Enhanced Earth System Teaching Through Regional and Local (ReaL) Earth Inquiry

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PALEONTOLOGICAL RESEARCH INSTITUTION

The Problem:
How can we support teachers in using local and regional geology to teach Earth science in an inquiry-based way? In 2006, 24% of Earth science teachers were not Earth science certified (CCSSO, 2007) and many do not know regional geology. Is it reasonable to expect teachers who do not have an in depth background in the discipline or a deep understanding of the local environment to lead meaningful Earth system science inquiry for their students?

How can we meet the content and pedagogical needs of teachers of Earth system science?

A Three-Pronged Approach:
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.

Virtual Fieldwork Development is Self-Documenting Professional Development:
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.

The process of VFE creation also makes aspects of the professional development self-documenting. Creation requires documenting fieldwork with photos and other kinds of data, and it requires the use of technology to assemble the virtual representation of the field site. It often documents student fieldwork.

Virtual Fieldwork Database:
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.

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Any opinions, findings, and conclusions or recommendations are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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

online at

teacherfriendlyguide.org

are

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

informs

is

Creating Virtual Fieldwork

Begun at

Face-to-face workshops

facilitated through

Virtual Study Groups (via Skype)

requires

provide

provide

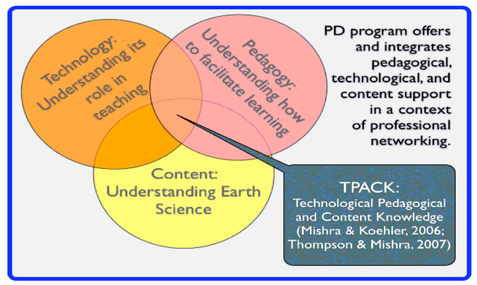
Pedagogical Support | Geological Support

Technological Support | Professional Networking

TPACK

Close study of the local environment with an eye toward student fieldwork

characterized by



Technological Support

Content Support

Pedagogical Support

Websites offer...

Virtualfieldwork.org

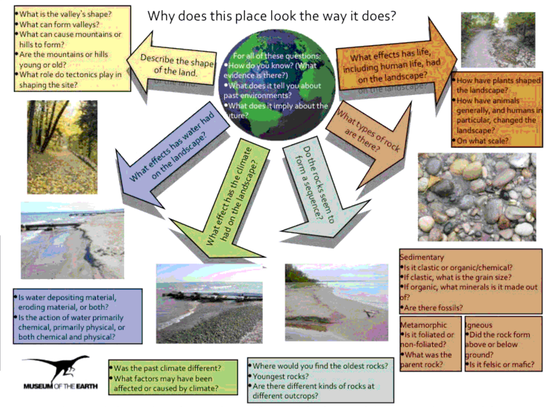
which contributes to

Producing

which are evidence of

Virtual Fieldwork Experiences (VFEs)

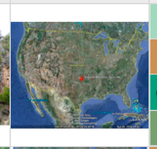
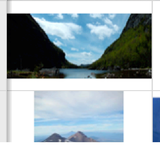
VFE development is (partially) self-documenting professional development.



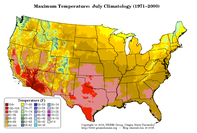
A participant's adaptation of provided graphic organizer, with photos from local field site, and customization of questions.

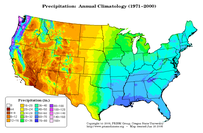
Performing inquiry at a distance (remote sensing).
Teacher-created resources for teaching local Earth systems science.
Using the local to understand the global.
Encouraging systems approaches & in depth study
Leads to *actual fieldwork*.

Virtual Fieldwork Database Mock-up

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			Quaternary / Neogene	Volcanic							

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





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