at the Oklahoma Climatological Survey at the University of Oklahoma coordinate the project. With initial funding from the National Science Foundation and the U.S. Department of Energy (via the Atmospheric Radiation Measurement Project), teachers who complete the summer institutes receive computer hardware and software to implement what they have learned, at their own schools.

EarthStorm provides schools with data every 15 minutes from the Oklahoma Meso-network, 115 automated environmental observing stations distributed throughout Oklahoma. EarthStorm provides the tools for initiation, implementation, and evaluation Mesonet data in classrooms. Teachers learn to use the Mesonet equipment, integrate weather data collection and analysis into their classrooms, and further their own understanding of the areas of science involved in the project. Teachers integrate weather analysis into existing curriculum to enhance students' knowledge and skills.

PROGRAM CONTEXT

Teachers and students from school districts throughout Oklahoma participate in EarthStorm training. Urban, suburban, and rural schools, as well as schools with high poverty and minority concentrations, are represented on the list of EarthStorm schools. High-need students, gifted students, and deaf students participate in weather data collection and analysis. Teachers from rural areas are able to enrich their schools and classrooms with access to sophisticated equipment and data that is not traditionally available to their students.

Content

- use of Oklahoma Mesonet measurements
- weather data collection
- analysis of weather data
- curriculum design
- principles of meteorology, climatology, and geography

Context

- variety of school contexts: rural, urban, and suburban
- large populations of high-poverty students
- high-needs students, including: special needs, at-risk, gifted, and hearing-impaired students



STAFF DEVELOPMENT PROGRAM

EarthStorm began with a core group of teachers who participated in a month-long summer institute that emphasized computer skills, basic meteorological principles, and integrating Mesonet data into the classroom. Follow-up institutes in subsequent summers allowed professional meteorologists and teachers who had participated in EarthStorm to create a curriculum for teachers to use in their classrooms. It is now available nationally.

Currently the staff development associated with EarthStorm includes a wide variety of workshops. The three-day introductory course incorporates an introduction to the Oklahoma Mesonet, introduction to the Oklahoma Mesonet Bulletin Board System, and Introduction to WxScope. Follow-up workshops vary from two hours to one day in length and focus on specific aspects of the program. All courses are taught by Oklahoma Climatological Survey staff members and Oklahoma teacher leaders who have implemented EarthStorm in their classrooms. Workshops are made up of small groups of teachers in well-equipped facilities, so teachers have hands-on experiences with the hardware and software their students will use.

Teacher training incorporates a) computer use; b) curriculum development; c) lesson application and data analysis software; d) a computer bulletin board; e) an educational newsletter; f) half-day science fairs; and g) continuing mentorship program with science mentors from the various federal and state meteorological facilities in Oklahoma. Teachers have ongoing support provided by the professional scientists who serve as mentors. In addition, they have networking opportunities through the bulletin board system and the Mesonet/ARM Science Fair.

SUMMARY OF RESULTS

Teachers and students increased their knowledge and understanding of meteorology and climatology. Using engaging software and authentic opportunities to do the work of real scientists, students in EarthStorm classrooms improved their performance on state and national tests in science, participated in — and won — local, regional, and state science fairs, and moved on to more advanced course work in science and math.

Process

- training
- follow-up institutes
- curriculum development
- mentors
- electronic support
- networking

Intended Audience

- individual volunteer teachers



EVIDENCE OF INCREASED STUDENT ACHIEVEMENT



Success Indicators

- norm-referenced tests in science
- state science proficiency test
- participation in science fairs
- females' participation and interest in science
- pursuit of advanced course work in science



There is no single measure demonstrating increased student achievement as a result of EarthStorm; however, drawing from multiple data sources from around the state, it is evident that EarthStorm has led to significant increases in students' learning. In one high-poverty, rural school district, students' performance on the ITBS science portion for three years during the school's involvement in EarthStorm averaged at the 77th percentile. Students in Sulphur, Oklahoma, increased their pass rate on the Oklahoma Proficiency Test for Science from 71 percent to 91 percent in one school year. The average score was 84 percent. A large number of students working with mentors won awards and recognition in state and local science fairs during the same three-year period. Participation in the Mesonet/ARM Science Fair increased from 25 students in 1993 to 112 students in 1996.

Several teachers report that engaging difficult, at-risk students in weather data recording and analysis has increased their achievement in all academic areas. Gifted students also became more successful in school as a result of their involvement in EarthStorm. Student weather forecasters were often more accurate in their predictions of weather than professionals. Teachers reported that students increased interest in science and pursued advanced coursework in science and math. In addition, girls demonstrated more interest in and success in science as a result of EarthStorm.

THE BOTTOM LINE



EarthStorm engages students in real-time data collection and analysis and gives their teachers opportunities to foster students' achievement in science. The staff development program incorporates the skills teachers need to take the EarthStorm Project back to their classrooms. This project has unique and diverse methods for demonstrating the link between staff development and student achievement.

SAMPLE SITES



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DOCUMENTATION

Cavallo, N.& Gerber, B. (1993). *The effects of EARTHSTORM, a technology-based NSF sponsored institute for middle school science teachers*. Annual Conference of the National Association for Research in Science Teaching, April 17, 1993, Atlanta, GA.

McPherson, R.A.& Crawford, K.C. (1996, April).The EARTHSTORM Project:Encouraging the use of real-time data from the Oklahoma Mesonet in K-12 classrooms. *Bulletin of the American Meteorological Society*.

