

Virtual Fieldwork and Teacher Professional Development



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ABSTRACT:

Fieldwork is crucial to geology education, yet in 2006, 24% of Earth science teachers were not Earth science certified (CCSSO, 2009). Is it reasonable to expect teachers who have not had field experience themselves to lead meaningful fieldwork for their students? Fieldwork is a core activity for applying inquiry to real-world scenarios. How can we support teachers in using local and regional geology to teach Earth science in an inquiry-based way?

Through *Enhanced Earth System Teaching through Regional and Local (ReaL) Earth Inquiry*, a professional development (PD) and curriculum materials development project funded by the National Science Foundation (NSF DRL 0733303), we are developing a nationwide series of *Teacher-Friendly Guides* for teaching about regional and local geology and we are creating PD programs with teachers in each region. Teachers are gaining field experience, making virtual fieldwork experiences (VFEs) and taking students into the field.

The PD program begins with a face-to-face workshop involving fieldwork at geologically interesting sites. This provides a brief, mentored introduction to fieldwork. As teachers work in the field and classroom, they also collaboratively create a VFE of the field sites for use in their classrooms.

The program continues post-workshop through virtual study groups in which the teachers complete the VFE they began during the workshop and support each other as they create VFEs of sites near their schools. Through the collaborative process of creating a VFE of the workshop field sites, teachers learn the skills needed to create a VFE of their local site.

As teachers work to create VFEs, they must consider their local environment as a classroom. VFE creation requires close study of field sites with considerations of what would be relevant to a scientist in the field. This is explicitly intended to be a step towards actual fieldwork with students.

As the project continues, a database of VFEs grows creating a resource not only for teachers in the program but for any teacher or interested learner. When the database becomes large enough, users will be able to easily compare local sites to others that are progressively different or by changing different characteristics, e.g., comparing sites with similar bedrock geology but different climate characteristics.

See virtualfieldwork.org.

Question Driven:
Why does this place look the way it does?

The Problem:
How to foster place-based inquiry-oriented Earth science teaching?

Three Pronged Approach:

Teacher Professional Development

Teacher Friendly Guides

Creating Virtual Fieldwork

Virtual Study Groups (via Skype)

Face-to-face workshops



Seven regional guides covering the entire US offering accessible information about geoscience and how to teach it.

online at

teacherfriendlyguide.org

provides



Pedagogical Support

Geological Support

Technological Support

Professional Networking

PD program offers & integrates...

- Pedagogical Support
- Technological Support
- Geological Support
- Professional Networking

Websites offer...



Performing inquiry at a distance (remote sensing).
Teacher-created resources for teaching local Earth systems science.
Using the local to understand the global.
Encouraging systems approaches & in depth study
Leads to *actual fieldwork*.

Database in DRAFT form -- input encouraged!

Virtual Fieldwork Experience Database											
Pedagogical Support			Technological Support			Geological Support			Professional Networking		
Place name (hyperlinked to teacher page)	Iconic Image	Map (sortable by latitude)	Rock Age (ISC Chart)	Landscape Type	Biome (biome map)	Rock Type (Igneous, metamorphic, sedimentary)	Minimum Elevation (m) (elevation map)	Peak Elevation (m) (elevation map)	Average January Temp (°F) (Jan. temp. map)	Average July Temp (°F) (July temp. map)	Average Annual Precip (in) (precip map)
Arbuckle Mountains, OK			Silurian Devonian Ordovician Cambrian	Folded Mountains	Prairie (wetter, taller grass) and Steppe	Sedimentary Igneous	281	374	37.8	82.2	40.66
Taughannock Falls, NY			Devonian	Plateau	Temperate Deciduous Forest	Sedimentary	116	251	19.8	66.9	36.71
Adirondack High Peaks, NY			Proterozoic	Domed Mountains	Taiga & Tundra	Metamorphic	616	1629	16.3	65.5	39.83
Cascade Mountains, OR			Quaternary Neogene (Tertiary) Paleogene (Tertiary)	Volcanic Mountains	Tundra	Igneous	980	1500	29.6	62.6	14.19
Glacier National Park, MT			Paleogene (Tertiary) Cretaceous Jurassic Proterozoic	Syncline	Tundra	Metamorphic Igneous	900	3000	19.4	58.90	28.26

Color coding schemes drawn from common maps & charts, like these:



Pedagogical Support

Technological Support

MAKE YOUR OWN POWERS OF TEN VIDEO TUTORIALS

MAKE YOUR OWN POWERS OF TEN CONTENTS:

- Background, Rationale, Downloads & Other Resources

VIDEO TUTORIALS:

- 1.00 Our Own Powers of Ten Introduction: Taughannock Falls Example
- 1.01 Getting Started with Google My Maps
- 1.02 Inviting Collaborators
- 1.03 Annotating Placemarks and Embedding Photos
- 1.04 Drawing Polygons - Making Boxes in Google Earth
- 1.05 Measuring & Drawing Bigger Polygons
- 1.06 Using the Line Tool to Measure & Guides for Keeping Square
- 1.07 Curvature Matters - 1000 km x 1000 km
- 1.08 Where a Kilometer Comes From - 10000 km x 10000 km
- 1.09 Cleaning Up and Downloading Into Google Earth
- 1.10 Adjusting Preferences for Viewing in Google Earth

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1.00 OUR OWN POWERS OF TEN INTRODUCTION: TAUGHANNOCK FALLS EXAMPLE

This first set of tutorials is inspired by the Charles & Ray Eames's film *Powers of Ten*. The film simultaneously powerfully illustrates the concept of scale and highlights a sense of place. These tutorials step you through how to use Google Maps and Google Earth to make a recreation of part of the film centered around a location of your choice.

Why would you want to center this on your own location?
There are at least three important reasons.

- It's cool. Here are two examples of what the finished product looks like in Google Earth:
 - New York Hall of Science Powers of Ten Google Earth Tour.
 - Taughannock Falls State Park Powers of Ten Google Earth Tour.
- For either file, download the file and open with Google Earth. Highlight the folder for the new tour and click the play button.
- Mapping is not trivial to understand. Maps are abstractions that are particularly difficult if an individual has not traveled much. If you can begin with the unmistakably local (like the schoolyard) and gradually pull back to see more and more, mapping can suddenly move from the abstract to the concrete.
- Scale, especially on astronomical and microscopic levels is more difficult to understand than mapping and highlighting scale should be done repeatedly throughout one's education. Scale and its representations is truly a big idea about the Earth system and it is discussed more in the Big Ideas section of the site.

