

Education and Human Resources

ED11A MCC: 3012 Monday 0800h

The Digital Library for Earth System Education: Opportunities for Collaboration I

Presiding: R Pandya, DLESE Program Center/University Corporation for Atmospheric Research; T Ledley, TERC

ED11A-01 0800h INVITED

DLESE - A New Kind of Science and Engineering Infrastructure for the 21st Century

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Recent reports to the National Science Board have highlighted the need for sustained and balanced investments in infrastructure, particularly cyberinfrastructure. DLESE is representative of an emerging area of infrastructure that will support NSF's mission to enable the Nation's future through discovery, learning and innovation. The DLESE enterprise is developing infrastructure that will help integrate the discovery, learning and innovation beyond the classroom. The recently released report *Facilities to Empower Geosciences Discovery, 2004-2008*, complements the GEO Science Plan, *NSF Geosciences Beyond 2000 - Understanding and Predicting Earth's Environment and Habitability (NSF 00-27)* and defines a framework for DLESE contribution. The report outlines several themes that are expected to dominate the development of research capabilities over the next five to ten years. These are: Improved Technology, Integration Across Disciplines, Continuing Exploration, The Access Revolution, Data Quality and Access, Observing Networks, and Interagency and International Coordination. The renewed emphasis at NSF on infrastructure and the potential contributions of DLESE will be discussed.

ED11A-02 0815h

New Directions for DLESE

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As in all long-range research and development initiatives, an evolving strategy of need and implementation has accompanied DLESE's given goals and accomplishments. From a project perspective, DLESE is at a stage of maturity where its focus can and should turn toward structured or designed selection of resources. The geosciences properly embrace earth system science as their research method of choice. Yet, instructionally, an effective earth system approach has been far more difficult to accomplish. Nowhere can DLESE's contribution be greater than in the earth system science arena. Because of an educational structure that trains principally within specialty areas and encourages continuing education largely through targeted professional affiliations, most instructors have little competence or confidence in teaching with an integrated approach. Quality instruction today, especially at the introductory level and within the highly integrated field of system science, requires a higher level of professional thought and collective contribution. It's not just a matter of having lots of good things to choose from, but rather a rational construct for why various activities modules or investigations are deserving of instructional implementation. What are indicators of quality of a submitted resource? What are the advance organizers that need to be established before using a submitted resource? What is known, or can be established by community users, about the effectiveness of a resource on various recognized styles of learning? It is in this critical curriculum development and utilization area that DLESE can make its next major contribution. An example of the value added contribution of DLESE is its USGS/San Francisco School System Pilot Program, an initiative that is aligning USGS resources to specific science standards.

ED11A-03 0830h

The National Science Digital Library: New Tools for Geoscience Education and Research

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Just as the Digital Library for Earth System Education (DLESE) serves as a catalyst for collaboration among its partner institutions and throughout the Geoscience community, DLESE is also a key partner in the broader collaborative efforts of the National Science Digital Library (NSDL). Established by the National Science Foundation to support continual improvement in science, technology, engineering, and mathematics education, NSDL provides an organized point of access to materials created by a broad range of collaborating partner institutions including universities, museums, professional organizations, government agencies, national research laboratories, and publishers of textbooks and journals. NSDL is a network of content and data-rich collections, educational resources, learning environments, and technology-based tools created to address the needs of educators and learners at all levels (K-12, higher education, and lifelong learning). This session will provide an overview of NSDL and explore the ways in which DLESE's active role in the NSDL community can facilitate collaborations with other Geoscience partners. Presenters will demonstrate online tools that can enhance cooperative learning and engagement with digital library resources. Funding opportunities for the development of future NSDL collections, services, and research will also be discussed.

URL: <http://nsdl.org>

ED11A-04 0845h

The Digital Library for Earth System Education (DLESE): Progress and Opportunities for Engagement

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The Digital Library for Earth System Education (DLESE) is a community-led, NSF-funded effort to promote access to high-quality digital resources for teaching and learning about the Earth. Now in its fourth year of development, DLESE is used by tens of thousands of educators and learners a month, and provides access to over 5000 educational resources. These resources include a variety of media formats, from text-based lesson plans to sophisticated tools for interactive three-dimensional visualization of authentic scientific data. In August of 2003, DLESE introduced Version 2.0 of the library. The new version features enhanced educational services including: the ability to search by National Science and Geography Standards, the ability to search over multiple, discrete collections, and annotation services that allow educators to evaluate resources and supply tips for their effective use. With version 2.0, DLESE can better provide services to support researchers through the entire cycle of their educational and outreach efforts. These services are of particular value to researchers when developing, disseminating, and evaluating educational materials in their efforts to meet the National Science Foundation's Criteria Two, for proposals. To support development efforts, we have published best-practices guides for developing resources; we actively broker relationships between the scientific community, instructional designers, and educational researchers; and we are leading efforts to integrate data into educational materials. The DLESE Evaluation Services offers broad support to a variety of research efforts. The DLESE Program Center provides technology integration and operational systems to support partnerships with the research community.

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

ED11A-05 0900h INVITED

DLESE Data Services - Facilitating Effective Use of Earth System Science Data in Education

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DLESE Data Services will work, in coordination with the other DLESE Core Service activities, toward DLESE's mission 'To improve the quality, quantity, and efficiency of teaching and learning about the Earth system' by facilitating the development and effective use of educational materials that make use of Earth system science datasets and data access and analysis tools. The currently planned major activities of DLESE Data Services are 1. To conduct a needs assessment for data and data analysis tools in the educational community 2. To identify existing educational modules utilizing data and data access and analysis tools for cataloging in DLESE 3. To organize and run DLESE Data Services Workshops in which we will bring together a wide range of Earth science data providers, developers of data access and analysis/exploration tools, with curriculum developers and educators to improve the use of Earth science data in education. Each of these activities and the benefits and opportunities they make available to the community will be described in more detail during the presentation.

URL: <http://www.dlese.org/people/info/dataservices.html>

ED11A-06 0915h

The DLESE Community Services Center

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The DLESE Community Services Center (DCSC) is one of several centers recently funded by the National Science Foundation to promote greater and more effective use of Digital Library resources. The primary goals of the DCSC are to: (1) increase the current resource user and contributor base to include greater numbers of K-12, informal, and college educators and students, (2) diversify the DLESE user and contributor base to include rich and robust representation of ethnic, cultural, and differently-abled groups, (3) improve the ability of users and contributors to easily find, adapt, and use high quality digital resources in their classrooms, laboratories, and communities and (4) demonstrate how DLESE can support community activity addressing issues in geoscience education. During the course of the next three years we will: (a) solicit, create, and disseminate "exemplars" that highlight effective digital resource use in a variety of diverse educational settings, (b) continue to support and promote on-line DLESE community services, and (c) work to develop a DLESE ambassadors outreach program involving educators, scientists, and students working across the Earth, space, and environmental sciences. Collaborations with the DLESE Evaluation and Data Centers, collection builders, the DLESE Program Center staff, as well as diverse audience groups will be a key focus of our efforts. We invite you to join us as we work to build and support the next generation of digital services and resources for educators and students at all levels.

ED11A-07 0930h

The DLESE Ambassadors Program

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The DLESE Ambassadors Program will leverage the experience and expertise of current Digital Library for Earth System Education (DLESE) users and provide important opportunities that promote DLESE to larger, more diverse communities. DLESE ambassadors will be comprised of small teams of practicing teachers (K-12, undergraduate, graduate, and informal educators), students, and researchers committed to facilitating effective DLESE use at local, regional, and national levels. Prior to serving as ambassadors, each DLESE Ambassador Program participant will attend a DLESE Ambassadors Institute. In addition to engaging in a series of orientation and training activities, the program participants will also receive outreach and instructional materials, as well as guidance and assistance in developing a strategic plan that is tailored to each team's target audience. The DLESE Ambassadors Program's coordinator and participants will work with the DLESE core services to facilitate the continued development and distribution of resources that support the implementation and adoption of DLESE into the classroom.

ED11A-08 0945h INVITED

The DLESE Evaluation Core Services Project

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The DLESE Evaluation Core Service project will conduct evaluation of DLESE and provide evaluation consultation, resources and services to the DLESE community. Through this work we anticipate that we will learn more about the impact and use of digital libraries, and will promote an evaluation mindset within the geoscience education community. Activities of the DLESE Evaluation Service team include 1) evaluation planning for and of DLESE, 2) conducting formative evaluation of DLESE (user needs, data access, collections, outreach), 3) conducting classroom evaluation of DLESE use on teaching practices and learning outcomes, and 4) collection, synthesis, and reporting of evaluation findings garnered from all core teams and major projects. Many opportunities for community involvement exist. A strand group convened during the 2004 DLESE Annual Meeting took DLESE Evaluation as their topic, provided recommendations and will continue their activities through the year. The related Evaluation Toolkit collection is now discoverable through DLESE, and upcoming activities of all the core teams will provide evaluation opportunities to be described. Other community opportunities include consulting with Evaluation Service for education grant proposals, attending an evaluation workshop, and applying for an Evaluation Minigrant (up to \$5K per award) Progress to date will be discussed, the Evaluation Core Services team members will be introduced, and plans and opportunities will be described in more detail.

ED11B MCC: Level 1 Monday 0830h

Promoting Undergraduate Education Through Involvement in Research Posters (joint with P, C)

Presiding: L A Reinen, Pomona College; K M Menking, Vassar College

ED11B-0100 0830h POSTER

Experiencing the Full Research Process at Sea Education Association (SEA)

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While some undergraduate research experiences include only a small piece of the research process, students attending Sea Education Association's SEA Semester complete all aspects of oceanographic research in an intensive 12 week program that earns a full semester's credit. In the first half of the program, students read and discuss background literature on a subject, ask questions, pose hypotheses, and develop a written research proposal, which they defend orally. The second half of the course takes place at sea on one of SEA's state-of-the-art oceanographic research vessels where students carry out their sampling plans, analyze samples and data, write a final paper and present their results before the vessel reaches port, completing the course. At sea, students participate in sample collection and analysis for all student projects in addition to learning the general oceanography along their cruise track. This structure exposes students to the realities of research from start to finish and allows them to take full ownership of their projects. In addition to honing writing, public speaking, and problem-solving skills, students learn that research requires dedication, flexibility, and creativity, particularly when their results are unexpected or negate their hypothesis. SEA's undergraduate research program has been developing since 1971. Over that time, SEA has collected an extensive historical oceanographic database in the western Atlantic and Caribbean, plus Pacific data since 2001. This database is available to both students and outside research scientists. Collaborations with scientists outside SEA enhance the student experience and help facilitate oceanographic research by providing "ship-of-opportunity" sampling in remote locations. SEA Semester provides an excellent model for undergraduate research experiences with over 5000 alumni, about 30% of whom enter graduate school. About half the students in SEA's undergraduate programs are non-science majors. Although their experience at SEA may be their only hands-on exposure to scientific research, they take away an understanding of the process and an ability to think critically about scientific problems.

URL: <http://www.sea.edu>

ED11B-0101 0830h POSTER

Integrating Undergraduate Research into the Curriculum: Approaches, Models, and Thoughts About What Works and What Doesn't Work

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Over the past decade, there has been an increasing awareness and interest in integrating research experiences into the undergraduate curriculum. A number of successful models are emerging and elements of these models are being adapted by departments and institutions to meet the needs of their students and reflect their teaching and learning environments. This presentation will focus on successful strategies and describe department and institutional approaches to broaden the participation of undergraduates in research. It will also provide an overview of the programs and opportunities available to students at Buffalo State College and attempt to identify those features that work, do not work, and why.

ED11B-0102 0830h POSTER

Promoting Undergraduate Research at Grand Valley State University

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Grand Valley State University (GVSU) is a relatively young, rapidly growing, predominately undergraduate institution of about 20,000 students located in western Michigan in which undergraduate research plays a vital role in the education of our students. Student research is supported and actively promoted by 1) creating university funding opportunities and taking advantage of small outside funding sources 2) building a tradition of undergraduate research 3) incorporating small research activities into classes and 4) educating students explicitly in how to prepare a professional poster, give a professional talk and write a journal article. As the saying goes, if you have money, the students will come. At GVSU most students recognize the value of a research experience but need income to pay for college expenses. The internally funded Student Summer Scholars program at GVSU provides student salary and faculty stipend for a summer research project (\$6000 per grant). The geology department has also been successful at obtaining grants from the NASA Michigan Space Grant Consortium (\$5,000

plus a 100% GVSU match). We have been successful in using these easier to obtain smaller grants to fund undergraduate projects. In some cases small grants actually allow us to pursue "risky" or otherwise difficult to fund projects. Undergraduate research "counts" at GVSU and once a tradition and critical mass of undergraduate research has been established, it can become self-sustaining. To recognize the achievements of undergraduate research at GVSU, there is an annual Student Scholarship Day in which the students (580 university wide) present the results of their research. Also, by persuading students in our introductory classes (for extra credit) to attend Student Scholarship Day, the students, early in their college career, can see what fellow students can accomplish and student presenters can revel in their role of researcher and educator. Such an event helps to build a tradition of undergraduate research. Students are more likely to tackle larger research projects if they have gained confidence and experience by successfully completing smaller research projects. Many upper level geology courses require that students complete a research project. Research projects can range from investigating the grain size variability of river sediment in sedimentology to analyzing a Superfund site in hydrogeology. The geology department is also committed to instructing all our majors in how to organize and communicate the results of their research. Students are required to complete a course in geology Information Literacy and a geology seminar course. The information literacy course instructs the students in how to search for articles, introduces common graphing and computing software and demonstrates how to design and produce a research poster. In seminar, the entire geology faculty participate and instruct and mentor the students as they prepare a research paper and professional talk. In conclusion, we have created a supportive undergraduate research atmosphere at GVSU by acquiring funding for their research, by training our students in how to conduct and present their research, and, perhaps most importantly, by celebrating their accomplishments.

ED11B-0103 0830h POSTER

Research and Research-Type Experiences Throughout an Undergraduate Liberal Arts Curriculum

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During the past several decades there has been a growing awareness of the educational benefits to students who participate in undergraduate research experiences. These benefits include, among others, increased communication skills, ability to work as part of a research team, and enhanced self-confidence in personal problem-solving skills. Several programs have been developed which provide summer research opportunities for undergraduates; however these programs must limit the number of students participating each year. In order for all of our students to reap the benefits of participating in research experiences, during the past eight years the Pomona College Geology Department has focused on developing a Community of Research for all members of our department which incorporate multiple research experiences into the geology curriculum. Students in geology courses at Pomona College participate in research and research-type experiences - including introductory-level and mid-tier courses through the required senior thesis. A central component of this research curricular "thread" is the mid-tier Research Methods course required of all geology majors. The research experience varies between courses and projects, but all share two elements which we find to be key to a successful experience: (1) The research results are unknown by both the student and the professor prior to the start of the project. The investigative nature of research is highlighted when students and professors are learning new results together. (2) Each student is responsible for deciding some important aspect of the project (e.g., defining the question to be addressed, the methods to be used, the area to be studied). This ownership helps students remain engaged in projects through difficult times and over long durations; the students thus become vested in the project results. In this session, we will present several examples of research projects and research-type experiences. The projects presented include a watershed investigation from an introductory-level course for majors and non-majors, a remote-sensing research project from a mid-level course for non-majors, both field-based research projects and investigations of planetary surfaces using satellite data from the Research Methods course, and senior theses.

URL: <http://www.geology.pomona.edu>