



# global glimpses

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## GLOBE: A New Model in K-12 Science Education

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### What is GLOBE?

The Global Learning and Observations to Benefit the Environment (GLOBE) Program is an international, hands-on, inquiry-based environmental science and education partnership. It brings together students, educators, scientists, schools, communities and countries in environmental studies and cross-cultural enrichment. GLOBE stands out among many excellent environmental education programs because it provides unique educational and scientific benefits around the world. GLOBE provides the opportunity for all students in K-12 classrooms to engage in authentic hands-on Earth science research. Students essentially learn science by doing science.

The original concept for the GLOBE program was first introduced in former Vice President Gore's book *Earth in the Balance* (1992): "Central to any strategy for changing the way people think about the Earth must be a concerted effort to convince them that the Global Environment is part of their 'backyard' ... I propose a program including as many countries as possible that will use school teachers and their students to monitor the entire Earth." The GLOBE Program was initiated in April 1994, in conjunction with the annual celebration of Earth Day (Finarelli, 1998).

### Goals of the GLOBE Program:

- to improve students' achievement in science, use computer and network technology, and help teachers meet local education standards,
- to expand the pipeline of potential future scientists and researchers for industry, academia and government,
- to increase student awareness of the global environment from a scientific viewpoint, without advocacy relative to issues, and
- to improve student understanding of science by involving them in performing real science—taking measurements, analyzing data, and participating in collaborative research with scientists.

In the United States, GLOBE is an interagency program of the National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration, National Science Foundation, Environmental Protection Agency, and Departments of Education and State. Implementation in the United States depends upon the efforts of 140 partner organizations consisting of colleges, universities, state and local school systems and non-government organizations. GLOBE has been adopted by schools in every state. Worldwide partnerships were established through bilateral agreements between the United States and its international partners, which are then responsible for designing program implementation in their own countries. To date, more than a million K-12 students in more than 10,000 schools and 16,000 teachers in over 95 countries are participating in this program.

In Alaska, the GLOBE program was established in November 1996 through a cooperative agreement between GLOBE and the University of Alaska Fairbanks (UAF) through the Center for Global Change and Arctic System Research. Elena Sparrow, coordinator of the Alaska Global Change Education Program, has been the UAF Alaska GLOBE program coordinator since its inception. The UAF-GLOBE Partnership has trained 100 teachers in 73 schools, four school administrators, three education specialists, four environmental educators, and five environmental specialists from Alaska Tribal Councils, in the GLOBE program.

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## GLOBE protocols

Scientists and educators comprise the GLOBE science/Education Teams for each discipline area: Atmosphere/Climate, Hydrology, Soil, Land Cover/Biology and Plant Phenology. The teams developed age and skill level-appropriate and scientifically valid protocols for standardized measurements and support materials. GLOBE protocols were chosen based on the following criteria:

- the data have research significance
- the procedures can be done by primary and secondary school students
- the equipment need is inexpensive enough for schools to purchase

Professional development workshops enable GLOBE teachers to guide their students in taking scientific measurements at or near their schools, in using the Internet to report and analyze scientific data, and in collaborating with scientists and GLOBE students worldwide.

## Benefits for Students

"GLOBE is the quintessentially ideal program for involving kids in science,"—Nobel laureate Dr. Leon Lederman (GLOBEoffline, 2001). GLOBE students gain first-hand science knowledge and experience through their observations, accurate data collection and use of the data in their investigations, instead of just reading about it. An Alaska Native student from Innoko River School in Shageluk, said "The thing I liked best about GLOBE was that we had to use our hands on such things as measuring trees and oxygen testing of the water. This is the best science class I ever took in my life." Another Alaskan student said that she would recommend GLOBE to other students and that it made her look at the environment differently.

GLOBE is good for all students, including those who may be uninterested in science or shy away from science. According to Kathleen Meckel, a Fairbanks teacher, the GLOBE phenology activities were especially good for Native students who tend to be quiet learners and not as articulate in class discussions. She found the students to be competent in taking the GLOBE measurements and they enjoyed doing it. According to another Alaska teacher, Cherie Stihler, GLOBE does more than benefit the environment. It also benefits eager young minds. "Never in all my years of teaching have I seen such excitement. Students who have never taken an interest in or enjoyed science and math now eagerly await our GLOBE work."

In addition to specific protocols, GLOBE students of all ages learn:

- to work together in teams
- to see a relationship between their work and the work of scientists and other students
- to see the relationship of their observations and long-term patterns taking place at their study sites, their neighborhoods, their regions and the world
- to answer questions based on their measurements and observations, rather than simply from textbooks
- to sometimes question those answers
- to appreciate that some questions do not yet have answers
- to use methodologies, analyses and other skills required by many state education standards
- to realize that science is a process and not the answer

A 1996-97 evaluation by SRI International, a California firm with world-renowned expertise in education evaluation, found that GLOBE is characterized by strong teacher and student enthusiasm, strong adaptability to a wide range of grade levels and contexts, and compatibility with collaborative and inquiry learning models. Students in active GLOBE classrooms have a very positive view of the importance of their GLOBE activities: 83 percent think GLOBE will help people better understand the Earth and 78 percent believe that the data they are collecting are important to scientists.

From GLOBE Year 2 evaluation (Means, 1997), GLOBE

teachers' perceptions of the biggest impact of GLOBE on student learning are in the following areas: observations skills (69%), measurement skills (68%), technology skills (60%), understand data (50%), work in small groups (50%), critical thinking (36%), and map skills (30%). GLOBE students performed better than their peers in non-GLOBE classes on assessments of their knowledge of measurement procedures, sampling and measurement principles, interpreting data and applying concepts, and interest in pursuing a career in science (Means, 1997).

Another major benefit in GLOBE is the opportunity for students to reach out beyond their countries, learn about geographic conditions (besides gaining hands-on experience to develop geographic skills such as understanding scale, latitude, longitude, map elements and spatial analysis), natural resources and cultural characteristics of other regions in the world.

## Benefits for Teachers

According to Dr. Diola Bagayoko, GLOBE partnership coordinator at the Southern University and A & M College in Baton Rouge, Louisiana, GLOBE provides a comprehensive, coherent, flexible tool for the actual implementation of the



*GLOBE students display hand-made clinometers for measuring tree height and slope of the land.*