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 multispectral 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

Glenn A Richard[1] ((631) 632-8336; Glenn.Richard@sunysb.edu)

Glenn Gordon Smith[2] ((631) 632-3241; Glenn.Smith@sunysb.edu)

Kathleen Flammer-Boccio[3] (kabocci@aol.com)

[1]Mineral Physics Institute, Earth and Space Sciences Building, Stony Brook University, Stony Brook, NY 11794, United States

[2]Department of Technology and Society, Harriman Hall, Stony Brook University, Stony Brook, NY 11794, United States

[3]Department of Geosciences, Earth and Space Sciences Building, Stony Brook University, Stony Brook, NY 11794, United States

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

Mary Jo Alfano[1] (1-703-379-2480; mja@agiweb.org)

Christopher M. Keane[1] (1-703-379-2480; keane@agiweb.org)

Robert W. Ridky[2] (1-703-648-4713; rridky@usgs.gov)

[1]American Geological Institute, 4220 King St., Alexandria, VA 22312, United States

[2]United States Geological Survey, 12201 Sunrise Valley Drive, Reston, VA 20192, United States

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 complimenting 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

Patrick A. Agbu[1] (301-867-2063; patrick_agbu@sesda.com)

Chai-Hsi Chang[1] (301-867-2059; chao-his_chang@sesda.com)

Frank E Corprew[1] (301-867-2058; corprew@killians.gsfc.nasa.gov)

[1]NASA EOSDIS/GST, 10210 Greenbelt Road, Suite 500, Lanham, MD 20706, United States

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)

The Institute for Global Environmental Strategies, 1600 Wilson Blvd., Suite 901, Arlington, VA 22209, United States

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

Robert Myers[1] (1-304-243-2368; bmyers@cet.edu)

James Botti[1] (1-304-243-4324; jbotti@cet.edu)

[1]Center for Educational Technologies, Wheeling Jesuit University, 316 Washington Avenue , Wheeling, WV 26003, United States

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/essea

ED61A-0010 0830h INVITED POSTER

Overview of the Earth System Science Education Alliance Online Courses

James Botti[1] (1-304-243-4324; jbotti@cet.edu)

Robert Myers[1] (1-304-243-2368; bmyers@cet.edu)

[1]Center for Educational Technologies, Wheeling Jesuit University, 316 Washington Avenue, Wheeling, WV 26003, United States

Science education reform has skyrocketed over the last decade in large part thanks to technology-and one technology in particular, the Internet. The World Wide Web has opened up dynamic new online communities of learners. It has allowed educators from around the world to share thoughts about Earth system science and reexamine the way science is taught.

A positive offshoot of this reform effort is the Earth System Science Education Alliance (ESSEA). This partnership among universities, colleges, and science education organizations is led by the Institute for Global Environmental Strategies and the Center for Educational Technologies^{tm} at Wheeling Jesuit University. ESSEA's mission is to improve Earth system science education.

ESSEA has developed three Earth system science courses for K-12 teachers. These online courses guide teachers into collaborative, student-centered science education experiences. Not only do these courses support teachers' professional development, they also help teachers implement Earth systems science content and age-appropriate pedagogical methods into their classrooms.

The ESSEA courses are open to elementary, middle school, and high school teachers. Each course lasts one semester. The courses begin with three weeks of introductory content. Then teachers develop content and pedagogical and technological knowledge in four three-week learning cycles.

The elementary school course focuses on basic Earth system interactions between land, life, air, and water. In week A of each learning cycle, teachers do earth system activities with their students. In week B teachers investigate aspects of the Earth system-for instance, the reason rocks change to soil, the relationship between rock weathering and soil nutrients, and the consequent development of biomes. In week C teachers develop classroom activities and share them online with other course participants.

The middle school course stresses the effects of real-world events-volcanic eruptions, hurricanes, rainforest destruction-on Earth's lithosphere, atmosphere, biosphere, and hydrosphere. Teachers team during week A of each cycle to research the effect of each event on individual spheres. In week B groups "jigsaw" to study the interactions between events, spheres, and positive and negative feedback loops. In week C teachers develop classroom activities.

The high school course uses problem-based learning to examine critical areas of global change, such as coral reef degradation, ozone depletion, and climate change.

The ESSEA presentation provides examples of learning environments from each of the three courses.

URL: http://www.cet.edu/essea

ED61A-0011 0830h INVITED POSTER

The Impact of the ESSEA On-Line Courses for Classroom Teachers on the Science Curricula in a Rural Ohio K-12 School District

William Slattery (1-937-775-3455; william.slattery@wright.edu)

Wright State University, Departments of Geological Sciences and Teacher Education 3640 Colonel Glenn Highway , Dayton, OH 45435, United States

In the last ten years Earth and Space science has become a critical element in the K-12 science curriculum in Ohio. It is now taught in every grade level from K-12 in Ohio and Earth and Space science questions form fully one-third of the science section of the Ohio Proficiency tests and new Ohio Graduation Test. However, Earth and Space science was not a required science topic in the pre-service educational preparation of most Ohio K-12 teachers. In addition, many K-12 teachers live in rural areas of the state far from professional development opportunities. Wright State University has teamed with one rural school district to deliver on-line Earth System science professional development to teachers and to assist in the development of a land laboratory on the school grounds that will be used by every grade level K-12 to explore Earth Systems science.

In the fall of 2001 the first Coldwater teachers took the Earth Systems Science Education Alliance (ESSEA) on-line course for Middle School teachers. In the Winter 2002 quarter, several others took the ESSEA on-line K-4 course. Both of these courses asked participants to develop K-12 classroom Earth Systems science activities. These activities were integrated into the new land lab curriculum. The effort to provide in-service professional development for teachers in this rural district is on-going. Seven more Coldwater middle school teachers are taking the on-line ESSEA course this fall, and five more elementary teachers will take the K-4 on-line course during the winter 2003 quarter.

Formative assessment of on-line course participants indicate that they have gained useful content knowledge, have a better understanding of inquiry-based science, and therefore feel more comfortable teaching science as a result of taking the ESSEA on-line courses. K-12 student assessments reflect an increase in both the affective and cognitive domains.

ED61A-0012 0830h POSTER

WestEd Eisenhower Regional Consortium: Helping to Build a Presence for Science With Online Professional Development Opportunities for K-12 Educators

Elizabeth Rognier (1-415-615-3214; lrognier@wested.org)

WestEd , 730 Harrison Street, San Francisco, CA 94107, United States

The WestEd Eisenhower Regional Consortium (WERC) is in its third year of offering two Earth Systems Science On-line Graduate courses from IGES - one for High School teachers, and one for Middle School teachers. These high-quality courses support WERC's commitment to "supporting increased scientific and mathematical literacy among our nation's youth through services and other support aimed at enhancing the efforts of those who provide K-12 science and mathematics education."

These courses also support our NSTA-sponsored "Building a Presence for Science" program in California, providing professional development opportunities to help achieve our vision of increased quantity and quality of science education statewide.

Our students have included classroom teachers from upper elementary through high school, community college science teachers, and environmental science center staff who provide inservice for teachers. Educators from Hawaii to New Jersey have provided diverse personal experiences of Earth Systems Science events, and add richness to the online discussions. Students have consistently embraced the concept of a systems-based approach to science instruction, commenting on how these courses have forever changed their teaching practices and provided a successful means for engaging and involving their students in scientific inquiry.

Through offering these online courses, we have learned valuable lessons about recruitment, retention, team-building, and facilitating discussions for classes with no "face to face" component. This format is both rich and challenging, with teammates from diverse geographic regions and timezones, with a variety of connectivity and accessibility issues. In this third year of offering the courses, we are pleased to have students taking their second course with us, wanting to continue learning content and stragtegies to improve their skills as science teachers.

ED61A-0013 0830h INVITED POSTER

RITES: Online (Reaching In-Service Teachers With Earth Sciences Online)

H. Prentice Baptiste (1-505-646-2616; baptiste@nmsu.edu)

New Mexico State University, College of Education, Curriculum and Instruction, Las Cruces, NM 88003, United States

The RITES: Online project team (Drs. H. Prentice Baptiste, Susan Brown, Jennifer Villa) believe that the power of technology could not be effectively utilized unless it is grounded in new models of teaching and learning based on a student centered and project based curriculum, that increases opportunities for active, hands-on learning and respect for multiculturalism. We subscribe to an inquiry approach to learning. Specifically, science teaching should actively engage the learners in activities that draw on multiple abilities and learning styles. Recent brain-based research has shown that human beings construct knowledge through actions and interactions within their environment. Learning occurs in communities, and new ideas are linked to previous knowledge and constructed by the learner. Knowledge is acquired by making connections. We believe the aforementioned ideas and points to be equally true for the inservice teachers participating in the RITES: Online project as well as for their students. The ESSEA science courses are delivered by distance learning via the university WebCt distance education system. Teachers are encouraged to use technology in their classrooms and to record their students' involvement in science activities with digital cameras.

Teachers involved in the ESSEA courses are engaged in earth science inquiry activities relevant to the four spheres (atmosphere, lithosphere, biosphere, hydrosphere) with the students in their classes. This presentation will highlight the teachers in the roles of designer, researcher, and collaborator.

As a result of our courses our teachers attain the following positive outcomes:

1) Teachers experience the inquiry approach to learning about the spheres of our earth.

2) Teachers become confident in using technology.

3) Teachers learn to work cooperatively in-groups and understand what their own students must feel.

4) Teachers find ways to obtain dynamic professional development and not leave their classrooms or homes.

5) Teachers develop relationships with other teachers that have an interest in teaching science and a learning community evolves.

ED61A-0014 0830h INVITED POSTER

ESSEA as an Enhancement to K-12 Earth Systems Science Efforts at San José State University

Paula Messina[1] (1-408-924-5027; pmessina@geosun.sjsu.edu)

Ellen P. Metzger[1] (1-408-924-5048; metzger@geosun.sjsu.edu)

Richard L. Sedlock[1] (1-408-924-5048; sedlock@geosun.sjsu.edu)

[1]San José State University, Department of Geology and Program in Science Education, San José, CA 95192-0102, United States

San José State Universitys Geology Department has implemented and maintained a two-fold approach to teacher education efforts. Both pre-service and in-service populations have been participants in a wide variety of content-area enrichment, training, and professional development endeavors.

Spearheading these initiatives is the Bay Area Earth Science Institute (BAESI); organized in 1990, this program has served more than 1,000 teachers in weekend- and summer-workshops, and field trips. It sustains a network of Bay Area teachers via its Website (http://www.baesi.org), newsletter, and allows teachers to borrow classroom-pertinent materials through the Earth Science Resource Center.

The Department has developed a course offering in Earth Systems Science (Geology 103), which targets pre-service teachers within SJSUs multiple-subject credential program. The curriculum satisfies California subject matter competency requirements in the geosciences, and infuses pedagogy into the syllabus. Course activities are intended for pre-service and in-service teachers adaptation in their own classrooms. The course has been enhanced by two SJSU-NASA collaborations (Project ALERT and the Sun-Earth Connection Education Forum), which have facilitated incorporation of NASA data, imagery, and curricular materials.

SJSU's M.A. in Natural Science, a combined effort of the Departments of Geology, Biology, and Program in Science Education, is designed to meet the multidisciplinary needs of single-subject credential science teachers by providing a flexible, individually-tailored curriculum that combines science course work with a science education project. Several BAESI teachers have extended their Earth science knowledge and teaching skills through such projects as field guides to local sites of geological interest; lab-based modules for teaching about earthquakes, rocks and minerals, water quality, and weather; and interactive online materials for students and teachers of science.

In keeping with SJSUs alliance with NASA Centers, the Geology Department is proud to offer ESSEA online courses as part of its multi-dimensional approach to Earth Systems teacher education. SJSU plans to offer both the middle- and high-school courses to a national audience, beginning spring 2003. The addition of ESSEA courses will complement existing projects, and will help to build a stronger Earth Systems-savvy community.

URL: http://www.baesi.org

ED61A-0015 0830h INVITED POSTER

Earth System Science Education: Hybrid Delivery for K-6 Teachers

Russanne Low (1-612-625-2505; rlow@cce.umn.edu)

University of Minnesota, 220 Pillsbury Hall, Minneapolis, MN 55455, United States

The University of Minnesota offers 3 sections of graduate-level Earth system science courses to in-service teachers annually. The Middle and High School educator course is offered as an on-line course, based on the Earth System Science Education Alliance curriculum developed by the Center for Educational Technologies and NASA. Elementary educator participation, however, is seriously compromised and curtailed by ever-growing demands by administrators for increased time allocation to reading and math, and the pace of the course was too fast for teachers to complete in light of their other responsibilities.

We have accommodated these logistical problems by designing a separate track for local elementary teachers. We solicit application from teacher-teams of 4 or more from local elementary schools, and provide each site with biweekly site visits from an instructor. The face-to-face meetings facilitate content learning, and

provide a forum where teachers can share ways that they incorporate literacy and math into their units - an important concern for their school and district. Scientists are also brought into the classroom as part of the for-credit course program, and teachers co-teach alongside a graduate student scientist.

URL: http://www.science.umn.edu

ED61A-0016 0830h INVITED POSTER

Distance Learning and Teachers: Experiences from the Earth System Science Education Alliance

Kevin P. Czajkowski[1] (419-530-4274; kczajko@utnet.utoledo.edu)

Alison Spongberg[1] (419-530-4091; aspongb@utnet.utoledo.edu)

Janet Struble[1] (419-530-4993; jstrubl2@pop3.utoledo.edu)

[1]University of Toledo, 2801 W. Bancroft St., Toledo, OH 43606

In response to the need to improve scientific literacy of teachers and K-12 students in Toledo and Ohio, the University of Toledo joined the Earth System Science Education Alliance to offer the 5-8th grade Earth Science course in the fall of 2001 and summer of 2002. The use of the Internet for the delivery of higher education courses has dramatically increased especially at the University of Toledo where over 6,000 students a semester take distance learning courses. Although distance learning has become an important medium for traditional undergraduate students who often have jobs, in-service teachers have been slow to sign up for distance learning courses even though they need Masters degrees to keep their licenses. Teachers are more likely to take lecture-based courses or summer seminars. In our presentation we will discuss our findings from pre and post course surveys and experiences from our two course offerings. We will relate technical difficulties encountered through the delivery of the course as well as the bureaucratic barriers that had to be overcome.

ED61A-0017 0830h INVITED POSTER

Capturing Earth Science Learning Dynamics: Communication Interactions of ESE Teachers and Children Occurring in Online, Classroom, and Small-Group Environments.

Conrad W. Snyder[1] (1-406-243-2289; conradwsnyder@aol.com)

Bonnie L. Prince[1] (1-740-593-3171; bonnielprince@aol.com)

[1]The University of Montana, Office of International Programs, Missoula, MT 59803, United States

While the processes of schooling in science are usually measured in the resulting skills and products that students acquire or generate, another way to understand science learning is to explore the interactions and discourse that occur during actual learning activities. To investigate the dynamics of inquiry-based learning of earth science, we have explored the patterns that emerge in several learning environments: when teachers create dialog with other teachers in online ESE courses; when they teach earth science lessons in their classrooms; when they discuss their teaching perspectives in interviews; and when small groups of children engage in learning earth science together. By observing and scoring lesson exchanges, preserving online discussions, and documenting words and interactions in audio or video recordings, we are able to distinguish communication configurations that occur when teachers and children engage in the learning of earth science that would otherwise be invisible.

ED61A-0018 0830h INVITED POSTER

Earth System Science Online at Hampton University

Dianne Robinson[1] (1-757-727-5869; dianne.robinson@hamptonu.edu)

Barbara Maggi[1] (1-757-727-5869; barbara.maggi@hamptonu.edu)

[1]Hampton University, Interdiciplinary Science Center, Hampton, VA 23668, United States

Earth System Science Online is an innovative web-based science course for teachers and future teachers. Supported by NASA and offered by the Interdisciplinary Science Center at Hampton University, this course targets students interested in an asynchronous web-based learning environment. Earth System Science Online allows participants to earn three hours of science graduate credit through their online explorations of the geosphere, hydrosphere, and atmosphere. The incorporation of specific problems-based case studies, allow students to investigate weather phenomena, deforestation, and the various instruments and satellite data systems that are used to collect and analyze this data.

This newly initiated web-based course delivers all lectures, text readings, and course assignments online. Assignments are given on a weekly basis, and participants are expected to conduct independent research that will enrich their online experience. The nature of the web allows registered participants to easily integrate text and graphics into their assignments and have access to their classmate's work. Participants meet online weekly and interact as a team. Team members take advantage of Hampton Universitys leadership in atmospheric sciences by meeting online to discuss course content with faculty and guest experts.

Hampton University, a Historically Black University (HBCU), has built a unique partnership between the scientists at the Center for Atmospheric Sciences and the educators at the Interdisciplinary Science Center. Both centers work closely together and partner with NASA to provide outreach efforts for several NASA satellite-based research missions. The ISC has been recognized for the quality of its professional development for teachers for over eighteen years. Earth System Science Online brings together a unique partnership of educators and scientists providing an innovative online course for teachers.

ED61A-0019 0830h POSTER

Online Student Learning and Earth System Processes

Robert M MacKay (360-693-8541; rmackay@clark.edu)

Clark College Physics and Meteorology, 1800 E McLoughlin Blvd, Vancouver, WA 98663, United States

Many students have difficulty understanding dynamical processes related to Earths climate system. This is particularly true in Earth System Science courses designed for non-majors. It is often tempting to gloss over these conceptually difficult topics and have students spend more study time learning factual information or ideas that require rather simple linear thought processes. Even when the professor is ambitious and tackles the more difficult ideas of system dynamics in such courses, they are typically greeted with frustration and limited success. However, an understanding of generic system concepts and processes is quite arguably an essential component of any quality liberal arts education.

We present online student-centered learning modules that are designed to help students explore different aspects of Earths climate system (see http://www.cs.clark.edu/mac/physlets/GlobalPollution/maintrace.htm for a sample activity). The JAVA based learning activities are designed to: be assessable to anyone with Web access; be self-paced, engaging, and hands-on; and make use of past results from science education research. Professors can use module activities to supplement lecture, as controlled-learning-lab activities, or as stand-alone homework assignments.

Acknowledgement This work was supported by NASA Office of Space Science contract NASW-98037, Atmospheric and Environmental Research Inc. of Lexington, MA., and Clark College.

ED61B MCC: Hall D Saturday 0830h

Digital Resources for Earth and Space Science Education Posters

Presiding: **S Stockman,** Science Systems and Applications, Inc.**; B Aivazian,** Natrona County School District

ED61B-0020 0830h POSTER

The Digital Library for Earth System Education: A Progress Report from the DLESE Program Center

Mary R. Marlino[1] (303-497-8350; marlino@ucar.edu)

Tamara R. Sumner[2] (303-492-2233; sumner@colorado.edu)

Karon K. Kelly[1] (303-497-2652; kkelly@ucar.edu)

Michael Wright[1] (303-497-8654; mwright@ucar.edu)

[1]University Corporation for Atmospheric Research DLESE Program Center (DPC), PO Box 3000, Boulder, CO 80307-3000, United States

[2]University of Colorado, Center for LifeLong Learning and Design Dept. of Computer Science, Boulder, CO 80309-0430, United States

DLESE is a community-owned and governed digital library offering easy access to high quality electronic resources about the Earth system at all educational levels. Currently in its third year of development and operation, DLESE resources are designed to support systemic educational reform, and include web-based teaching resources, tools, and services for the inclusion of data in classroom activities, as well as a virtual community center that supports community goals and growth. Community-owned and community-governed embody the singularity of DLESE through its unique participatory approach to both library building and governance.

DLESE is guided by policy development vested in the DLESE Steering Committee, and informed by Standing Committees centered on Collections, Services, Technology, and Users, and community working groups covering a wide variety of interest areas.

This presentation highlights both current and projected status of the library and opportunities for community engagement. It is specifically structured to engage community members in the design of the next version of the library release.

The current Version 1.0 of the library consists of a web-accessible graphical user interface connected to a database of catalogued educational resources (approximately 3000); a metadata framework enabling resource characterization; a cataloging tool allowing community cataloging and indexing of materials; a search and discovery system allowing browsing based on topic, grade level, and resource type, and permitting keyword and controlled vocabulary-based searches; and a portal website supporting library use, community action, and DLESE partnerships.

Future stages of library development will focus on enhanced community collaborative support; development of controlled vocabularies; collections building and community review systems; resource discovery integrating the National Science Education Standards and geography standards; Earth system science vocabulary; georeferenced discovery; and ultimately, AAAS Benchmarks. DLESE is being designed from the outset to support resource discovery across a diverse, federated network of holdings and collections, including the Alexandria Digital Library Earth Prototype (ADL/ADEPT), NASA education collections, the DLESE reviewed collection, and other community-held resources that have been cataloged and indexed as part of the overall DLESE collections.

ED61B-0021 0830h POSTER

Finding the Best Water Resources for the K-12 Classroom: A Preview of The Digital Water Education Library Project (DWEL)

Bryan L. Aivazian[1] (307-235-1536; bryana@trib.com)

Ed Geary[2] (970-491-1700; egeary@csmate.colostate.edu)

Tammy Sumner[3] (303-492-2233; sumner@colorado.edu)

Michael Khoo[4] (michael.khoo@colorado.edu)

Shirley Ireton[5] (301-924-3027; ireton@comcast.net)

[1]Natrona County School District, 1425 S. Ash, Casper, Wy 82601, United States

[2]CSMATE; Colorado State University, B301 NESB, Fort Collins, CO 80523-1802, United States

[3]University of Colorado - Boulder, Department of Computer Science; 430 UCB, Boulder, CO 80309-0430, United States

[4]University of Colorado - Boulder, Department of Communication; CB 270, Boulder, CO 80309, United States

[5]Independent Consultant, 16100 Chester Mill Terrace, Silver Spring, MD 20906, United States

DWEL is the first major collection building effort to bring high quality, K-12 resources into the Digital Library for Earth Systems Education (DLESE). Efforts are currently underway to provide teachers, students and informal educators with easy, searchable access to over 500 exemplary digital resources related to the science, policy and economics of water by the end of 2003. A discovery tool will allow users to search the library catalogue by content area, grade level, resource type and the national science standards to obtain the resources they desire. Part of this presentation will focus on how to access this tool and specific ways to use it more effectively.

URL: http://dwel.dlese.org