The GLOBE Program

Global Learning and Observations to Benefit the Environment
An International Environmental Science and Education Partnership

GLOBE is a hands-on, school-based science and education program that unites students, teachers, and scientists in study and research about the dynamics of the Earth's environment. Over a million GLOBE students in thousands of schools located in over 100 countries are taking important environmental measurements. Their data are used in their own research activities and also by scientists around the world.

The goals of the GLOBE Program are to:

- Increase scientific understanding of the Earth,
- Improve student achievement in science and mathematics, and
- Enhance the environmental awareness of individuals worldwide.

"GLOBE is the quintessentially ideal program for involving kids in science."
Nobel Laureate Dr. Leon Lederman.

The GLOBE Program is implemented through a worldwide network of primary and secondary schools. GLOBE students:

- Take environmental measurements at or near their schools,
- Report their data to the GLOBE data archive via the Internet,
- Create maps and graphs to analyze GLOBE data sets, and
- Collaborate with scientists and other GLOBE students around the world.

GLOBE students have reported over 11 million measurements in the areas of Atmosphere/Climate, Hydrology, Soils and Land Cover/Biology. GLOBE improves student understanding because it involves students in performing real science – taking measurements, analyzing data, and participating in research collaborations with other students, as well as with scientists.

Scientists and educators have developed environmental science educational materials as a resource for GLOBE teachers. Professional development workshops train teachers to guide their students in taking measurements according to scientific protocols, in using the Internet to report and analyze scientific data, and in creating partnerships among students at GLOBE schools around the world.

Broad international participation is integral to the design of the GLOBE Program. Bilateral agreements establish partnerships between the United States and its international partner countries, which are then responsible for designing program implementation in their own countries. Implementation in the United States depends upon the efforts of almost 100 state and local partner organizations. GLOBE is funded by NASA, supported by NSF and the Department of State, and implemented in partnership with the University Consortium for Atmospheric Research (UCAR) in Boulder, Colorado.

Visit the GLOBE Program at www.globe.gov

GLOBE PROGRAM SUMMARY

Hundreds of thousands of primary and secondary students around the world are working in partnership with scientists to collect important data for research about the Earth's environment. These students and their teachers are part of the GLOBE Program -- a hands-on science and education program focusing on Earth system science. Thousands of teachers worldwide have received GLOBE training. More than 100 countries participate in the program.

GLOBE students measure and report physical, chemical and biological properties of Atmosphere and Climate, Hydrology, Soils, Land Cover/Biology and Phenology. The resulting global data sets are made freely available via the Internet at **www.globe.gov** to users including the worldwide environmental science community. GLOBE students also access these data for classroom studies, research, student-scientist partnerships, and worldwide school-to-school collaborations.

GLOBE supports education by providing hands-on experience in authentic science. GLOBE students are doing science, not just learning about the work of others. Students build from the measurement of individual environmental parameters to an understanding of how the Earth functions as a system.

GOALS

GLOBE brings together students, teachers and scientists:

- To increase scientific understanding of the Earth;
- To support improved student achievement in science and math; and
- To enhance environmental awareness of individuals worldwide.

IMPLEMENTING STRATEGY

Under the guidance of GLOBE teachers, students at all GLOBE schools throughout the world:

- Take environmental measurements using GLOBE measurement protocols and appropriate, calibrated measurement equipment;
- Report observations via the Internet to the GLOBE data archive;
- Use GLOBE maps and graphs on the Internet created from their own data and those of GLOBE schools around the world; and
- Conduct real research in collaboration with scientists and other GLOBE students worldwide.

SCIENCE

GLOBE student measurements in the areas of Atmosphere and Climate, Hydrology, Soils, Land Cover, and Plant Phenology are contributing significantly to scientists' understanding of the Earth's environment. Each GLOBE measurement is part of an ongoing scientific investigation selected through the National Science Foundation's peer review process. Scientists develop measurement protocols and instrument specifications to ensure that the data collected by the students are accurate and consistent. The scientists also continually review GLOBE data reports in the archive for quality control purposes.

Scientists are using GLOBE data for research about the current state of the Earth as well as to look at the dynamics of environmental change. According to Dr. Elissa Levine of NASA's Goddard Space Flight Center, "The comprehensive suite of GLOBE measurements that is being collected by students is critical for Earth science research -- for assessing current conditions, for monitoring changes and for driving, testing and creating models for predictions into the future."

EDUCATION
Improvement in science and mathematics education has focused on the importance of students' learning appropriate scientific methods through scientific inquiry. GLOBE provides students the opportunity to do research using their own data and that of their peers around the world. With GLOBE data, students can propose testable hypotheses, take measurements, analyze data, draw conclusions and publish their results (on the GLOBE Web site) –- in short, they can experience the discovery and excitement associated with scientific research using a database they helped to create.

The GLOBE Program is implemented in schools, domestic and international, under the guidance of teachers who have participated in teacher-training workshops. These professional development workshops enable teachers to guide students in taking the measurements according to scientific protocols, in using classroom computers and the Internet in a meaningful way, in using GLOBE data in student research, and in creating partnerships among students at GLOBE schools around the world. More than 24,000 in-service and pre-service teachers have participated in GLOBE workshops in preparation for implementing GLOBE in their schools.

The GLOBE Teacher's Guide contains the protocols for the GLOBE measurements, information about environmental science topics to provide a context for the measurements, and age-appropriate, inquiry-based learning activities that involve students in the whole process of science. Videos demonstrating the various GLOBE protocols are also available. GLOBE is not a curriculum but rather a resource for GLOBE teachers. Teachers adapt GLOBE materials for use in their schools and classrooms.

PROGRAM EVALUATION
SRI International annually evaluates the performance of the GLOBE Program using student and teacher surveys, interviews and site visits. SRI has found that participation in GLOBE increases the likelihood that teachers will engage their students in *doing* science (such as making measurements or observations, applying concepts, and interpreting data) rather than limiting their students to memorizing concepts and definitions of terms. Teachers reported that GLOBE improves students' higher order thinking skills through activities such as interpreting data and drawing inferences. Further, teachers also reported that involvement in GLOBE activities increases not just students' ability to take the environmental measurements included in the program, but also their ability to apply more broadly principles of sound sampling and data collection and to interpret data.

SRI concludes GLOBE is an ambitious attempt to put the concepts of authentic learning, student-scientist partnership and inquiry-based pedagogy into practice on an unprecedented scale. Several states have developed and implemented assessments that yielded statistically significant evidence that GLOBE enhances science and mathematics learning.

GLOBE PROGRAM MANAGEMENT
GLOBE is managed by the University Corporation for Atmospheric Research (UCAR) in partnership with Colorado State University (CSU) and supported by the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the U.S. Department of State.

• ***U.S. PARTNERSHIPS:*** Implementation of the GLOBE Program in the United States depends upon the efforts of more than 100 US Partners –- universities, state departments of education, school districts and other non-profit organizations. U.S. Partners raise their own funds, leveraged off the Federal investment in the program, to deliver GLOBE in their areas. U.S. Partners recruit schools, train teachers, provide follow-up support, and help in the adaptation of the program to state and local standards and requirements.

• ***INTERNATIONAL PARTNERSHIPS:*** Because broad international participation is integral to the implementation of the program, GLOBE enters into formal agreements with countries all over the world. In these partnerships, GLOBE provides the program infrastructure. Each international partner manages and provides funding for its own implementation, acquiring the resources from government, private sector and non-profit sources. GLOBE partners determine implementation strategies consistent with their countries' educational systems and priorities.

On 16 June 2003, the University Corporation for Atmospheric Research (UCAR) in partnership with Colorado State University (CSU) was officially awarded a Cooperative Agreement from NASA to assume primary responsibility for development and administration of the GLOBE Program. http://www.globe.gov/fsl/html/templ.cgi?newGLOBEteam&lang=en&nav=1

The University Corporation for Atmospheric Research (UCAR) is an NFP (Not for Profit) corporation supported by NASA, the National Science Foundation and the U.S. Department of State, and it is also an academic institution which consists of a consortium of universities. http://www.ucar.edu/ucar/

GLOBE is organized into a Directorate and four Teams - Education, Science, Partnerships / Outreach and Systems. Communication and coordination between GLOBE Teams and the Directorate, as well as with the NASA Program Manager, is facilitated by means of an Executive Committee. GLOBE also has an Advisory Board (GAB) consisting of external members, leaders in education, science, industry, and public policy, to advise the GLOBE Director on Program issues, particularly those related to sustainability. Furthermore, GLOBE has established a Sustainability Working Group (SWG), comprised of representatives from the various GLOBE Teams and the Directorate, to coordinate efforts to secure sponsorship and investment. And finally, ad hoc groups are formed periodically to ensure end-user feedback into the implementation of the various aspects of the GLOBE Program. An overview of the GLOBE Management structure can be found at http://www.globe.gov/fsl/html/templ.cgi?globe_staff&lang=en&nav=1

The GLOBE Staff are guided by their Framework and Roadmap document that outlines the Program's strategic goals and associated objectives. Learn more about the Framework and Roadmap for Inspiring the Next Generation of Explorers at
http://www.globe.gov/fsl/html/templ.cgi?framework&lang=en&nav=1