

EDUCATION PARTNERSHIP EVENT REPORT AND RECOMMENDATIONS

Attendee and Report Writer's Name:

Joseph J. Kerski - USGS - Geographer

Location: Maui Hawaii

Event Date: 5-8 January 2005

Name of Event:

**My Community-Our Earth Institute using
Geotechnologies and the Maui Digital
Bus**

Purpose of Event:

Geography, Sustainable development,
watershed hands-on workshop for
educators

Educational Partners:

ESRI, Inc. (www.esri.com)

Association of American Geographers

(www.aag.org)

Akimeka LLC

US Geological Survey (www.usgs.gov)

Office of Naval Research

Maui Community College

GLOBE (www.globe.gov)

Executive Summary

Staff from Akimeka LLC, AAG, ESRI, and USGS conducted a hands-on "Adventures in Geography" institute for educators using the Maui Digital Bus. The institute focused on the My Community Our Earth (MyCOE) theme of sustainable development, and water resources in particular. Institute participants analyzed land use, climate, natural hazards, water resources, and other issues and spatial data within a Geographic Information Systems (GIS) environment. Participants collected and analyzed field data, including coordinates from GPS receivers and from water quality equipment.



The Digital Bus in the Iao Valley, a spectacular place (fortunately protected by state park status) where we conducted a portion of our fieldwork to map and analyze the Iao Watershed. [Click here for a video with sound taken at the institute.](#)

The Maui Digital Bus Project

The goal of the Maui Digital Bus Project (www.digitalbus.org) is to support science and technology education for the youth of Maui Nui. It began in 2004 with funds from the Office of Naval Research, and supported through Akimeka LLC. It offers project-based learning opportunities at schools and also at field sites. Projects include this I Spy on Maui, Welcome to the Wetlands, My Watershed-Maui Nui's Future, Mapping Maui Nui (which this January 2005 institute fit into), and more.



Maui office of Akimeka LLC, a Native Hawaiian-owned IT company that oversees the Digital Bus and its programs.



It was a pleasure to have Andy Vliet, left, of Akimeka LLC, and Ted Sheppard of the Office of Naval Research, as they both have played such a prominent role in funding and supporting the Digital Bus project.



Ellen Moshein, left, and Diana Papini in their office at Akimeka LLC. They both have extensive backgrounds in science and technology education and were a pleasure to work with.



The Digital Bus is a specially-outfitted vehicle for field investigations.



This project, like all Digital Bus Projects, fit in well with the Hawaii Content and Performance Standards in science, education technology, geography, and mathematics. These include students using system, change, scale, and model concepts to help them explain the world, understanding scientific inquiry, using technology as a tool for research, using geographic representations to analyze people, places, and environments, and pose questions and interpret data using statistics and other mathematical constructs.



The Digital Bus equipment includes 9 Macintosh iBook G4 laptops with OS X, GPS receivers, microscopes, digital cameras, software, a wireless network, a large monitor, projector, water quality

testing equipment, and much more.



Another view of us preparing data and lessons inside the Digital Bus.



The Digital Bus in Action! It enables scientific investigations at field sites, providing equipment and expertise for the examination of a variety of issues.



Joseph Kerski, Angela Lee, and Nikolas Schiller at Iao Needle, a spectacular location for part of our field work near the headwaters of the Iao Stream.



Hawaii is one of the world's most wonderful places to study geography, because of its unique place on the globe, its unique plant life, and its grappling with issues of natural resource conservation, tourism and development, and natural hazards.

My Community Our Earth

This institute was conducted in conjunction with the My Community Our Earth (MyCOE) initiative. MyCOE is a worldwide geographic educational effort for sustainable development. It is a partnership between numerous organizations, including AAG, ESRI, USGS, National Geographic, USDA NRCS, NOAA, and others. Themes include biodiversity, climate change, environmental pollution, food production, freshwater supply, health and disease, mountain development, poverty reduction, rural development, and urbanization. MyCOE encourages people of all ages to identify a sustainable development issue in their own community, examine it, and take action. In my 2002 ESRI User Conference report, I included a section on the impressive MyCOE projects from around the world: <http://rockyweb.cr.usgs.gov/public/outreach/success.html>.



Natural hazards are a threat to every community and environment around the world. Threats to Hawaii include flash floods, volcanic eruptions, tsunamis, earthquakes, hurricanes, wildfires, and landslides. In light of the recent South Asia disaster, tsunamis were an excellent theme to explore. Tsunamis have accounted for more lost lives in Hawaii in the 20th Century than all other disasters combined (221 people).



Hawaii is a freshwater oasis within millions of hectares of saltwater. Education about water conservation, watersheds, and water quality is important for students and all residents and tourists.



With development come infrastructure issues that have environmental implications, such as pipelines, above.



An innovative and unusual use of recycled materials: At Maui Community College, recycled glass is used as planter fill. What else can be recycled on these islands?



Construction and development are controversial and sensitive issues on all of the Hawaiian Islands.



Development of north Wailuku extends up the mountainsides. What sort of development do communities want? What is sustainable? We discussed these issues a bit as a group and extensively with individuals at the field sites.



Students awaiting the school bus. Our desire is to instill a love of learning in these workshops, including building confidence of students and teachers that they can use some real-world tools in their own research, and to give them confidence that they have an important role in society.



Teachers on Maui seek to incorporate technology in a meaningful way in schools, not technology in a meaningful way, but in a way that students can use it to enhance their investigations and become comfortable with using it as a tool.



Sugar cane processing plant on Maui; part of the refuse is used for biomass energy production. We discussed issues of land use and economics throughout the institute.

Institute Description

The institute was structured as follows:

Investigate earthquakes, plate tectonics, and volcanoes with an emphasis on Hawaii

Investigate Hawaii's position in the Pacific Basin

Investigate population change in the USA, Hawaii, and on Maui

Investigate climate, land use, elevation, development, and watersheds on Maui

Investigate issues using satellite images, maps, and aerial photographs of Maui

GPS Overview and Discussion

Collect coordinates using GPS

Collect water quality samples in ocean, near mouth of Iao Stream, and near headwaters of Iao Stream.

Discuss issues of water quality, cultural and physical geography, and sustainable development on Maui in the field

Build databases of coordinates and water quality attributes and incorporate data into GIS

Discuss the use of geotechnologies in education

Map and analyze field data within GIS environment

Discuss ways to network in the future

Evaluations



Above, Diana Papini provides an overview of the institute. Participants included secondary school teachers of careers and technology, tourism and development, geography, and science, and other educational professionals from non-school settings, such as the water district and a coastal protection district. One teacher brought one of his students to the institute. We also had a professor from Hunter College and other visitors.



Part of the institute was held in the Maui Community College (in the building above), and the rest was held at four field sites using the Maui Digital Bus.



After several weeks of preparing data sets, we assembled about 50 layers for participants to examine, including soils (above), digital orthophotoquads, digital topographic maps, land use, tsunami heights, population, watersheds, streams, dams, schools, slopes, elevation, direction of slope (aspect), climate, vegetation, roads, fire protection districts, and much more. Although we could not examine all of the layers in two days, we provided each of the participants with a CD with the guiding questions, data, software, and documentation. We decided to use Arc Explorer Java Edition for Education (AEJEE) from ESRI as our GIS software.

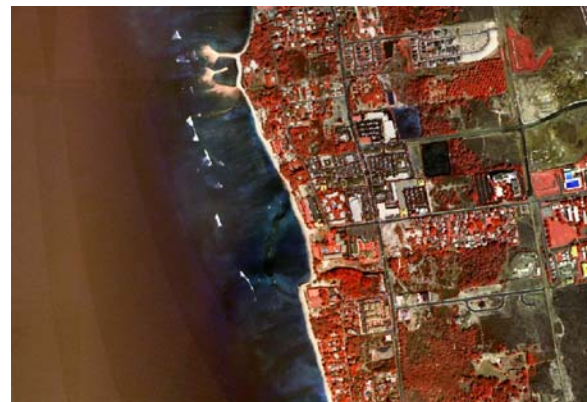


At the institute, we sought to model the geographic inquiry process of asking a geographic question, acquiring data,

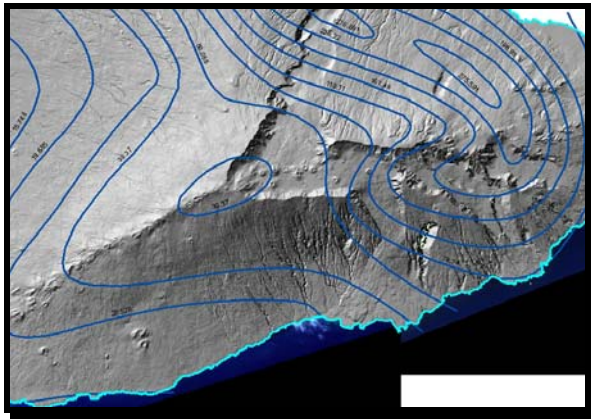
exploring data, analysis, conclusions, acting upon the new knowledge, and further questions. We tested pH, Dissolved Oxygen, temperature, and conductivity. The results of our analysis showed lower conductivity near the headwaters of lao Stream, higher pH, higher dissolved oxygen, and lower temperatures than near the mouth of the lao Stream.



Testing our field procedures at Site 1—Kahului Harbor. One person records the position with GPS, one person engages the Logger Pro software on the laptop to record the water quality information, one person holds the cables, and another person holds the probes in the water—a team effort!



We used digital orthophotoquads to analyze development and land use in coastal and inland areas of Maui.



Overlaying the spatial data was particularly effective in Hawaii because of the clear relationships between elevation, landforms, and rainfall (above), and other phenomena and features.



Angela Lee from ESRI works with a participant who is an education outreach professional with a water conservancy district on Maui.



Dr Jerry Berc, right, from the Natural Resources Conservation Service, explains how students can investigate soils on the landscape.



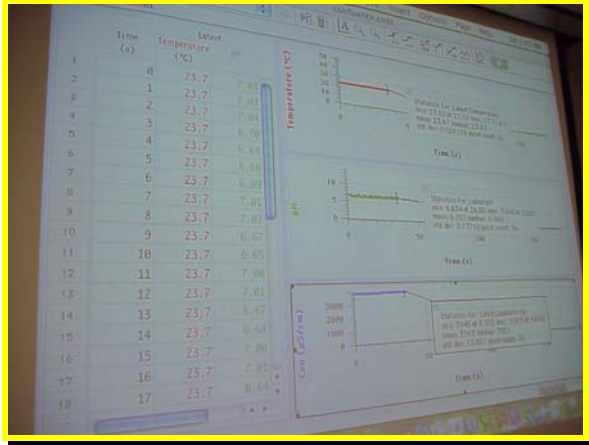
The mouth of Iao Stream as it flows into the Pacific Ocean on the north side of Wailuku. The stream's channelization affects water quality, runoff, and ocean marine life. The width of the channel gives some indication of the tremendous volume that this and other streams experience during significant precipitation events.



The computer lab we used at Maui Community College proved to be an excellent facility for our institute.



The institute participants certainly did not go away empty-handed. We provided a combination of materials from the USGS, ESRI, and AAG that included posters, guidelines, books, and maps about human and physical geography, GIS, GPS, geology, water resources, and much more.



I was very impressed with the Vernier Logger Pro software and water quality testing equipment. It had advanced quite a bit since the last time I had used it, and the software made porting the data easy to our GIS software. The software also greatly facilitated the understanding of water quality variables and relationships. We collected the dissolved oxygen using a tablet method.



Nikolas Schiller helps one of the institute participants. We appreciated Nikolas' help in preparing for the institute and during the institute.



After a discussion of GPS and its use in education, we collected a point outside the community college and discussed waypoints, routes, tracks, datums, and coordinate systems.



Nikolas Schiller (AAG) films the discussion and collection at the second site, the mouth of Iao Stream. Nikolas documented much of the institute in several different media formats.



Collecting water quality information at Kahului Harbor.



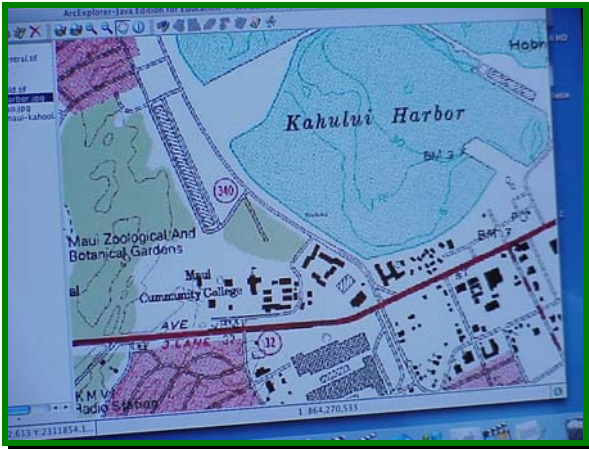
Testing water quality near the headwaters of Iao Stream.



At each site, there was discussion on the relationship of that site to the watershed, and the natural processes, land use, and human impact that affects the water quality of each.



This environment was obviously an ideal place to observe and discuss coastal processes such as degradation, erosion, siltation, fish habitat, and tsunamis.



Digital Raster Graphic (topographic map) showing the location of Maui Community College and our first field collection point in Kahului Harbor.



At the second site, we discussed how geotechnologies can be incorporated into social and cultural studies. Above, the foundation of ancient ceremonial buildings built by Native Hawaiians at site 2, the Halekii Pihana State Monument.



At the end of the institute, we discussed data sources, ways to connect to other educators using geotechnologies, and ways to connect to programs such as MyCOE, East, and GLOBE.

Acknowledgements

My heartfelt thanks for this successful institute first goes to the educators who participated in the event and brought their enthusiasm and ideas, making it so memorable. They are the real heroes. I also thank all of those who had an important role in making the event as well as our ongoing partnership happen: Diana Papini, John Fortson, Ellen Moshein, and Andy Vliet of Akimeka LLC, Angela Lee, Royce Jones, Carmelle Cote, and Charlie Fitzpatrick of ESRI, Inc, Nikolas Schiller and Patricia Solis of the AAG, and Ted Sheppard of the Office of Naval Research.

I thank Dr Patricia Solis and the AAG for paying for my travel and lodging to this event. I thank the USGS for their support of the time for my attendance at this event and to the local USGS staff including Sky Harrison and Derek Masaki for their support of education. I also appreciated the assistance from Chris Smith of NRCS, Teresa Kennedy from GLOBE, and Henry

Wolter of USGS. I also thank the faculty and staff of Maui Community College for being so supportive of our event, including the security, access to the lab, and software and hardware support. It was a sincere pleasure to work with everyone involved.

Recommendations

All of us involved with this and related educational efforts believe in the power of spatial technologies and spatial thinking. It empowers students to investigate the world using 3D fly-throughs, maps, images, and databases that are engaging and interesting to them. Many applications of geotechnologies exist in education—history, math, geography, environmental studies, careers, technology, tourism and development, earth science, biology, hydrology, and more.

This event emphasized interdisciplinary linkages between geography, technology, and science. It also emphasized examining real-world issues in standards-based education. I believe these themes can continue to transform education to help students to be the problem-solvers we need in our 21st Century society.

I believe that the AAG and other professional societies, Akimeka LLC, the Office of Naval Research, local and regional organizations, USGS, other federal and state agencies, local governments, and nonprofit organizations have a key role to play in preparing teachers and students to understand their community, region, and world. We can also help them to become lifelong learners so that they are taking their own initiative to spatial data and technologies. Our relationship with some of the MyCOE partners are some of the most fruitful of all of our educational relationships

and I will do all I can to ensure that it continues.

I believe that our involvement in education is one of our responsibilities as a federal public service agency. Education serves the needs of diversity, recruitment, and retention.

At this institute, I was able to use the Garmin Rino receivers for the first time. These GPS units have the capability to find the location of other units that colleagues are using in the field; a very useful feature. They also include a 2-way radio.

AEJEE was a useful tool for an educational workshop such as this. It works on Macintosh computers, is free, yet powerful. It is a new tool with some of the bugs still being worked out, but all in all, I was satisfied with the choice of this tool. The educators took to it very quickly.

This institute was a perfect example of what education should be all about. In addition, the institute is not just a one-time occurrence. Rather, Akimeka and all of us will continue to support these educators into the future.

I look forward to more educational projects with these partners.



Sunset at Kihei, Hawaii, 5 January 2005.

*** End of MyCOE January 2005 Report ***
