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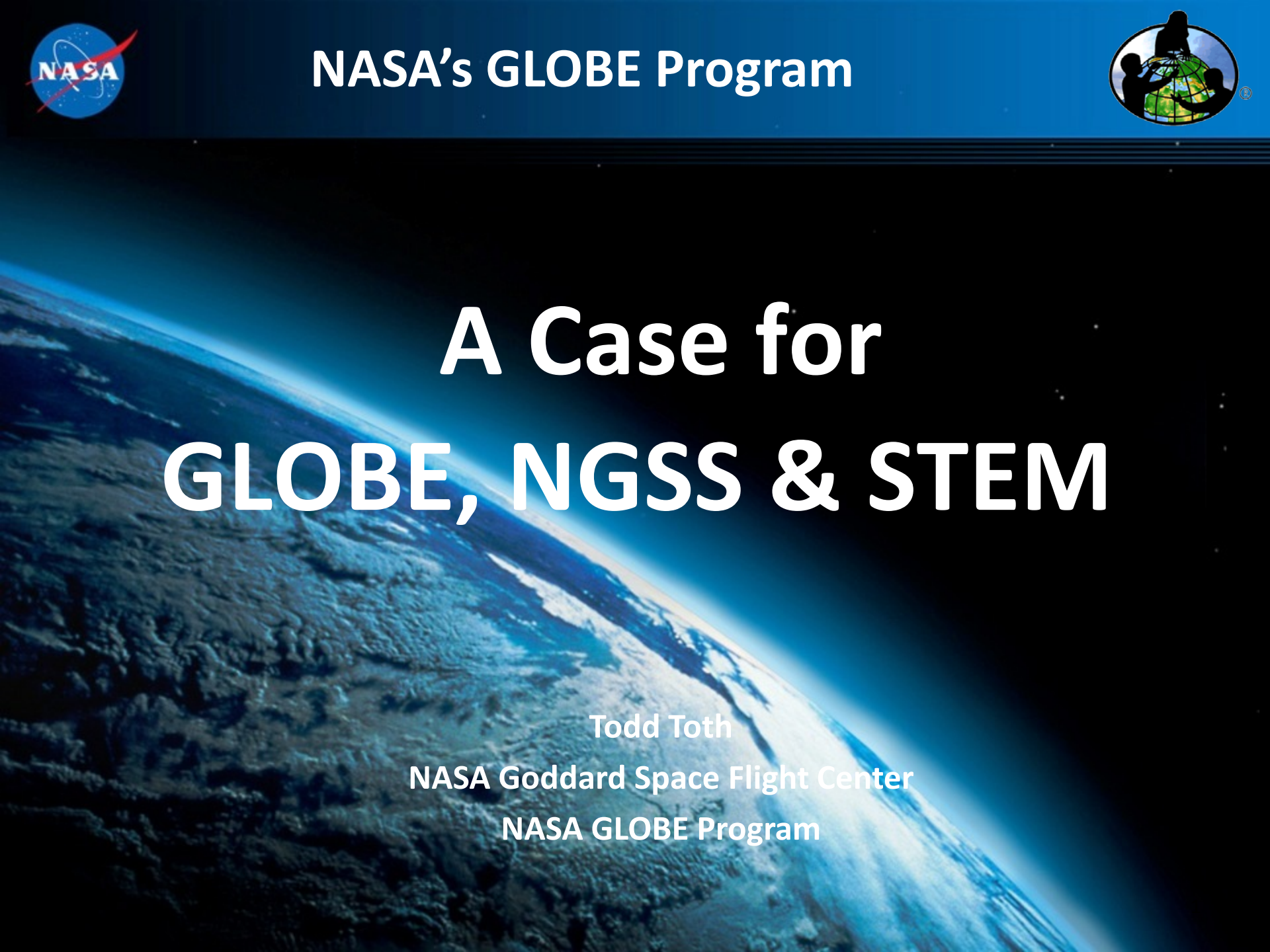
NASA's GLOBE Program
A Case for
GLOBE, NGSS & STEM
Todd Toth
NASA Goddard Space Flight Center
NASA GLOBE Program

NASA's Premier Education Program

THE GLOBE PROGRAM

Global Learning & Observations to Benefit the Environment

- A worldwide, hands-on, inquiry-based primary and secondary school science and education program
- GLOBE connects and supports students, teachers and scientists from around the world as they collaborate in the investigation of the environment and Earth system science
- In GLOBE, students don't just read about science, they do science!

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

GLOBE Partners Around the World

111 Partner Countries

Currently 27,147 Schools

18,877 teachers

128 U.S. Partners

- **Six regional offices: Africa (22), Asia and the Pacific (16), Europe and Eurasia (40), Latin America and the Caribbean (18), Near East and North Africa (13), North America (2**

THE GLOBE PROGRAM

English
Log In

GLOBE Students in Switzerland Collect Atmospheric Data

Students in Switzerland compare their GLOBE data with data collected by an automated weather monitoring station. GLOBE Switzerland works to enhance dialogue between education and science in addition to guaranteeing sustainable development of program content and curricula for all school levels.

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Welcome to GLOBE

The Global Learning and Observations to Benefit the Environment (GLOBE) program is a worldwide hands-on, primary and secondary school-based science and education program.

Learn More about GLOBE

GLOBE Community

Schools:
27,030

Teachers:
18,677

Total Measurements:
118,273,022

Measurements This Month:
1,624,230

Collaboration Groups

Recent Postings In:
Community Feedback Forum

RE: Making friends could be more easy
Try out this process for a start..

https://www.globe.gov/web/community-feedback-forum/discussions/-/message_boards/message/753692 >>

SCIENTISTS' Blog

Mt. Rainier: R5th in beauty and science


Firefox File Edit View History Bookmarks Tools Window Help
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Home - GLOBE.gov
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Most Visited
Getting Started
Sports - CBSSpo...
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Dictionary and T...
Weather Center
Full Screen Rada...
D2Football.com ...
Rapid Response ...
THE GLOBE PROGRAM
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Mt. Kilimanjaro Student Research Xpedition
GLOBE students on a research expedition to the summit of Mt. Kilimanjaro study the various ecological zones and record vegetation, temperature, rainfall and elevation on the tallest peak in Africa. They retrieve data from data loggers placed on the mountain by previous Xpeditions for their research on the
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GLOBE Across the Curriculum
Inquiry-Based Instruction
Assessment Tools
Recognition Resources
Materials for Teaching & Learning
Learning Standards
Professional Development Resources
e-Training
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Collaboration Groups
Recent Postings In:
Community Feedback Forum
RE: Edit or update Site infpormation, data correction after sending
The Student ZONE
Learn how to be a student GLOBE scientist
Visualize and Retrieve Your Data

Short GLOBE Introduction

GLOBE Investigations Areas

GLOBE provides five scientific investigation areas, each providing background information, measurement protocols and learning activities. Resources from the five areas can be combined in many ways, providing students and educators with many options for building meaningful scientific investigations. Also provided are data sheets and field guides to assist in the accurate collection of data.

Atmosphere

Earth as a System

Hydrology

Land Cover/Biology

Soil

Atmosphere

Overview | Members | Protocols | Learning Activities | Discussions | Documents | Useful Links

Introduction • Data Sheets • Field Guides • Appendix • Tool kit • GPS

Alignment

Why align GLOBE:

The Next Generation Science Standards (NGSS) released in April 2013 present GLOBE with some challenges

- How well do the GLOBE protocols, activities and resources match NGSS
- What fine tuning needs to be done
- How to promote GLOBE & NGSS alignment

but also some unique opportunities

- It provides opportunities for all students in a classroom to learn about science by doing science
- It has developed standardized science measurements being used locally and globally not only by citizen scientist but by NASA scientists as well
- GLOBE as a model for effective science education and outreach - STEM, NGSS and Common Core standards
- A way of meeting curricular needs in K-12 classrooms through hands-on/minds-on activities that can be integrated in science, math, language arts, social studies and music

Using GLOBE will help states and schools to build STEM - NGSS capacity and infrastructure for success

GLOBE & STEM

GLOBE protocols and activities are the perfect example of STEM activities

- K-12 STEM activities waiting to be used
  - calibrating a thermometer
  - building a sun photometer

Example of GLOBE as STEM in action

The GLOBE California Academy Program: Strengthening College and Career Readiness in STEM by Leveraging School Structure and Student Aspirations

- California 3 year study by WestEd and UC Berkeley's Career Academy Support Network (CASN) to improve learning and workforce development in science, technology, engineering, math (STEM) and in information and communication technology (ICT)
- Proposed strategy integrates the hands-on science pedagogy of the GLOBE program into the multi-year curriculum of the California green high school academies
- The program engages students in research related to climate change together with career development activities. Teachers are supported by professional development and other forms of support in career academies that focus on the growing renewable energy and clean technology workforce sector

GLOBE & STEM

- In career academies, students implement projects that both strengthen their science practices and connect the content and practices to students' career aspirations
- integral to career academies are opportunities for students to engage in "work-based learning"
- GLOBE offers— student contributions to real science by using high-quality scientist-developed protocols and entering their data into an international database for scientific analysis—is consistent with this definition of work-based learning
- Students not only learn, but they also produce outcomes of value to others beyond school
- Finally, the structure of academies, based on cohort scheduling over three years, offers coherence and continuity for students over time, supporting academic skill-building and both career and socio-emotional development from one grade to the next. This structure also allows for the embedding of multi-year initiatives

GLOBE & STEM

Potential Applications

- A growing number of schools are implementing career academies as a high school reform model; there are currently over 7,000 academies nationwide
- In addition, the demand for professional and technical workers in the renewable energy sector is likely to grow
- Occupations in this sector, from installing and maintaining new energy technologies to conducting basic research, require knowledge and skills across several STEM disciplines
- Implementation of GLOBE within California's green academies will provide a proof of concept for more widespread implementation in California and across the country
- Partnership with the GLOBE network, detailed documentation, and communication with national groups involved with STEM and career academies will help pave the way to broader replication

GLOBE & NGSS

The Next Generation Science Standards (NGSS) provide a new way of looking at science education. They emphasize the **practices of science**, the **crosscutting concepts of science** and the **content knowledge of science**.

- GLOBE provides an excellent example of the NGSS in action
- A GLOBE student demonstrates the practices of science as they collect and analyze data
- A GLOBE student's learning takes place within the context of the science disciplines of Earth, Physical and Life Science
- GLOBE students understand the interrelationships of the science disciplines through "big ideas" of science that crosscut all of the sciences
- Students in GLOBE continually apply their science knowledge in meaningful endeavors and demonstrate that the observations and learning that take place in GLOBE demonstrate that what we learn about our environment can be used in the relationships between engineering, technology, and the applications of science

-David Bydlowski, US Partner Coordinator – Wayne County Mathematics and Science Center at Wayne RESA (Michigan), Certified Protocol Trainer – Atmosphere, Hydrology, Land Cover, Phenology, and Soil

Questions

THE GLOBE PROGRAM

Question #1: **What will teachers need to know about GLOBE to address the NGSS?**

Questions

Question #2: **What resources should GLOBE provide to help teachers address the NGSS?**

Questions

THE GLOBE PROGRAM

Question #3. **What should a NGSS Professional Development (PD) session during a GLOBE workshop look like?**

GLOBE / NGSS Model Template

GLOBE Investigation Strategy / NGSS Model Unit

Standard(s) for this model unit. **MS_ESS2-6**	**Develop and use a model to describe how unequal heating and rotation of the earth cause patterns of atmospheric and oceanic circulation that determines regional climates.**		
Essential Questions:			
GLOBE Investigation Strategies:	**Proposed GLOBE Resources for this stage:**	**NGSS Practices Used:** *(align to each resource)*	**Notes:**
Plan investigations • Set up a new, appropriate problem/application • Design an experiment • Specify measurements/variables to investigate • Pose relevant questions	**S4: modeling the Reasons for Seasonal Change**	**Develop and use a model to describe phenomena.** **Develop a model to describe unobservable mechanisms.** **Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.** **Analyze and interpret data to provide**	

Example

GLOBE and NGSS Alignment

Standard

- **3-ESS2-1.** Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

Instruction

- Students obtaining weather data for different seasons either by collecting it, downloading it, or both.
- Students applying mathematics and computational thinking skills in other content areas to learn how spreadsheets and graphing tools can be used to organize, analyze and interpret data including looking for patterns in data.
- Students discussing (using argument and evidence) - similarities and differences in the weather in different seasons.

Assessment

- The Student will Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

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