

Implementing GLOBE in the U.S.

Program Update
Challenges Schools
Face

Case Studies and
Best Practices

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GLOBE Program Overview

- Launched in 1994, GLOBE enlists teachers and students to measure and report physical, chemical and biological properties of Earth's atmosphere, climate, water cycle, soils, land cover, and living organisms.
- The resulting global data sets are made freely available to users via the Internet at www.globe.gov
- Ongoing scientific investigation selected through the 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.

GLOBE Goals

- To help K-12 students improve their achievement in science and mathematics;
- help expand the pipeline of potential future scientists and researchers;
- increase awareness of the environment from a scientific viewpoint,; and
- improve student understanding of science through involvement in performing real science.

GLOBE Today

- A hands-on, school-based international science and education program, GLOBE involves hundreds of thousands of primary and secondary students around the world working in partnership with scientists to collect important data for research on Earth's environment.
- More than 24,000 teachers in over 14,000 schools and more than 100 countries have received GLOBE training.

GLOBE Program Update

1. Public-private Partnership Created For GLOBE

- The National Aeronautics and Space Administration (NASA) has entered into a public-private partnership, giving an organization outside the U.S. Government responsibility for the essential core operations of the globe program.
- On October 1, 2003, the University Corporation for Atmospheric Research (UCAR), in partnership with Colorado State University (CSU), assumed the responsibility to support globe implementation in the u.s. and worldwide, to expand the program and its base of support, and to sustain GLOBE for the foreseeable future.

2. Duties of other U.S. Institutions

- NASA will continue to oversee the GLOBE program, determine the science measurement content of globe, and be responsible for the international GLOBE agreements.
- The National Science Foundation will continue to support competitively selected GLOBE science and education investigations from U.S. institutions.

3. GLOBE implementation around the world

- Since January 2003, GLOBE workshops in Bolivia, Cameroon, New Zealand, Norway and Switzerland.
- Increased Collaboration.
 - Countries in the Arctic region are continuing to collaborate to study "persistent organic pollutants" and how they relate to atmospheric, hydrological, and other systems in the arctic.
- Estonia Conference. The goal of the project is to incorporate GLOBE into their educational standards and to develop materials to support implementation of GLOBE as part of "information technology" in the classroom.
- Globe schools along the Rhine river in six

4. Educational Materials

- GLOBE is a no-exchange of funds program.
- The U.S. government provides the program infrastructure, maintains the data archive, manages the database, and develops educational materials. The globe teacher's guide is the principal educational tool used by all globe partners.
- 2003 version of the teacher's guide:
 - new measurements, improvements to existing measurements, lab guides and field guides to lead teachers and students through the steps involved in taking measurements and analyzing data.
 - A revised implementation guide provides assistance to partners and teachers in implementing globe in the classroom, including sample unit and lesson plans, assessment tips, and sample rubrics.

5. Science

- NSF: New GLOBE science investigation groups for the next funding cycle (42 months),
- GLOBE has an open invitation to partner countries for their scientists to propose globe investigations and become members of the GLOBE science team (Germany and Iceland).

GLOBE Learning Expedition (GLE) Sibenik, Croatia

- GLOBE Learning Expedition (GLE) held June 28-July 4, 2003, in Sibenik, Croatia.
- Student/teacher conference: Present the results of their research projects to the GLOBE community and work side-by-side with scientists in the field.
- 300 students, teachers, scientists and partners from 24 countries attended the GLE.

Two Goals for 2004

- More cross-border partnerships
- Increased involvement of local scientists

GLOBE in the U.S.

Reviewing the Program After
6 years (2002)

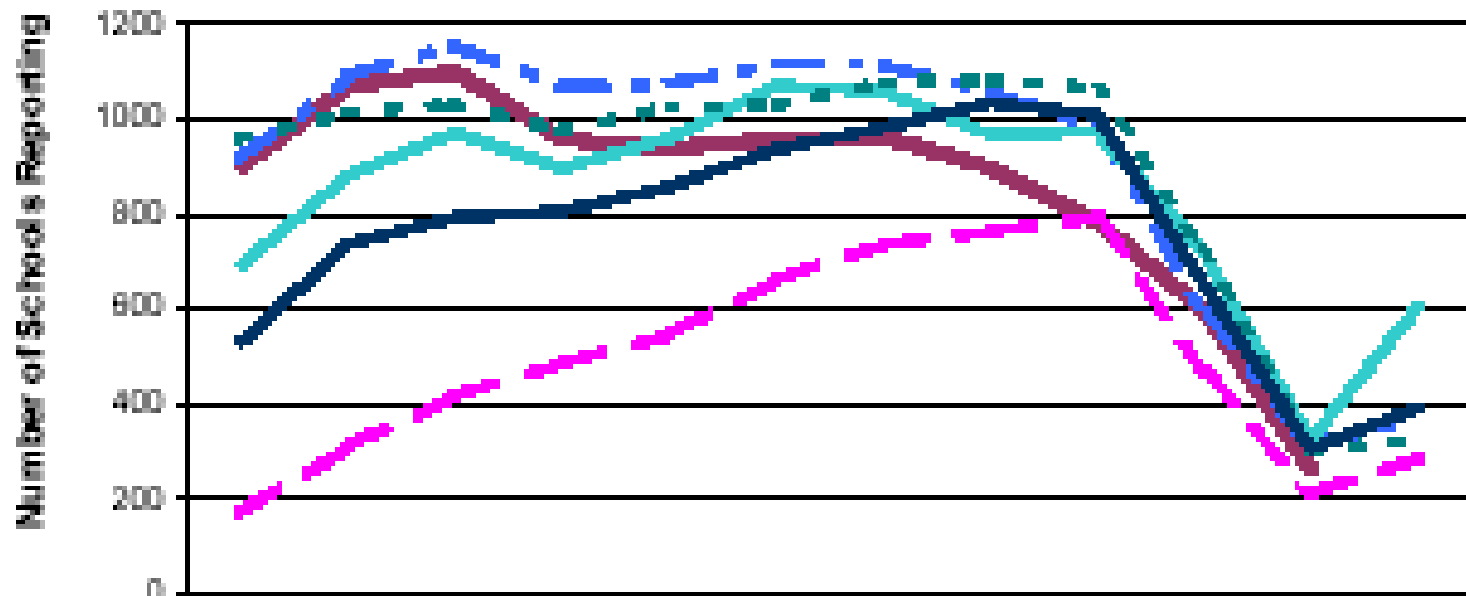
Challenges Schools are Likely
to Face

Decline in the Number of New GLOBE Teachers Trained

- As of September 1, 2001, 16,371 GLOBE teachers had been trained overall since the Program launched in 1995, including 12,655 in the United States and 3,706 internationally. Looking at the number of teachers trained from September 2000 through August 2001 in the United States, we found that 1,390 United States teachers were trained in Year 6, compared with nearly 3,000 in Year 5.

Figure 3.1

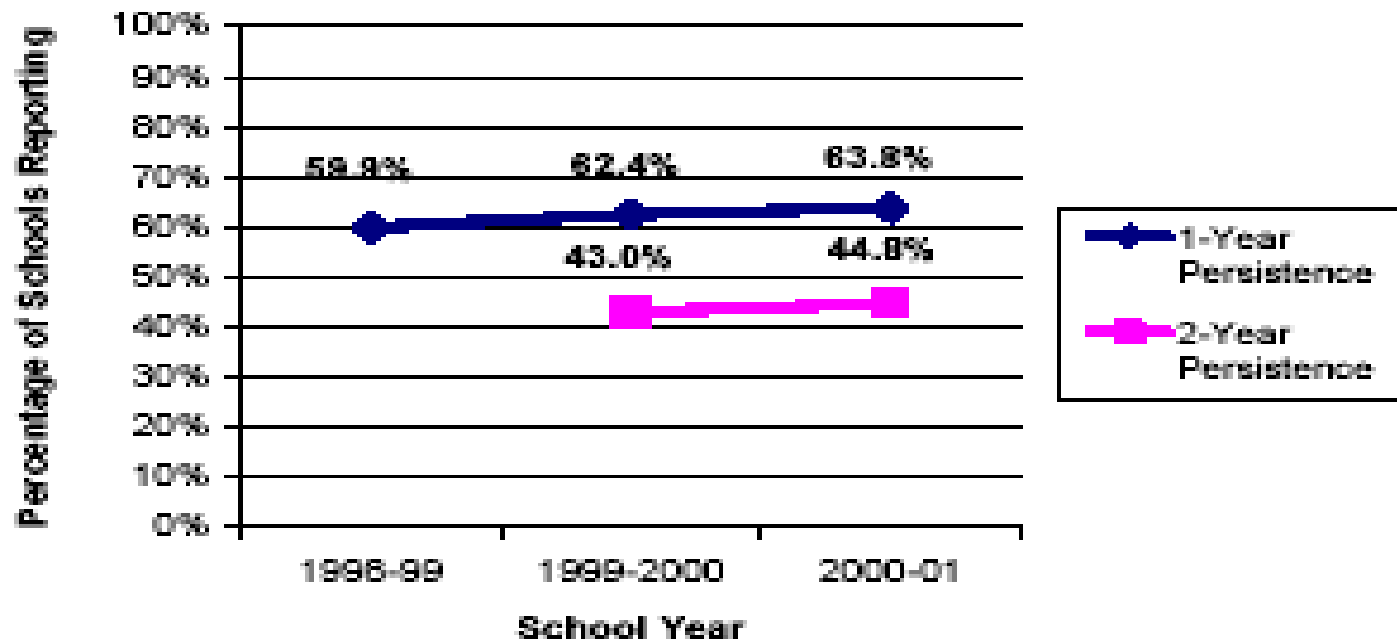
Number of Schools Reporting Data in GLOBE, Years 1-6, by Month



	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
2000-01	899	1069	1100	959	939	958	964	898	785	598	259	
99-2000	916	1091	1158	1070	1075	1115	1115	1058	985	591	311	387
98-99	692	882	972	898	961	1071	1060	967	974	721	323	604
97-98	960	1014	1032	978	1026	1028	1078	1084	1065	720	301	322
96-97	529	735	793	808	857	936	983	1034	1011	652	304	391
95-96	170	308	415	485	543	660	736	763	792	468	210	283

GLOBE School Retention

Figure 3.2
Trends in GLOBE School Retention



Variation in Implementation Across Schools

- GLOBE schools that are consistent in their data reporting—that is, schools that report GLOBE data seven or more months out of the year—are much more likely to report data the next year than are schools that report data less frequently.
- An analysis of post-training teacher support suggests that the most valuable resources to teachers are on-site mentoring and provision of materials and other incentives to make GLOBE data reporting easier. Teachers who accessed these supports from United States or international partners or elsewhere were much more likely to report data and to report data at higher levels than those who did not.

Consistency of data reporting

- The alignment of GLOBE with teachers' curricular goals affects reporting.
- Finding time to submit data is a problem for many GLOBE teachers, and for some, it is the reason most likely to prevent them from submitting data already collected.
- For some teachers, the belief that the value of GLOBE lies in taking data, rather than reporting it, is a factor in inconsistent data reporting.
- Teachers continue to report that difficulties with Internet connectivity contribute to not reporting data consistently.

Impact of Post-training Supports on GLOBE Data Reporting

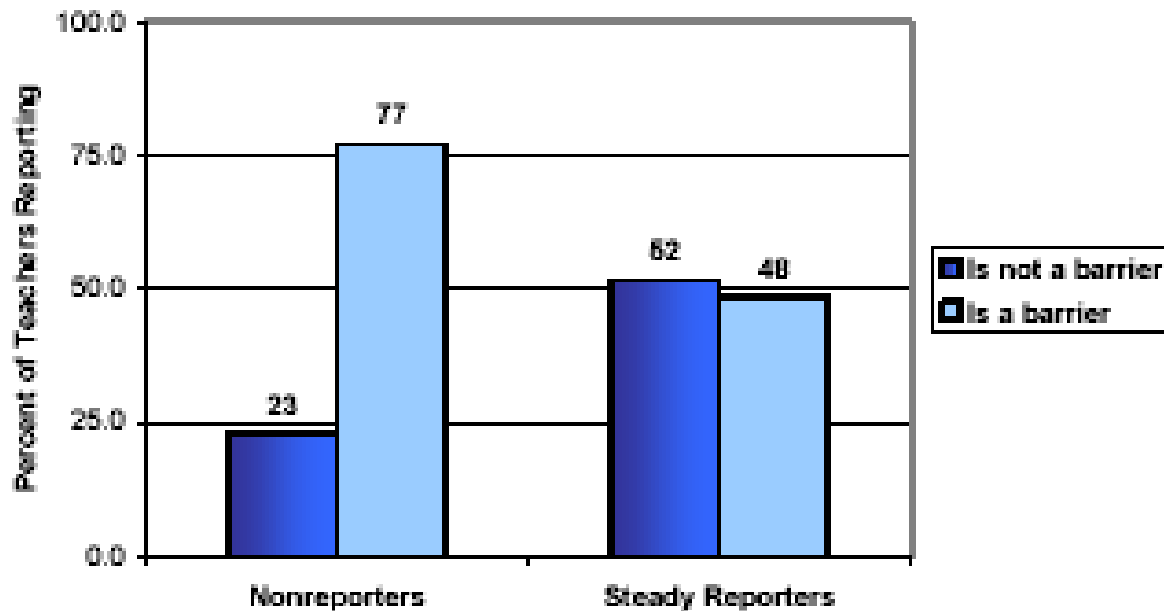
- Communications through such methods as listservs, newsletters, meetings and conferences, and contact with GLOBE partner staff or other GLOBE teachers via telephone or e-mail.
- Mentoring during school visits by GLOBE partner staff or experienced GLOBE teachers.
- Supplementary materials, such as tips for implementation.
- Follow-up or refresher training sessions.
- Participation incentives, such as equipment or recognition for reporting certain types or amounts of data.

Barriers to Data Reporting

- Impact of standards and testing on that implementation.
- One barrier identified by more than three-quarters of teachers from non-reporting schools is the difficulty teachers face in integrating GLOBE into their curricula (Figure 4.6). Fewer than half of steady reporters (48%) considered this a major barrier, compared with more than three-quarters of nonreporters (77%).

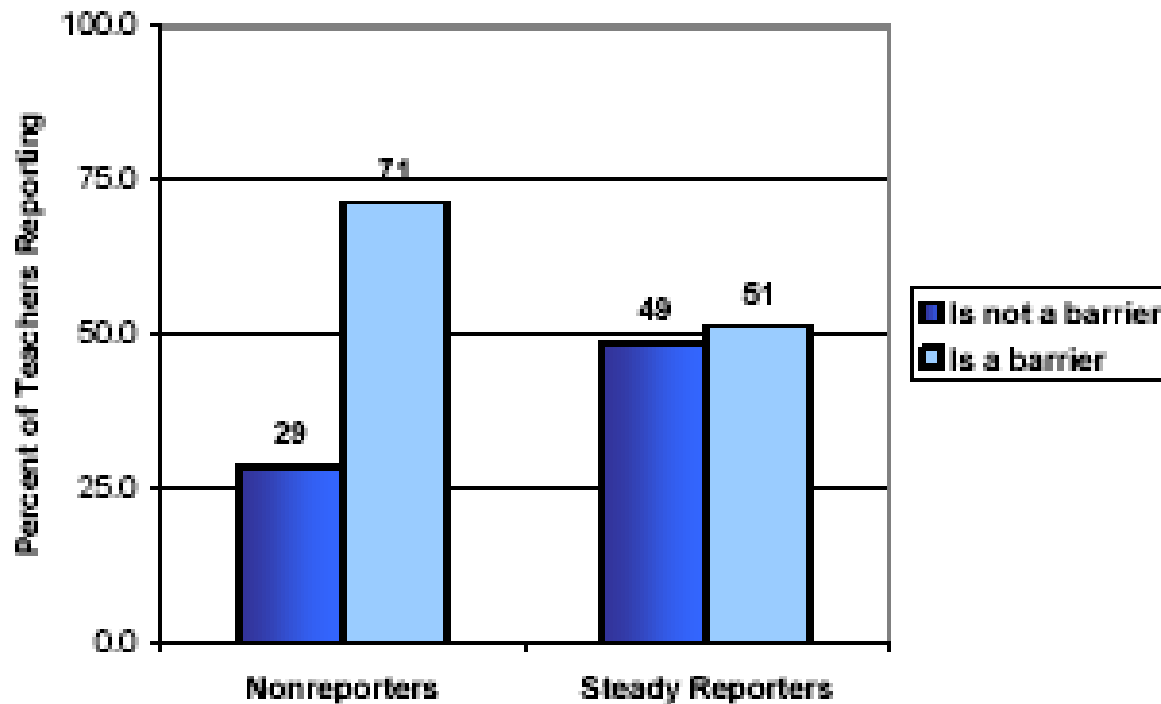
Curriculum Integration

Figure 4.6
Difficulty with Curriculum Integration, by Reporting Type



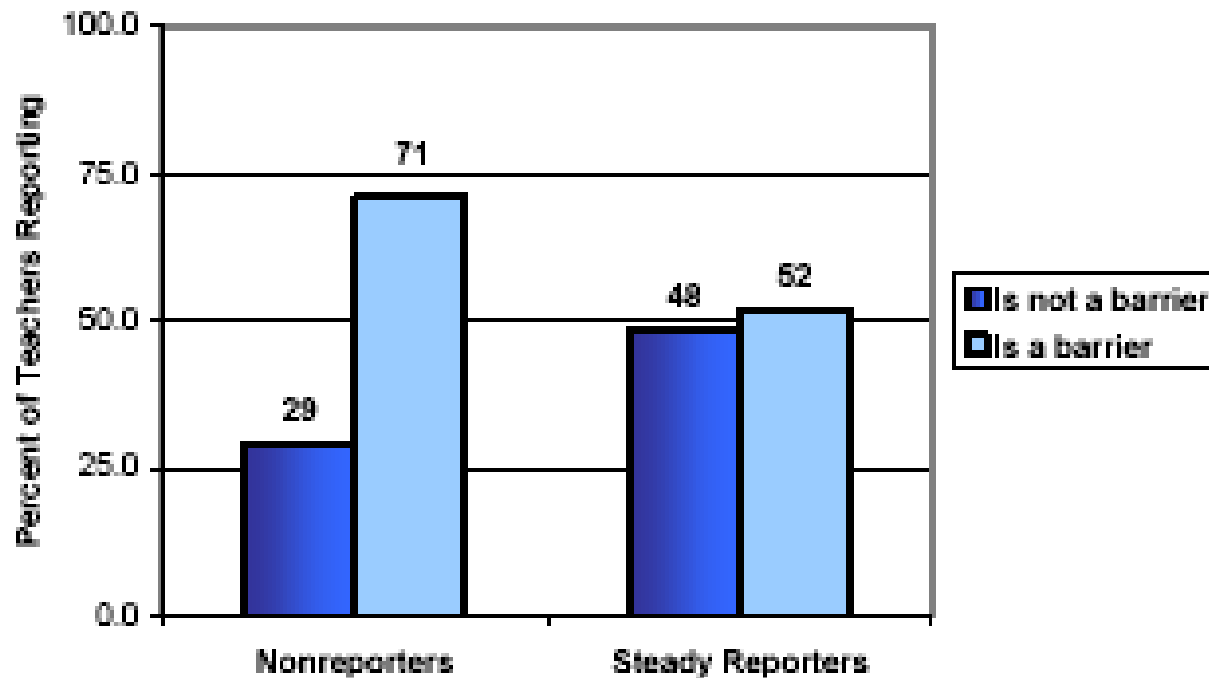
Finding Time to Report Data

Figure 4.7
Difficulty Finding Time to Report Data, by Reporting Type



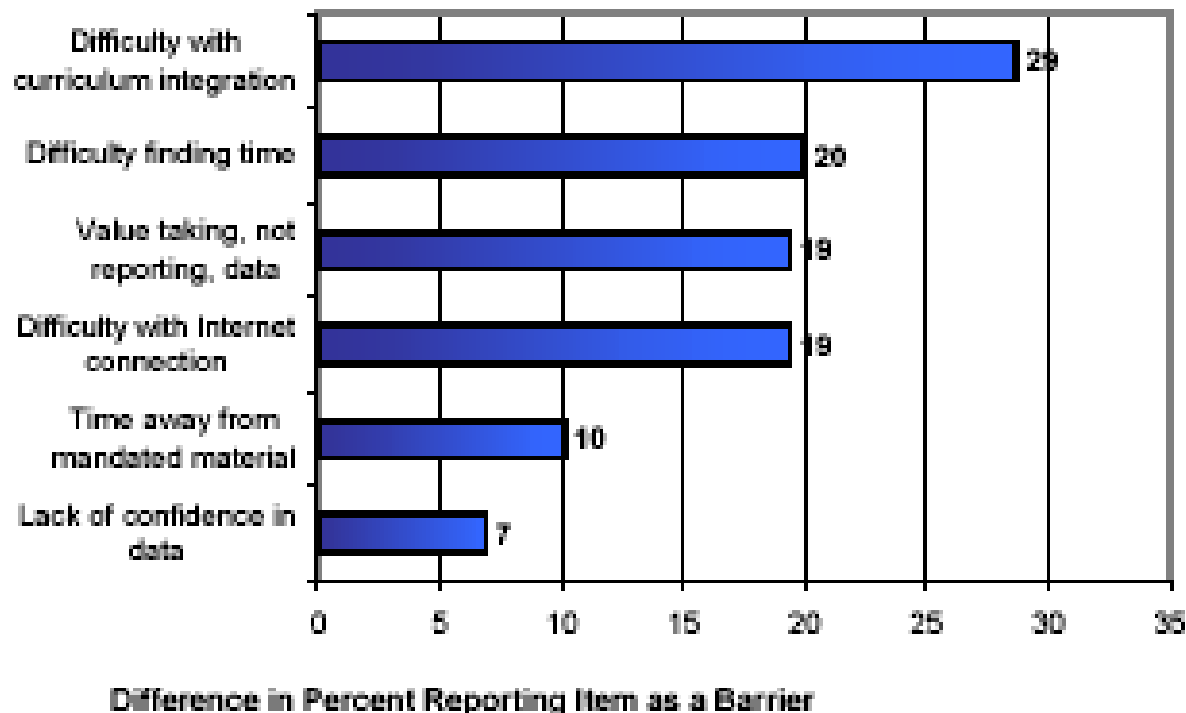
Difficulty with the Internet

Figure 4.9
Difficulty with Internet Connectivity, by Reporting Type



Barriers to Reporting

Figure 4.10
Difference between Nonreporters and Steady Reporters, by Barriers to Reporting



Variation in Implementation in Case Study Schools

- School-Level Versus Teacher-Level Focus on GLOBE
- Practicing Doing Science Versus Contributing to Science
- Adapting to Versus Defining Standards and Tests

School Level versus Teacher-Level Focus on GLOBE

- Most of the schools we visited had what might be called a school-level focus on GLOBE (in contrast to a teacher-level focus).
- At some of the schools, this school-level focus on GLOBE is augmented by external supports, such as a GLOBE United States partner or supportive district personnel.
- At these schools, where there is a teacher-level focus on GLOBE, the individual teacher often must navigate how GLOBE fits into the curriculum and aligns with standards and testing on his or her own, perhaps with the support of the principal but without active endorsement from administrators at the district level for participation in GLOBE.

Practicing Doing Science Versus Contributing to Science

- Teachers adopt and adapt GLOBE to their local classrooms partly on the basis of their goals for GLOBE. The emphasis some give to GLOBE is for students to **practice doing science**. GLOBE data collection is an activity of scientists; collecting and reporting data are avenues for practicing doing science.
- Other teachers involve GLOBE students with real scientists from outside their schools. For these students and their teacher, GLOBE is more than just an opportunity to practice doing science. it is

Adapting to Versus Defining Standards and Tests

- Adapting: Interpret and articulate to others connections between skills their students are likely to learn through GLOBE.
- Defining: Creating new standards suitable to “hands-on” science.

Measuring Student Learning

Table 7.2
Analysis of Differences in Scores across Groups in Assessment Pilot

		Hydrology Content	Inquiry Skills
Active GLOBE (National)	Mean	10.37	5.35
	N	73	57
	SD	3.42	3.03
* Standards Aligned (North Carolina)	Mean	9.69	4.04
	N	13	21
	SD	2.50	1.94
Non-GLOBE	Mean	7.12	3.50
	N	34	34
	SD	2.91	2.14
		$F = 12.02$ ($df = 2,117$), $p < .0005$	$F = 5.84$ ($df = 2,109$), $p < .004$

*Standards Aligned refers to the North Carolina sample. This sample did not in fact implement GLOBE to the extent that GLOBE schools did, but did cover more GLOBE content than non-GLOBE classrooms.

Best Practices for GLOBE Program Sustainability in Lithuania

- Network, Meeting Regularly
- Integration with Universities, Institutes
- Support on Curricula, Standards
- Fundraising
- Goals and Rewards for Students, Teachers, Schools
- Other Tips

1. Networking within Lithuania

- Economies of scale, sharing information
- Giving support to other schools, new schools
- Translation of materials
- Experience for students
- Local management issues

2. Integration with Universities and Research Institutes

- Great source of technical expertise and “labor” for your program
- Might integrate well into university programs, e.g. pedagogy
- Extra equipment
- Source of ideas for special investigations
- Get the Community involved, families

3. Curricula Integration

- In most countries there is a move towards “hands-on” science.
- Goal will be to adapt to existing standards and get the support of school officials

Sample curriculum integration chart

- GLOBE INVESTIGATION AREAS:GLOBE INVESTIGATION STRATEGIES:
- Atmosphere, Hydrology, Landcover, Soils, Earth Systems, Visualizations

Plan investigations

- Set up a new, appropriate problem/application
- Design an experiment
- Specify measurements/variables to investigate
- Pose relevant questions

Take GLOBE measurements

- Measurements are accurate and appropriate
- Detect errors
- Use quality assurance procedures (multiple, repeated readings, re-calibration)

Analyze and Compare GLOBE data

- Identify data components
- Identify similarities and differences
- Explain reasons for differences
- Use appropriate mathematical procedures Interpret GLOBE data
- Infer patterns, trends
- Explain data and relationships
- Create multiple formats to represent data

Communicate

- Compose informal and informal reports to explain or persuade
- Create and make presentations of key conclusions and finding

4. School-to-School Activities: Fundraising

- School-to-school collaborations between nine Norwegian and nine Estonian “twinned” schools—funded by a SAS and Coca Cola environmental grant won by their Country Coordinators Karl Hetland and Ülle Kikas, respectively—is now in full swing. Students from the “twinned” schools are participating in a larger Phenology project with schools from the Czech Republic. In addition, each pair is pursuing its own joint research projects and mutual visits.

5. Goals and Rewards for Students, Teachers

- Set yearly goals for reporting, participation, investigation, and management
- Set aside time to promote your program at your school
- Collaborate with other schools
- Report often

6. Other Sustainability Tips

- Partner countries are using GLOBE as a launching point for increasing environmental awareness and integrating this awareness into national education curricula and local communities.
- Linking data collection to a local environmental concern and developing a partnership between GLOBE students and the community to meet a mutual need.
- Providing teachers with sustained support.
- Translating and/or adapting GLOBE materials to suit the unique needs of the country.
- Meeting funding challenges with creative partnerships that extend beyond the support of government and quasi-governmental ministries and environmental agencies to include corporate and private-enterprise sponsors and the local community.
- Providing guidance on how GLOBE fits within the national curriculum and providing support to help teachers meet changing curriculum guidelines, with a focus on sustainable development.

Waterscape International Group