

different ethnic backgrounds, as well as with handicap-challenged and under-served students. ASTRO-Tucson is one of 13 sites nationally that have collectively reached over 100,000 students in the last 6 years.

The programs core element is the partnering of professional and amateur astronomers with K-12 teachers and community educators who want to enrich their astronomy and science teaching. The partnerships are extended through a training workshop, hands-on activities, effective educational materials, follow-up workshops, continued staff support, and connections to community resources. In turn, the interest generated by Project ASTRO has fostered new programs such as Family ASTRO (just begun in Tucson), which invites families to evening or weekend family events doing fun astronomy activities together. We will describe some of the lessons learned from the Project ASTRO and Family ASTRO programs in Tucson and discuss efforts to jump-start and localize a Project ASTRO-type program in Chile at Cerro Tololo Inter-American Observatory.  
URL: <http://www.noao.edu/education/noaoeco.html>

#### ED52B-0022 1330h POSTER

##### Science Education Using a Computer Model-Virtual Puget Sound

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We created an interactive learning environment based on an oceanographic computer model of Puget Sound-Virtual Puget Sound (VPS)-as an alternative to traditional teaching methods. Students immersed in this navigable 3-D virtual environment observed tidal movements and salinity changes, and performed tracer and buoyancy experiments. Scientific concepts were embedded in a goal-based scenario to locate a new sewage outfall in Puget Sound.

Traditional science teaching methods focus on distilled representations of agreed-upon knowledge removed from real-world context and scientific debate. Our strategy leverages students' natural interest in their environment, provides meaningful context and engages students in scientific debate and knowledge creation.

Results show that VPS provides a powerful learning environment, but highlights the need for research on how to most effectively represent concepts and organize interactions to support scientific inquiry and understanding. Research is also needed to ensure that new technologies and visualizations do not foster misconceptions, including the impression that the model represents reality rather than being a useful tool. In this presentation we review results from prior work with VPS and outline new work for a modeling partnership recently formed with funding from the National Ocean Partnership Program (NOPP).

#### ED52B-0023 1330h POSTER

##### Dive and Explore: An Interactive Exhibit That Simulates Making an ROV Dive to a Submarine Volcano, Hatfield Marine Science Visitor Center, Newport, Oregon

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We have created a new interactive exhibit in which the user can sit down and simulate that they are making a dive to the seafloor with the remotely operated vehicle (ROV) named ROPOS. The exhibit immerses

the user in an interactive experience that is naturally fun but also educational. This new public display is located at the Hatfield Marine Science Visitor Center in Newport, Oregon. The exhibit is designed to look like the real ROPOS control console and includes three video monitors, a PC, a DVD player, an overhead speaker, graphic panels, buttons, lights, dials, and a seat in front of a joystick. The dives are based on real seafloor settings at Axial seamount, an active submarine volcano on the Juan de Fuca Ridge (NE Pacific) that is also the location of a seafloor observatory called NeMO. The user can choose between 1 of 3 different dives sites in the caldera of Axial Volcano. Once a dive is chosen, then the user watches ROPOS being deployed and then arrives into a 3-D computer-generated seafloor environment that is based on the real world but is easier to visualize and navigate. Once on the bottom, the user is placed within a 360 degree panorama and can look in all directions by manipulating the joystick. By clicking on markers embedded in the scene, the user can then either move to other panorama locations via movies that travel through the 3-D virtual environment, or they can play video clips from actual ROPOS dives specifically related to that scene. Audio accompanying the video clips informs the user where they are going or what they are looking at. After the user is finished exploring the dive site they end the dive by leaving the bottom and watching the ROV being recovered onto the ship at the surface. The user can then choose a different dive or make the same dive again. Within the three simulated dives there are a total of 6 arrival and departure movies, 7 seafloor panoramas, 12 travel movies, and 23 ROPOS video clips. The exhibit software was created with Macromedia Director using Apple Quicktime and Quicktime VR. The exhibit is based on the NeMO Explorer web site (<http://www.pmel.noaa.gov/vents/nemo/explorer.html>).

#### ED52B-0024 1330h POSTER

##### The Rising Tide Project: Establishing a Sustainable and Desirable Tradition of Productive Interaction Between Researchers and Teachers

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With the support of an NSF Geoscience Education award, the Rising Tide Project was piloted during the summer of 2002 at Coastal Carolina University. The programs goal is to raise the level of scientific awareness and confidence on a local level by fostering collaboration between researchers, educators, and undergraduates. High school science teachers from surrounding counties work 120 hours during the summer with a university researcher and an undergraduate science major on a locally relevant marine science research project. Using the methodology and data from their experience, the teams design discovery- and inquiry-based activities for the teachers classrooms that emphasize hypothesis testing, data manipulation, and interpretation. After being tested in the classroom and revised, the web-based activities are posted on the South Carolina Aquariums educational web site. A series of built-in incentives attract faculty, teachers, and students into the program, and corporate sponsorship of teacher/student teams provides long-term sustainability. Due to the local emphasis and flexible scheduling, over 10% of the high school science teachers from surrounding counties applied for the program. Faculty researchers are attracted to the program because it enhances their research and teaching activities without imposing an unreasonable workload. Although designed for marine science programs in South Carolina, the Rising Tide model is adaptable to other disciplines and locations.

#### ED52B-0025 1330h POSTER

##### The PISCES Project: Bringing Graduate Students into Elementary School Classrooms

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The PISCES Project (Partnerships Involving the Scientific Community in Elementary Schools) is an NSF G-K12 funded initiative that is in its fourth year of funding. In the Project graduate students from San Diego State University, California State University San Marcos, and University of California San Diego partner with San Diego area elementary school teachers to immerse students in hands-on standards-based elementary science curriculum. The project has grown from 24 teachers representing 7 school districts and 10 Science Corps Fellows (graduate students), to over 100 teachers from 14 districts and 22 Fellows. During the second project year, Fellows interacted for over 10,000 hours with K-12 students. This close interaction, coupled

with high quality, ongoing professional development for teachers and intensive outreach efforts has resulted in increased student enthusiasm for science from K-6 students, an appreciation of the importance of high quality science education from Fellows, and improved commitment by teachers to utilize hands-on science materials.  
URL: <http://www.sdsu.org/pisces>

#### ED52B-0026 1330h POSTER

##### Teachers and Researchers Collaborate to Bring a Polar Field Experience to the K-12 Classroom

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Through a NSF sponsored program, Teachers Experiencing Antarctica and the Arctic (TEA), K-12 classroom teachers are linked with polar researchers to create science investigations in the classroom which model the real process of science. In addition, the teachers build on their research experience to work in their communities establishing a growing Polar Learning Community using engaging and innovative ways which underscore the relevance of polar science and our society.  
URL: <http://www.tea.rice.edu>

#### ED52C MCC: Hall C-TH Friday 1330h

##### Using Global Data Sets in a Local Context (joint with OS, S, T, GC, PA)

Presiding: C Manduca, Carleton Science Education Resource Center; D Mogk, Montana State University

#### ED52C-01 1330h

##### Drawing Connections Between Local and Global Observations: An Essential Element of Geoscience Education

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One of the hallmarks of geoscience research is the process of moving between observations and interpretations on local and global scales to develop an integrated understanding of Earth processes. Understanding this interplay is an important aspect of student geoscience learning which leads to an understanding of the fundamental principles of science and geoscience and of the connections between local natural phenomena or human activity and global processes. Several techniques that engage students in inquiry and discovery (as recommended in the National Science Education Standards, NRC 1996, Shaping the Future of Undergraduate Earth Science Education, AGU, 1997) hold promise for helping students make these connections. These include the development of global data sets from local observations (e.g. GLOBE); studying small scale or local phenomenon in the context of global models (e.g. carbon storage in local vegetation and its role in the carbon cycle); or an analysis of local environmental issues in a global context (e.g. a comparison of local flooding to flooding in other countries and analysis in the context of weather, geology and development patterns).

Research on learning suggests that data-rich activities linking the local and global have excellent potential for enhancing student learning because 1) students have already developed observations and interpretations of their local environment which can serve as a starting point for constructing new knowledge and 2) this context may motivate learning and develop understanding that can be transferred to other situations. (How People Learn, NRC, 2001). Faculty and teachers at two recent workshops confirm that projects that involve local or global data can engage students in learning by providing real world context, creating student ownership of the learning process, and developing scientific skills applicable to the complex problems that characterize modern science and society. Workshop participants called for increased dissemination of examples of effective practice, evaluation of the impact of data-rich activities on learning, and further

development of data access infrastructure and services. (for additional workshop results and discussion see [http://serc.carleton.edu/research\\_education/usingdata](http://serc.carleton.edu/research_education/usingdata))  
URL: [http://serc.carleton.edu/research\\_education/usingdata](http://serc.carleton.edu/research_education/usingdata)

## ED52C-02 1345h INVITED

### Making Global Climate Processes Accessible through the Integration of Data Visualization and Hands-On Activities

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While global data sets are increasingly available for use in education, *accessibility* is still a challenge. Since 1992, we have been engaged in a learning sciences research effort with the goal of making data visualization and analysis accessible to middle school through college students. As part of that research, we have developed WorldWatcher, a tool for visualization and analysis of gridded (raster) data. WorldWatcher couples the power of powerful tools used by scientists with the support required by students. While WorldWatcher makes data and analysis accessible to learners, understanding the underlying Earth systems processes is still a challenge. Therefore, we have developed curriculum units that provide students with inquiry experiences in which they conduct hands-on laboratory investigations to collect small-scale data on the same phenomena which they are able to visualize and analyze in the form of global-scale data sets. We will demonstrate WorldWatcher and present examples from a high school unit on Global Warming of activities that integrate global-scale data analysis investigations with local-scale hands-on investigations.

URL: <http://www.worldwatcher.northwestern.edu>

## ED52C-03 1400h

### Quantitative Literacy: Geosciences and Beyond

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Quantitative literacy seems like such a natural for the geosciences, right? The field has gone from its origin as a largely descriptive discipline to one where it is hard to imagine failing to bring a full range of mathematical tools to the solution of geological problems.

Although there are many definitions of quantitative literacy, we have proposed one that is analogous to the UNESCO definition of conventional literacy: "A quantitatively literate person is one who, with understanding, can both read and represent quantitative information arising in his or her everyday life." Central to this definition is the concept that a curriculum for quantitative literacy must go beyond the basic ability to "read and write" mathematics and develop conceptual understanding. It is also critical that a curriculum for quantitative literacy be engaged with a context, be it everyday life, humanities, geoscience or other sciences, business, engineering, or technology. Thus, our definition works both within and outside the sciences.

What role do geoscience faculty have in helping students become quantitatively literate? Is it our role, or that of the mathematicians? How does quantitative literacy vary between different scientific and engineering fields? Or between science and nonscience fields? We will argue that successful quantitative literacy curricula must be an across-the-curriculum responsibility.

We will share examples of how quantitative literacy can be developed within a geoscience curriculum, beginning with introductory classes for nonmajors (using the Mauna Loa CO<sub>2</sub> data set) through graduate courses in inverse theory (using singular value decomposition). We will highlight six approaches to across-the-curriculum efforts from national models: collaboration between mathematics and other faculty; gateway testing; intensive instructional support; workshops for nonmathematics faculty; quantitative reasoning requirement; and individual initiative by nonmathematics faculty.

## ED52C-04 1415h

### Dynamic Digital Maps: On-line Publication of Representative "Local" Geology in a Plate Tectonic Setting

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The use of Dynamic Digital Maps (DDMs) offers the geologic community a combination of attributes which allow the on-line publication of spatially related, highly quantitative data, to be set in a local or regional environment which lets both professional and students make inquiry based observations, and makes these data easily available for analyses. The DDM does this by displaying analytical data, images and movies from links at sample site locations on maps or images in a friendly user interface. Macintosh-only prototypes of two of these DDMs [Springerville Volcanic Field (DDM-SVF) and Tatara-San Pedro volcanic complex (DDM-TSP)] have been used in university petrology classes; the latter program has been converted to a template from which other DDMs can be made. This DDM.Template is presently being ported to a cross-platform web-enabled programming environment (MetaCard - Revolution). An example of a map produced in the process of creating this port, the DDM of New England (DDM-NE) includes six geologic field trips and the State Geologic Map of Massachusetts, and can be obtained from the URL <http://ddm.geo.umass.edu>. The use of these three maps allows what is essentially access to representative "local" geology in three global plate tectonic settings: a subduction zone (the Andes, DDM-TSP), a continental interior monogenetic volcanic field (DDM-SVF) and a failed rift valley (the Deerfield Basin within the DDM-NE). Because the DDM.Template provides locations for text and captions to be inserted for use at several user levels (e.g. the professional geologist, the beginning geoscientist, and the layman or perhaps middle-school student) the use of DDMs also provides a much needed outreach mechanism for the geosciences.

URL: <http://ddm.geo.umass.edu>

## ED52C-05 1430h

### Use of Global Topographic Datasets in Geomorphology Education and Undergraduate Research

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With the growth of the internet in the past few years, digital topographic datasets have become easily available. For undergraduate students in geomorphology courses and in research, these data provide opportunities in investigation and discovery that were previously unavailable. Data of different resolution emphasize features at different scales, and the concepts associated with them. Numerous three-dimensional visualization tools and techniques are available for viewing and interpreting the data. The ones that we rely on range from simple image software (The Gimp) to professional remote sensing software (ENVI).

ETOPO5 data at 5 arc-minute coverage provide a synoptic scale view of the earth's surface. In geomorphology class, the data were obtained from NOAA for the 10 degree by 10 degree region that includes Afghanistan. Students investigated the synoptic scale features of this large region by comparing the ETOPO5 data with the geological map of Afghanistan to understand the relationships between rocks of different ages and the system of ranges and basins, and the relationships of the topographic systems to the plate tectonic framework.

More detailed data from the global Shuttle Radar Topography Mission (SRTM) and Topographic SAR (TOPSAR) instruments are also available for certain regions at 1 arc second and 5-10 m postings, respectively. These data are used in class to investigate the features within range and basin systems that both cause and result from mountain building. In particular, TOPSAR data for California are used by the students to investigate fluvial, volcanic and aeolian landforms, and the causes of their formation in relationship to the mountain building of the Basin Ranges province.

Students seem to find use of these digital resources intriguing. Several have gone on to pursue undergraduate research relying on use of digital topography. Most recently, we are investigating the usefulness of SRTM and TOPSAR datasets in understanding the volcanotectonics of the Mono Basin, California. Our results indicate that TOPSAR data will be useful for interpreting deformed landforms, but that averaging is too extensive in the SRTM data to differentiate features at the appropriate scales.

URL: <http://www.volcano.buffalo.edu/course/312>

## ED52C-06 1445h

### From the Local to the Global: Integrating Fluvial Data Across Spatial and Temporal Scales

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Geomorphology students typically measure channel cross-section and discharge, often in the context of mapping a stream channel reach. Positioning these data, typically collected over a week or two, within larger spatial and temporal contexts presents interesting intellectual challenges. Spatially, discharges measured in the field may be compared with synchronous data involving smaller or larger watershed areas at gauged sites. This allows students to determine some of the spatial variations in runoff and baseflow within a larger watershed. Temporally, a single discharge measurement theoretically can be situated in the framework of static, steady-state, and dynamic equilibria (c.f. Ritter, Kochel and Miller, 1995, p. 7 and citations). It is not easy to assess whether the short-term stream study is taking place during a shift of the stream system dynamics, caused, for instance, by climate or land use change, or by Schumm's "complex response." Longer term data, such as discharge records, climate records, or sequential aerial photography and satellite data, may be used to evaluate these questions. For instance, discharge records for streams in southern Minnesota and western Wisconsin seem to show an increase in base flow readings since about 1970 (Knox, 2001) which may affect local stream morphology. Also, because students typically measure stream discharge at a narrow range of wadeable stages, their observations are seldom in synch with the high discharge periods when most geomorphic work is likely accomplished. By mapping, observing, and measuring streams, students acquire the detailed knowledge of a small system to compare with statements made in textbooks and research articles. Typically, they find that the local stream matches a textbook description only in some ways. The field work and multiple measurements by many student groups develop student confidence in their data. They can then incorporate textbooks and published research into their own developing understanding, a process typical of ways that students learn about global processes based on local evidence.

## ED52C-07 1520h

### Up to Our Knees in Inquiry: A Course for Pre-Service Teachers on Physical Science of the Earth System

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A novel science course targeting undergraduates planning to be elementary school teachers addresses the physical science principles behind important environmental phenomena observed on a variety of spatial and temporal scales. The course is inquiry-driven and data-rich, emphasizing skills in observation, data interpretation, and communication alongside conceptual understanding of key physical and Earth science concepts these future teachers will encounter in the K-5 curriculum. Students interpret the spectra of stars based on their laboratory observations of light, color, and atomic spectra, consider plate tectonics and the rock cycle in relation to field and lab observations of Rocky Mountain geology, and examine atmospheric and oceanic influences on climate through computer modeling, laboratory observations, local meteorological measurements, and online data sets. A field project focusing on a local stream or pond provides the opportunity to develop a research question, conduct field measurements, compare results to on-line regional data sources and global satellite data, and interpret findings within a broader systems perspective. The presentation will highlight selected links between local and global phenomena as studied through a rich array of classroom inquiry methods.

URL: <http://cires.colorado.edu/~k12/>

## ED52C-08 1535h

### The GLOBE Program: Use and Generation of Global Data Sets by K-12 Children

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Dixon M Butler (202-501-3200; dbutler@globe.gov)  
Through the GLOBE Program children are able to contribute to research quality data and our knowledge of planet Earth. In the process they engage in science education and gain a better understanding of their environment. The GLOBE infrastructure includes protocols, developed by scientists, that train children to take measurements of atmospheric parameters, soil characteristics, water quality and watershed behavior, the monitoring and changes of land cover from multi-spectral satellite images, and seasonal phenological changes. The data are integrated through web-based archives into Global Data Sets. GLOBE also provides web-accessible Global Reference Data Sets that allows the children to reference their local measurements to regional and global models of changing environmental conditions. Access to graphing, data management, statistical and visualization tools allow the children to manipulate the data and participate in active research projects. Students are encouraged and trained to synthesize the data to give a comprehensive understanding of the Earth as a System.

The data is used by collaborating scientists to conduct research, by students in their own environmental research projects, in local to regional environmental studies to help inform local communities, and as ground truthing for a number of satellite programs. Approximately 1,000,000 students from 12,000 schools in 98 countries have participated in the GLOBE Program.

URL: <http://www.globe.gov>

### ED52C-09 1550h

#### Modeling of the Tidal Section of a River System by Pre-College Students Using GIS and Field Data

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In July, 2002, a group of fourteen pre-college students conducted a three-day study of the tidal section of the groundwater-fed Nissequogue River system, which spans from the interior of Long Island to Long Island Sound. The students were participants in the Brentwood Honors Earth Science program, which offers rising tenth graders from the Brentwood, New York School District a four-week summer residential experience at Stony Brook University that engages them in inquiry-based studies of environmental geology. Pre- and post-tests assessed the projects effectiveness in fostering cognitive models of the system.

The initial day of the project involved using GIS datasets to formulate hypotheses about the relationships between the saline water brought in by the tides, a phenomenon the students understood in a global context, the flow of freshwater, the topography, and the biota present along the riverbanks and in the surrounding uplands. Datasets included aerial photographs, digital elevation models, and shapefiles representing the coastline, water table elevations, and roads. To enhance their cognitive maps of Long Island, the students were first asked to explore the aerial photographs and road datasets to locate their school and observe its relationship to the study area. Then they used the aerial photographs, digital elevation models and water table contours to propose models of the system that could predict patterns of flow direction, salinity, fauna, and flora along the river.

During a canoe trip on the second day, the students collected data on salinity, flow direction, fauna, and flora at five points along the tidal section of the river. They used printed aerial photographs to locate these data collection points. Salinity was measured with a hand-held refractometer, and fauna and flora were identified using an illustrated set of field guides to Long Island's natural environment.

On the final day, the students entered their data as a new theme and analyzed it to evaluate and refine their models of the system. Discussions and pre- and post-tests involving hand-drawn maps revealed that students learned that: 1) groundwater enters the river all along its course due to gravity, 2) salinity increases towards the mouth of the river due to mixing, 3) this salinity gradient migrates dynamically with the tides, 4) species distribution reflects salinity, and 5) flow direction reverses with tide in the tidal section of the river. However, they struggled to understand that peak velocity of the ebb tide exceeds that of the flood tide in the system.

### ED52C-10 1605h

#### EarthInquiry: Using On-Line Data to Help Students Explore Fundamental Concepts in Geoscience

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Using local case studies to learn about earth processes increases the relevance of science instruction. Students are encouraged to think about how geological processes affect their lives and experiences. Today, with many global data sets available on-line, instructors have unprecedented opportunities to bring local data into the classroom. However, while the resources are available, using on-line data presents a particular set of challenges. Access and entry to web sites frequently change and data format can be unpredictable. Often, instructors are faced with non-functional web sites on the day, or week, that they plan to assign a given activity.

The American Geological Institute, with the participation of numerous geoscience professors, has developed EarthInquiry, a series of activities that utilize the abundant real-time and archived geoscience data available on-line. These modules are developed primarily for introductory college students. EarthInquiry modules follow a structured format, beginning with familiar examples at the global and national level to introduce students to the on-line data and the EarthInquiry web site. The web site offers detailed and up-to-date instructions on how to access the data, cached copies of sample data that can be used to complete each activity in the event of a network outage, and an assessment activity that helps students determine how well they have achieved an understanding of key concepts. The EarthInquiry booklet contains a series of engaging questions that allow students to solve problems in a scientific manner. As students gain content understanding and confidence in the requisite analysis, they examine the presented material at a more local level. In one activity, students explore the recurrence interval of a local stream. In other activities, they investigate the mineral resources and earthquake histories of their state. All modules are developed with the intent of building an appropriate cognitive foundation, while complementing the topics typically discussed in an introductory physical or environmental geology course.

The project is a collaboration of the American Geological Institute and W.H. Freeman and Company Publishers.

URL: <http://www.earthinquiry.com>

### ED52C-11 1620h

#### EOSDIS: The Ultimate Earth Science Data Source for Research and Education

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Today, there is compelling scientific evidence that human activities have attained the magnitude of a geological force and are speeding up the rates of global changes. For example, carbon dioxide levels have risen 30 percent since the industrial revolution and about 40 percent of the world's land surface has been transformed by humans. To assemble long-term information needed to construct accurate computer models that will enable forecasting of the causes and effects of climate change, the use of space-based Earth observing platforms is the only feasible way. Consequently, NASA's Earth Observing System (EOS) has begun an international study of planet Earth that is comprised of three main components: 1) a series of satellites specially designed to study the complexities of global change; 2) an advanced computer network for processing, storing, and distributing data (EOS Data and Information System); and 3) teams of scientists all over the world who will study the data. Recent launches of Landsat 7 in April 15, 1999 to continue the flow of global change information to users worldwide, and Terra the EOS flagship in December 18, 1999 to monitor climate and environmental change on Earth over the next 15 years, has tremendously expanded the sources of valuable Earth science data for research and education. These data and others from focused campaigns, e.g., FIFE and BOREAS designed to study surface-atmospheric interactions will be presented.

### ED61A MCC: Hall D Saturday 0830h

#### Earth System Science Education Alliance: Inquiry-Based, Online Learning Communities Posters (joint with OS, V, PA)

**Presiding:** T Schwerin, Institute for Global Environmental Strategies (IGES); B Myers, Center for Educational Technologies (CET)

### ED61A-0008 0830h INVITED POSTER

#### ESSEA: Inquiry-Based, Online Learning Communities

Theresa G. Schwerin (1-703-312-0823; theresa\_schwerin@strategies.org)

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The Earth System Science Education Alliance (ESSEA) is a partnership between the Institute for Global Environmental Strategies (IGES) and the Center for Educational Technologies (CET) at Wheeling Jesuit University, through funding from NASA's Earth Science Enterprise. ESSEA is supporting universities, colleges, and science education organizations in offering Earth system science online graduate courses that have been developed within the CET at Wheeling Jesuit University.

ESSEA has created a national professional development program aimed at improving the knowledge, skills, and resources of Earth system science educators, offering state-of-the-art, rigorous, online courses to promote understanding of Earth system science.

The three available ESS courses use an innovative instructional design model and are delivered over the Internet - they feature student-centered, knowledge-building virtual communities, the optimal method for teaching and learning. Participants in these exciting professional development courses experience online, collaborative learning, while mastering new content that addresses National Education Science Standards; develop confidence in using technology; design new classroom activities; and identify new Earth system science resources.

The courses have been successfully implemented for both in-service and pre-service teacher education.

URL: <http://www.strategies.org>

### ED61A-0009 0830h INVITED POSTER

#### Problem-Based Learning and Earth System Science - The ESSEA High School Earth System Science Online Course

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The high school Earth system science course is web based and designed to meet the professional development needs of science teachers in grades 9-12. Three themes predominate this course: Earth system science (ESS) content, collaborative investigations, and problem-based learning (PBL) methodology. PBL uses real-world contexts for in-depth investigations of a subject matter. Participants predict the potential impacts of the selected event on Earth's spheres and the subsequent feedback and potential interactions that might result.

PBL activities start with an ill-structured problem that serves as a springboard to team engagement. These PBL scenarios contain real-world situations. Teams of learners conduct an Earth system science analysis of the event and make recommendations or offer solutions regarding the problem. The course design provides an electronic forum for conversations, debate, development, and application of ideas.

Samples of threaded discussions built around ESS thinking in science and PBL pedagogy will be presented.

URL: <http://www.cet.edu/essca>