Geotechnologies In Education Event:
GeoTech Colorado 2006

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Location: Calwood Education Center, Boulder County, Colorado

Event Dates: 29 Jul–3 Aug 2006

Purpose: Geotechnologies (Geographic Information Systems (GIS) and Global Positioning Systems (GPS) Technology Institute for Educators.

Sponsors: USGS and the Colorado Geographic Alliance, with wonderful support from the Calwood Education Center, ESRI, and Sky Vista Middle School.

Institute Leaders: Joseph Kerski (USGS), Roger Palmer (GISetc), Anita Palmer (GISetc), Al Lewandowski (Port Huron School District), Sophia Linn (Front Range Community College).

Main classroom building at Calwood Education Center.

The setting of the Calwood Education Center, with its excellent outdoor laboratories—woodland and wetland—provided an excellent opportunity of conducting a field-based institute. The vision of holding the event at Calwood became a reality because of the dedication of everyone involved over the past 12 months.

One of the lodges at Calwood Education Center. These in-residence institutes really provide the best opportunities to networking and learning over any other setting, in my experience.

Dr Rafael Salgado, Director of the Calwood Education Center, gives participants an overview and mission of the Center on the first evening of the workshop. More information is at http://www.calwood.org.

Participants in GeoTech Colorado 2006 came from universities, nonformal education, and K-12 educational institutions in 10 states and 3 countries (Australia, New Zealand, and the USA).

GeoTech Colorado provided not only an excellent building facility for such an event, but also a over 1,000 acres of Rocky Mountain woodland, wetland, grassland, and lakes for conducting field research. It was one of the best places that I have ever taught. I first found out about it through helping teach the University of Colorado's Earthworks program in 2005.

Part of the instructional team—Joseph Kerski (USGS), Anita Palmer (GISetc), Roger Palmer (GISetc) with Barb Wallner (participant from Milwaukee Public Schools). It was a sincere pleasure to work with each of my colleagues, the participants, and the Calwood staff. We also had a high school student from New York with us who was an excellent addition to our workshop.

Above, Sophia Linn and Ravay Snow-Renner, our institute evaluators. Thanks to two grants from the Colorado Geographic Alliance, we are evaluating the changes in teachers and students attitudes' and skills as a result of this institute through surveys and follow-up workshops. The Colorado Geographic Alliance partly funded 8 teachers from Colorado to attend the institute, which we (and they) greatly appreciated.

During the institute, participants worked in either a Thorough Investigations lab or a Special Topics lab, and switched back and forth depending on their needs at the time.

Numerous educators attended the workshop who have years of experience in training teachers and students in geotechnologies, such as Anne Olsen and Stephanie Eddy, from New Zealand, above. For more information about their work, see: http://www.gismaped.co.nz/

We conducted an extensive marketing effort over the past year, resulting in 30 extremely inquisitive, innovative educators from a variety of educational levels and subjects.

It was not easy to set up and network 30 computers for the institute, but it was worth the effort to hold the institute in such a spectacular setting with the field lab literally steps away, out the door.

Instruction Summary

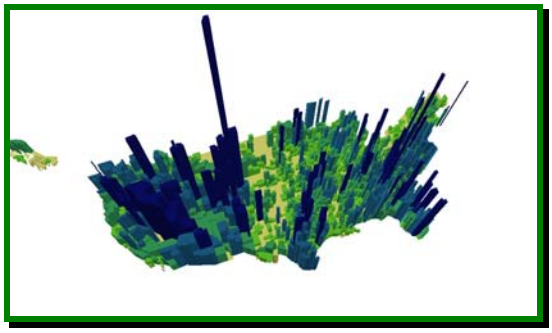
Hands on work with GIS and GPS in the theme-based and tools-based lessons: 93% hands-on; and 7% discussions on curricular implementation strategies.

Laboratory work: 85%.
Field data collection: 15%.

We worked in a variety of settings and featured different instructional styles. The institute featured evening sessions. We took care to include low-tech components, to illustrate that low-tech can be used effectively with high-tech, such as a hand-made tree-height clinometer from the GLOBE program.

We custom-built this institute based on the needs of the participants and modified it daily based on the daily evaluations we received at the end of each day. This represented much of the value-added that we feel we can offer to educators.

Software Used



Above, population change map from 1990 to 2000 that we created during one of the lessons.

ArcGIS 9.1, ESRI, on laptop computers. This mobile setup was perfect for the institute.

Other software included the Minnesota DNR Garmin utility for GPS upload, and we gave a demonstration of Virtual Globe

software including NASA WorldWind and Google Earth.

Above, mapping our field data on a digital orthophotoquad for the institute.

Selected Workshop Themes

1. Critical thinking skills.
2. Spatial thinking.
3. Integration of geotechnologies (GIS, webmapping, GPS) with geography, science, mathematics, history, and environmental studies curriculum at the university, secondary, and primary levels.
4. Scale.
5. How to locate, format, and use geospatial data for GIS-based projects.

Each participant received a vast array of material from the USGS and from ESRI and from GISetc, including a Mapping Our World book, Essentials of the Environment book, and a GIS Tutorial book, USGS books, maps, and pamphlets, lessons, guidelines, and articles. Each participant received a custom-made folder on a USB drive with data, tools, lessons, and photographs.

Activities and Lessons

1. Webmapping with the National Atlas, Terraserver, USGS Earthquake Center.
2. Climate, population, plate tectonics and other lessons from *Mapping Our World, Community Geography,* and from other lessons that we have written.
3. Boulder County physical and cultural analysis.
4. Analysis of North Atlantic hurricanes.
5. Accessing and analyzing Census TIGER files and demographic data.
6. Tornadoes of the USA analysis.
7. Downloading and using Terraserver USGS DOQs and DRGs for field base maps.
8. Collecting field data and GPS coordinates and examining field data within a GIS environment.

9. Digitizing map features.
10. Analyzing population change in USA counties, 1900-2000.
11. Throughout the institute, we held discussions about pedagogical issues of teaching with geotechnologies, standards, logistics, and more. There was a great deal of collegiality and peer mentoring that occurred throughout the week.
12. Work on projects that the participants wanted to create and/or refine.

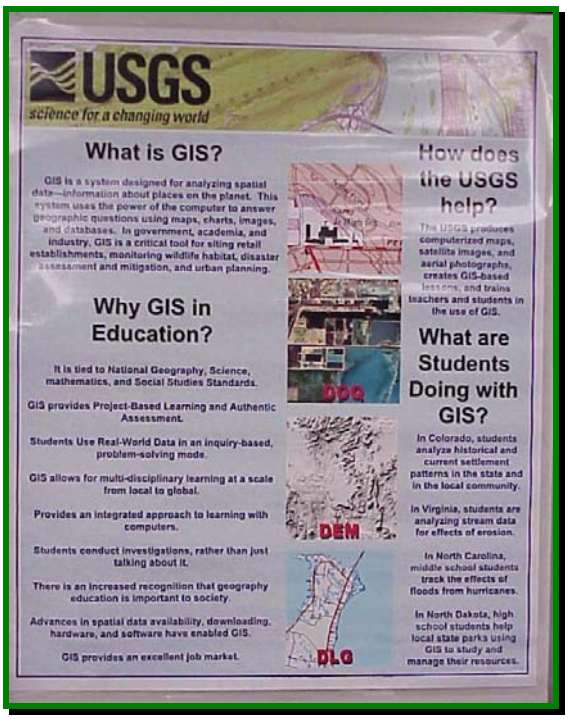
Field Work

Above, probes that we used for the institute.

Groups collected field data on the following themes: water quality, animals, tree species and height, flowers, land use, and trails.

The participants brought all of the field data to the GIS environment where it became part of a growing database that the Calwood staff is collecting. It also illustrated how the participants can plan field experiences in their own settings.

We took a field trip to the National Center for Atmospheric Research, which was, as always, fascinating.



One of the GIS In education posters that I created for the institute.

Cafeteria at Calwood, which provided yet another networking opportunity. Dee, our cook, set new heights of culinary excellence!

Acknowledgements

I appreciated USGS support of my attendance at this event and thank Sherry Jackson for her help with the materials. I thank my co-organizers of GeoTech—Anita Palmer. Roger Palmer, Sophia Linn, and Al Lewandowski, for their hard work over these past 12 months. They truly went above and beyond all expectations and put in countless hours of unpaid work. I look forward to our continued collaboration. I thank Sophia Linn and Ravay Snow-Renner for their evaluation and assessment expertise. We all appreciated the financial support from the Colorado Geographic Alliance and the computers from Sky Vista Middle School. I thank Rafael Salgado and the Calwood staff for being so supportive and Esther Worker from ESRI for her support and materials. Last but not least, I thank the participants for making this event so memorable. I am certain that I am forgetting someone who worked hard on this institute, but

know that your efforts were much appreciated as well.

Recommendations

GeoTech and events like it illustrate the impact that a combination of spatial analysis, authentic, outdoor experiential learning, and inquiry-based, problem-solving learning with real-world data can have. It empowers students to investigate their world, connect with their environment and with their community, and augment their self-image and their perceived role in the world. The conference attendees well illustrated the wide applications of GIS and GPS throughout education—history, math, geography, teacher education, environmental studies, earth science, biology, and more.

GeoTech emphasized interdisciplinary linkages between geography and science, and examining real-world issues in education and standards-based education. During the past 20 years, the USA has fallen from 3rd to 17th worldwide in the percentage of college undergraduates who major in science. Geography is experiencing a revival, but the pace is slower than we would like it to be. Now more than ever, it is important that educators, GIS specialists, and scientists remain involved with events such as this and with nurturing the relationships and partnerships that follow.

I believe that the USGS and other federal organizations have a role to play in preparing teachers and students to use our data and products, and spatial data and technologies. I believe that it is also our responsibility to do so as a public service agency. Our relationship with the GeoTech event organizers has been fruitful and continues to grow. We had met several of the participants during prior workshops.

By conducting workshops, we have the opportunity of working one-on-one with the teachers. We have the opportunity of obtaining their feedback on curricular materials that we develop. We work with educators to demonstrate ***how*** our products and spatial data in general can be used in conjunction with national science and geography standards. It does more than explaining ***what*** products are available.

At the workshop, I focused on USGS and other organizations' resources in real-world data and technology in education, particularly geospatial and scientific information. Both the growth in educational technology and the curricular content standards present excellent opportunities for us to introduce our data and products to students and educators across the country. Educators who are trained in the types and applications of our data are a powerful voice for the USGS. Students familiar with our data will form a geospatially-literate society. Another objective was to "train the trainers"--teachers--to magnify our effectiveness and maximize our limited resources. These trainers will themselves have already begun

to network with and train other educators, administrators, and students. By participating in this event, the attention generated from teachers and students across the country for science and for geography could be enormous, given current concern with teaching about globalization, the environment, and technology.

We need to remain involved in education as an agency. Education shows our relevance to Congress and the general public. Education serves the needs of diversity, recruitment, and retention.

Flyer for Institute

SUMMER RESIDENTIAL INSTITUTE
Learn GIS, GPS, and Geographic Field Studies in 1,000 acres
In the Beautiful Colorado Front Range
29 July - 3 August 2006

Instructors Dr. Joseph Kerski, Mr. Roger Palmer, Mrs. Anita Palmer.

Location Cal-Wood Education Center, 20 miles NW of Boulder, Colorado, USA, among the pines at elevation 7,800 feet: www.calwood.org

Target Audience Grade 6 through College-level pre-service and in-service environmental-social studies, technology, science education.

Class Meeting Times 4pm Saturday through Noon Thursday.

Registration $ 995 includes room, board, and accommodations in the Colorado Front Range. 1,040 acres to study and explore at Calwood.

Materials Provided

- *Mapping Our World—GIS lessons for Educators v.9.0*; includes a one year school wide site license and curriculum ready to go when you return.
- *Essentials of the Environment* book to provide a basis for our work
- ArcGIS Tutorial
- Over 40 hours of hands on exercises and exploration to ensure your success at bringing this technology back into your classroom!

History/Social Science/Geography Content Standards

- Chronological and Spatial Thinking (mapping historical changes to local settings of interest)
- Research, Evidence and Point of View (using maps/images to model inquiry, comparing multiple interests)
- Historical Interpretation (human and physical characteristic of place, cause and effect, land use change)
- Determine new boundaries based on cultural and physical data
- Show historical movements of people in USA and worldwide
- Field-based, hands-on, problem-solving inquiry

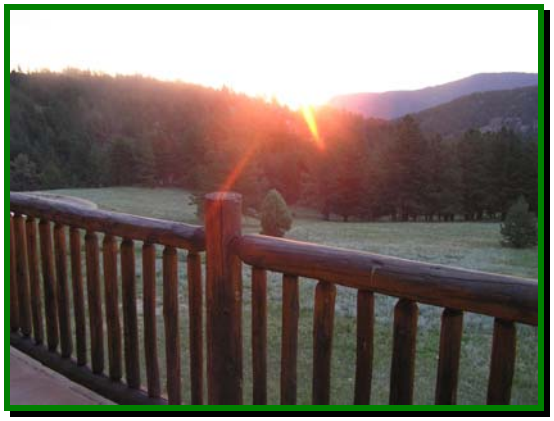
Science Content Standards

- Physical Science (light properties, color, energy, motion, salinity, density)
- Life Science (ecology, land use, plant animal and nutrient cycles, coastal wetlands restoration)
- Earth Science (land, water, atmosphere, watersheds, geology)
- Investigation and Experimentation (active inquiry based approach to the environment we are studying.)

Mathematics Academic Content Standards

- Measurement and Geometry (calculating distances, areas, and volumes, proportional reasoning)
- Mathematical Reasoning (creating algebraic expressions, observing patterns, calculation estimations)
- Graphical Representation of Statistical Concepts

🗁 **For more information: Contact Anita Palmer at Info@gisetc.com - or register online at http://www.gisetc.com/calwood.html**



Sunrise and Sunset at Calwood Lodge, Summer 2006.

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GeoTech Colorado 2006 Report