

Broadening DLESE
Outcomes of the 2003 DLESE Annual Meeting
Executive Summary
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Introduction

The 4th Annual DLESE meeting was held at the University of Colorado in Boulder, Colorado, August 3-5, 2003, with optional Skills Workshops on August 2, 2003. To address this theme of *Broadening DLESE*, the meeting was structured around four broad goals, roughly aligned with the newly established DLESE core services. These goals were

1. Broadening the User Base
2. Broadening Earth Science Data/Tools Development for Education
3. Broadening the DLESE Collection
4. Broadening Ties Between Research and Educational Practice/Evaluation and Assessment

The program was structured around strand groups whose purpose was to facilitate meeting participants working together to develop plans and solutions to issues that help broaden DLESE. Strand group topics reflected the interests of the DLESE community and the needs of DLESE as identified through a *Call for Interest* posted on the DLESE web site. Respondents suggested topics of interest they felt should be addressed by the DLESE community. This community input was used to define the 13 strand topics of the meeting.

Attendees were assigned to strand groups based on preferences indicated in the registration process. Strands were populated by a diverse group of participants including educators, curriculum developers, tool developers, evaluators, instructional designers, librarians, scientists, students, and software/library developers.

Each strand leader's role was to facilitate the work of the strand and move group efforts forward, by email prior to the meeting, by chairing the strand working sessions, and by facilitating follow-up activities after the meeting. The strands, strand leaders, and their affiliations are listed in Appendix 1. The discussions that occurred in the strand groups, as well as documents they created, resources they identified, and recommendations they made were recorded in an online report-out form (a Swiki). The information contained in the Swikis is available at <http://swiki.dlese.org/ReportOut2003/1>. In addition, each strand created a three-slide PowerPoint summary that included 1) the title and goal of the strand, 2) the major issues discussed, and 3) the recommendations and plans for future work. The individual strand PowerPoints are available on each of their Swiki pages (see Appendix 2). All of the strand PowerPoint summary slides can be found at <http://swiki.dlese.org/ReportOut2003/19> (scroll to bottom of page). A detailed summary of each of the strand's discussions and outcomes has been developed

from the content of the Swikis and is available at

http://www.dlese.org/documents/reports/meeting/AM2003/Outcomes_full.pdf

This executive summary of the outcomes from the 2003 DLESE Annual Meeting was developed from the Detailed Strand Summaries. An electronic version of this document can be found at

http://www.dlese.org/documents/reports/meeting/AM2003/Outcomes_execsum.pdf

Cross Cutting Issues and Recommendations

The *Individual Strand Goals, Discussions, Recommendations and Plans – Summaries* section below briefly summarizes these elements for each of the strand groups. However, in these summaries there are a number of recommendations and plans that cut across the topics of the individual strands. These represent needs that are broader than any particular topic, and if developed beyond this recommendation phase (it is recognized that some of these recommendations are in process or have already been implemented) could, through coordinated efforts, efficiently serve a broad spectrum of the DLESE community.

Governance: Three strands addressed diversity issues through the goals of Broadening the User Base and Broadening the DLESE Collection. Together they recommended the formation of a Standing Committee for Diversity to oversee the implementation of the recommendations of the strands with respect to diversity. A draft proposal for the formation of this standing committee is under development and will be presented to the Steering Committee for consideration.

It was also recommended that the governance of DLESE, within the Steering Committee, Standing Committees, and core services, reflect the diversity it recommends for the library.

Collaboration Finder: Five strands covering the use of data in education, collections development, and evaluation recommended that DLESE have a mechanism to facilitate community members identifying collaborators or experts from whom they could obtain specific information.

Best Practices/Toolkits: Many of the strands recommended a set of best practices or toolkits to facilitate outreach to new users, development of new resources, review of resources, evaluation, and the preparation of students for collaborative efforts. This was expressed by at least seven strands covering broadening of the user base, collection development, evaluation, and the integration of research and education.

Data: The three data strands made a number of recommendations concerning the use of data in education. These included: that there be a place in DLESE for unfinished and unreviewed material using data and datasets so that this material is easily available to resource developers; that this kind of resource be identifiable as such to the user to avoid confusion with other types of resources of the DLESE

collection; and finally, the strands recommended that metadata be developed specifically for data to make it more useful in educational contexts.

Quality and Review Criteria: The collections and evaluation strands made recommendations regarding the quality and review of resources. These revolved around providing feedback to collection builders to help improve their collections, informing resource developers of gaps in the library, assuring that the review policy be sensitive to diversity issues, applying educational research to guide the development of threshold criteria, review processes, and vocabularies of learning materials, and assuring that the community participate in a robust review process. Six of the strands made recommendations in this area.

Collaboration with core services: Many of the strands could see roles for the core services in moving their recommendations forward. Following are the recommendations articulated in the individual strand Swikis for collaborating with the core services. They do not represent a complete list of ways in which the core services can support the efforts of the DLESE community.

Community Services: Some of the roles seen for Community Services include 1) coordinating the DLESE Ambassadors Program, 2) engaging minority organizations, 3) developing exemplars with place-based resources and resources with data, and 4) facilitating student-teacher-scientist partnership efforts.

Evaluation Services: Some of the roles seen for Evaluation Services include 1) developing a baseline profile of the current DLESE user base; perhaps in collaboration with Community Services and the DLESE Program Center (DPC), 2) helping groups document the effectiveness of a resource in formal and informal contexts, and 3) developing tools and protocols for assessment of student-teacher-scientist partnerships and feedback.

Data Services: A couple of roles seen for Data Services were 1) facilitating the use of data in student-teacher-scientist partnerships, and 2) creating examples (or exemplars) of using data in learning (in collaboration with Community Services).

Collection Services: The articulated role for Collection Services was engaging developers for diverse communities (perhaps in collaboration with Community Services).

DLESE Program Center: The articulated role for the DLESE Program Center was to facilitate a bulletin board to post a calendar for the community.

It was also felt that all of the core services should consult with organizations that support diversity.

Strand Summaries

Following are brief summaries of the goals, discussions, recommendations and plans of each of the strand groups. Many of these groups developed documents,

spreadsheets, and itemized lists in support of the issues they discussed and strategized how to solve. Those items are available in the Detailed Strand Summaries, which can be found at: http://www.dlese.org/documents/reports/meeting/AM2003/Outcomes_full.pdf, and were derived from the strand Swikis, developed by the group during the meeting: <http://swiki.dlese.org/ReportOut2003/1>.

U1: DLESE Ambassadors Program

<http://swiki.dlese.org/ReportOut2003/22>

The strand identified three areas that need to be addressed for a successful DLESE Ambassadors Program. These included 1) identifying opportunities within DLESE that would move the program forward, 2) addressing issues of scalability and sustainability, and 3) defining the details of the operations of the program.

The strand began to address these areas by delineating specific activities that need to be accomplished, including 1) identifying the audiences of the DLESE Ambassadors; 2) identifying the areas in which market research would inform the development of the program; 3) developing strategic marketing that would make the program more visible; 4) developing the training structure of the Ambassadors; 5) creating an Ambassadors *bag of tricks* or resources that they would have available; and 6) identifying what library developments would support the DLESE Ambassadors Program.

The strand felt that the DLESE Ambassadors Program should be conducted through the DLESE core services and in particular, DLESE Community Services, and that through this mechanism a needs assessment should be developed and key contacts identified. They planned to move forward to develop a proposal for the DLESE Ambassadors Program, identify users with ambassador potential and provide feedback on advertising tools. In a first step to accomplish these goals the strand created a spread sheet entitled [DLESE Ambassadors Array.xls](http://swiki.dlese.org/ReportOut2003/uploads/22/DLESE_Ambassadors_Array.xls) (http://swiki.dlese.org/ReportOut2003/uploads/22/DLESE_Ambassadors_Array.xls) that identifies 1) the target audiences of the DLESE Ambassadors, 2) the needs of those audiences, 3) the message from DLESE to those audiences, 4) areas of collaboration with the core services, 5) characteristics of DLESE Ambassadors and 6) post-meeting action plan (see detailed strand summary).

U2: Develop Strategies for Including Diverse Communities in All Aspects of DLESE

<http://swiki.dlese.org/ReportOut2003/23>

The goal of this strand was to synthesize characteristics, accessibility, and resources related to diversity and to address the need to broaden the user group (educators, learners and developers).

The strand began their discussions by identifying descriptors of the broad issue of diversity. They then broke into three subgroups to address the issues of 1) Defining Diversity of DLESE Users; 2) Recommendations for Resources; and 3) Improving Access.

The Defining Diversity of DLESE Users subgroup identified a wide range of diverse communities that DLESE should address including those concerned with special needs; cultural and ethnic diversity, diverse teaching and learning, technical access, gender, age, socio-economic status, and geography.

The Recommendations for Resources subgroup recommended that DLESE contain resources which address the diversity of the learner and the diversity of the educator. This subgroup also recommended that DLESE have tutorials designed for each of the audiences, and have a compatibility/compliance indicator for users with special physical learning needs.

The Improving Access subgroup recognized that there are barriers making it difficult for some groups to access DLESE resources. They recommended the development of a comprehensive, fine-grained metadata structure for all DLESE resources to allow a wide range of users to better select the resources that are most useful for them. They then went on to identify different ways of improving access to DLESE to a wide range of communities including those identified by socio-economic level; computer literacy; geographic level (local, regional, global); physical disabilities; language; and culturally-based knowledge/heritage.

The strand's recommendations include: 1) formation of a Standing Committee for Diversity; 2) DLESE Evaluation Services to develop a baseline profile of the current DLESE user base and to examine those statistics annually to determine progress in addressing diversity; 3) DLESE Collection Services to engage developers from diverse communities to develop resources that address those communities needs; 4) DLESE Community Services to engage organizations such as the Hispanic Association of Colleges and Universities (HACU), Tribal Colleges and Universities, and Historically Black Colleges and Universities as a mechanism to increase users among these populations; and 5) DLESE should in each of its core services, PIs, and governance model the level of diversity it advocates in its collections and user base.

U3: Developing Place-Based (Local) Resources as Transferable Models

<http://swiki.dlese.org/ReportOut2003/24>

The goal of this strand was to provide frameworks for users to access and contribute to place-based learning.

The strand first focused on defining “place-based.” The consensus definition was: *A learner's intimate acquaintance with a local community defined by a geospatial location, including features above and below the surface, with boundaries that include physical, cultural, and other criteria.* However, there were many

opinions about the definition and alternatives were offered (see Detailed Strand Summaries).

The strand determined that there were four areas that needed to be discussed to work toward accomplishing the strand goal. These were 1) current and needed resources, 2) functionality to aid in place-based searches, 3) directions to move in the future including collaborations, prototypes, and geospatial interfaces, and 4) recommendations to DLESE.

The strand recommends that DLESE provide users with developed resources as examples of activities and models, and guidance on how to create a place-based activity. Exemplary place based materials must have content, pedagogy, and geospatial referencing that conform to DLESE standards. This may be an area where the DLESE Community Services' development of exemplars might be helpful. The strand identified specific needs to accomplish this goal revolving around metadata, cataloging, and search capabilities.

The strand's after-meeting plans included 1) reviewing geospatial and other search interfaces, 2) identifying partnerships with state surveys, museums, colleges, and others to identify resources to be cataloged, 3) identifying and obtaining exemplars of place-based Earth systems curricula as models, and 4) obtaining feedback from users.

D1: Using Data in the K-12 Classroom

<http://swiki.dlese.org/ReportOut2003/25>

The goal of this strand was to 1) identify what can be done to make DLESE data, tools, activities, and other materials easily useable in the K-12 classroom (Guidance for Developers of Data Learning Packages, <http://swiki.dlese.org/ReportOut2003/39>) and 2) identify the benefits and challenges of getting data into the classrooms, elucidate why this is important, and explore what is meant by "data" (Issues of Data, <http://swiki.dlese.org/ReportOut2003/40>).

The strand had some broad discussions on how to accomplish the goals and came to a wide range of recommendations. These centered around functionality and included 1) developing a means of posting student work, 2) developing a Services Bulletin Board for upcoming workshops, web casts, events, etc.—basically a calendar for the community, 3) developing a Coordination Bulletin Board for K-12 educators and developers so that they can support each others efforts, and 4) interfaces/lead-in pages for datasets.

The strand also had a wide range of action items for after the meeting. including 1) reviewing the *Earth Exploration Toolbook* (EET) and continuing conversation about the EET, 2) participating in the DLESE Ambassadors Program, 3) cataloging and reviewing data rich resources, 4) pilot programs—being involved

in teacher professional development, 5) promoting awareness of DLESE, and 6) promoting and being involved in evaluation.

The strand also suggested that data should be cataloged/indexed/documentated in ways that communicate what the data are, how they can be used, and why they are interesting/important; and that educators should be part of the development/review team.

D2: Using Data in the College/University Classroom<http://swiki.dlese.org/ReportOut2003/26>

This strand identified three goals. These included 1) making explicit the thinking of educators and resource developers and data providers via *concept maps* about the relationship between data and education for the purpose of providing guidance to the DLESE Data Services. A sub-goal was to consider the implications of concept maps for data labeling; 2) developing recommendations for resources that make a compelling case to undergraduate faculty for the use of data in the classroom; and 3) considering the spectrum of tools for teaching about uncertainty as a possible example for goal 1, or as a single example of pedagogical data strategies which may not ‘fall out of’ the concept map.

This strand addressed four major issues: . 1) the need for a repository in DLESE for unpolished material including data, illustrations/animations, modules, and activities, 2) concept maps and case studies describing the relationships between data-data services-education-learning as a tool for communicating between developers and faculty, 3) metadata, labeling, and contextual information that make data useful in college/university education, and 4) strategies for increasing use of data in undergraduate teaching.

There was a strong sense in the strand that there was a need for the DLESE collection to house unfinished and unreviewed material/tools/data/etc., but noted that these resources needed to be identified in this way. There was a suggestion that DLESE provide a “filter” to distinguish this type of resource from reviewed data resources.

The strand also suggested that there were a number of needs to consider in facilitating the use of data in the college/university classroom. These included 1) considering why we use data in the classroom and how to motivate faculty to do so, 2) a need for standard data access protocols that adhere to both data suppliers and analysis and visualization tools developers, and 3) a need for data metadata that is aligned with DLESE discovery metadata.

The strand felt there was a need for case studies and examples that use data for teaching and learning. They decided as a group to create concept maps that provide examples and case studies. During their sessions they created 13 concept maps, which are available on the Swiki (<http://swiki.dlese.org/ReportOut2003/26>)

and in the Detailed Strand Summaries. During the session they discussed each of these concept maps with the entire strand. This proved to be a very interesting exercise because it revealed that each participant's framework for thinking about this pathway was unique. Thus, when we talk about scientists, software developers, and faculty working together to make more data available in forms useful for teaching we have a wide spectrum of ideas as to what we are talking about. A wide range of perspectives was expressed during the discussions (see Detailed Strand Summaries). Once these perspectives are made explicit, it is much easier to understand why we have difficulty finding common ground for approaching issues of data access and use. The spectrum of ways in which we think about using data is so large that we are not all discussing the same thing.

The strand planned to 1) develop and use the *Using Data Portal* to facilitate the use of data in the college/university classroom, 2) partner with the DLESE Ambassadors Program, and 3) review and contribute to the *Earth Exploration Toolbook* and the *Starting Point* web sites.

D3: Integrating Digital Resources and Field Work and Developing a Transferable Model

<http://swiki.dlese.org/ReportOut2003/27>

The goals of this strand were to 1) review DLESE holdings to determine to what extent current holdings include sites that integrate field and digital data, 2) discover and disseminate quality resources that feature the integration of field and digital data, and 3) form a DLESE working group to address resources that support use of field and digital data in education.

The discussion revolved around 1) what current resources exist that aide the integration of digital resources with field work, and 2) what gaps exist in the DLESE holdings in regard to the needs of integrating field and digital data.

The strand developed guidelines for field data integration sites: *Guidelines for Developers of Digital Resources Relating to Field Data* (http://swiki.dlese.org/ReportOut2003/uploads/27/Guidelines_for_Developers.doc), and a scoring rubric (involving collection, use, sharing, analysis, and composing criteria) to evaluate the usefulness of a site in relation to the integration of field data (http://swiki.dlese.org/ReportOut2003/uploads/27/scoring_rubric.xls). The plans developed for after the meeting include 1) establishing a working group to focus on the integration of field work data in digital resources, 2) reviewing web sites and publishing findings in the *Journal of Geoscience Education* using the scoring rubric. The review article is expected to be published in 2004.

C1: Develop/Review Strategies for Collection Building: To Help Collection Builders

<http://swiki.dlese.org/ReportOut2003/28>

The goal of this strand was to broaden DLESE collection development by increasing the participation of collection builders.

Discussions revolved around the development of an extensive list of possible avenues to promote collection development. This led to the development of a graphic, *The Data Collection Life Cycle* (http://swiki.dlese.org/ReportOut2003/28/Collection_Development.ppt), which represents the different roles of community members who contribute to the development and operation of collections during the collection development lifecycle; and a document entitled *Strategies to Facilitate Partnerships Between DLESE and Non-digitized and/or Non-Interpretational Collections* (<http://swiki.dlese.org/ReportOut2003/45>). The strand also identified a wide range of resources that could support collection builders, which is available on the Swiki.

The strand developed a series of seven recommendations including 1) promoting DLESE to potential collection builders; 2) increasing the benefits and recognition of collection builders; 3) creating and integrating tools and services for collection builders; 4) finalizing current criteria guidelines for collection builders; 5) creating a “cookbook” to educate developers; 6) developing and encouraging feedback to improve the collection; and 7) facilitating partnerships between current and future DLESE community members.

The strand planned to develop some of these recommendations focused around 1) funding outreach and partnerships; 2) developing and integrating tools; and 3) creating a cookbook providing information on best practices, guidance documents, and testimonials, and providing methods of collaboration.

C2: Develop/Review Strategies for Collection Building: To Help Resource Developers

<http://swiki.dlese.org/ReportOut2003/29>

The goals of this strand were to 1) create a best practices design document for resource development, 2) develop a collaboration matching service, and 3) develop a mechanism for informing developers of resource needs.

The strand began a brainstorming session on what might help resource developers develop resources and collections more efficiently. They created a detailed list of issues that should be addressed, available in the Detailed Strand Summaries. The major issues discussed included 1) what do educators, resource developers, research scientists, and data providers need to know to develop high quality resources?, 2) how can we facilitate collaboration in support of resource development?, and 3) who is our audience and what are they looking for in DLESE?.

The strand then broke into three groups to begin to develop the documents and ideas that they felt were the most important. The topics addressed were 1) Best Practices for Resource Developers, 2) Collaboration, and 3) Informing Resource Developers of Gaps in the Library.

The Best Practices group developed a table (see Detailed Strand Summaries) for best practices that addresses Educational Materials, Tools, Data, and Visualizations, and Text, Video, and Audio, with respect to the following issues: a) getting started or square one, b) accuracy, c) pedagogy, d) documentation, e) ease of use, f) power to inspire and motivate, f) robustness and sustainability, and g) vocabulary. The group identified future plans that included a case study of lesson development, usability references, classification of content, and getting the Community Core Services involved. They suggested a workshop on Best Design Practices.

The Collaboration group developed a document entitled *Collaboration Matching* (see Detailed Strand Summaries) that proposes that DLESE institute a web service that allows community members to search for other DLESE community members with complementary skills who are willing to share their experiences. This document further describes what the service would be, why it is needed, who would have access to the service, where it would be located, and how it might be instituted.

The Informing Resource Developers of Gaps in the Library group suggested that a mechanism be instituted to inform resource developers of results in gap analyses. This might take the form of a “Ten Most Wanted” list. It was suggested that this be done in collaboration with Evaluation Services and Collection Services. The group planned to compile examples and describe the type of information that resource developers can use.

C3: Develop/Review Strategies to Build a Collection to Address the Needs of Diverse Communities

<http://swiki.dlese.org/ReportOut2003/30>

The goals of this strand were to 1) build collections for diverse communities that are inclusive of participants from diverse communities and 2) encourage development of collections/resources *by* members of diverse communities.

The strand discussed many avenues that should be pursued to increase materials for diverse communities. The avenues determined to be the most important included developing projects that stimulated participation among diverse audiences, involving diverse groups in the review and assessment process of resources, facilitating access to the DLESE collection by diverse audiences, and identifying gaps in the collection in terms of audience characteristics, as well as scientific or process-oriented content.

In order to address the issues raised the strand recommended the formation of a DLESE Standing Committee on Diversity that is embedded into all the core services and policy or decision making entities. This committee would then oversee the implementation of the strand recommendations. These recommendations are 1) implement a mechanism to identify resources/collections that take a project-based approach, 2) insure that the collections review policy be sensitive to diversity issues, 3) insure that cataloged resources account for ranges in levels of available technology, technological competency, and are searchable by types of accessibility characteristics, 4) help the core services consult with organizations that support diversity, and 5) educate developers about diversity issues.

The strand also developed plans for moving their recommendations forward. These plans include 1) making a recommendation to the DLESE Steering Committee on behalf of diversity consideration regarding metadata and cataloging during the collections accessioning process, 2) identifying existing or new resources that can be used collaboratively, 3) identifying additional parameters for search capabilities that would contribute to increased accessibility, 4) applying for a planning grant from DLESE Evaluation Services to design an instrument that could be used in identifying effective resources, and to help identify the types of resources that are needed and are or would be used by different audiences, 5) identifying potential exemplars that can be used to engage underserved communities, and 6) providing assistance to DLESE support efforts to increase accessibility.

C4: Promoting Collection Quality: Reviewing the Review Systems from the Users Point of View

<http://swiki.dlese.org/ReportOut2003/31>

The goal of this strand was to identify content review systems and processes that work and that our communities accept, and to recommend the best ways to incorporate resources that have passed through those systems and processes into the DLESE reviewed and broad collections.

Strand discussions ranged over a broad range of topics and then developed a number of recommendations. These include 1) pursuing a proposal with NAGT to bring the Journal of Geoscience Education (JGE) online electronically as a reviewed collection, 2) continuing the development of the Community Review System and a pilot study extending teaching tips to the broad collection (Note: Teaching tips for all resources have been implemented.), 3) revisiting academic recognition issues and offering suggestions on how to highlight and give credit for collections, 4) finalizing the Best Practices document, 5) bringing the revised and more detailed Collection Quality Workshop recommendations to the Steering Committee (Note: this has been done as of the March 2004 Steering Committee meeting), 6) incorporating Metadata Workshop results into DLESE, 7) holding a workshop for collection developers to define scope statements, best practices, and priorities, 8) making connections between NSDL and DLESE with concept mapping, and 9) recommending more robust Collection Core Services activities with funded partners.

The strand also made specific recommendations to the DLESE core services. These recommendations included 1) targeted gathering to smooth out the library, 2) different handling of public and private comments, 3) professional and academic recognition for contributions, 4) developing exemplars for controversial or developmental topics, 5) creating quality criteria for data sites by DLESE Data Services, and 6) improving the articulation of the term “Earth System Education.”

E1: A Successful DLESE: What Does It Look Like and How Do We Evaluate It?

<http://swiki.dlese.org/ReportOut2003/32>

This strand focused on determining goals for DLESE success because evaluation cannot be done without identifying goals. In order to accomplish this goal the strand followed a four-step process, involving 1) brainstorming through scenario development, 2) analysis of scenarios, 3) developing statements describing what a successful DLESE looks like, and 4) talking about evidence and how it is discovered.

For the brainstorming session the strand broke into four discussion groups. These groups identified features of a successful DLESE. This led to the strand identifying nine objectives that describe DLESE as a successful organization and

resource. They also developed a set of evaluation questions as issues raised for sets of objectives.

The nine objectives for a successful DLESE include 1) support for teachers and scientists in how to use DLESE resources effectively, 2) being proactive in helping people meet their specific needs by creating mechanisms that support use of the library, 3) serving as a relationship broker, 4) being able to influence Earth science agencies (NIH, NOAA, NASA, USGS) to help them provide better value to the educational community for services they already offer, 5) influencing states' K-12 high-stakes testing policy makers in standards development, 6) significantly contributing to making Earth system science a component of science literacy, 7) supporting critical thinking by presenting issues which have in the past or present been debated from multiple perspectives, 8) being perceived as having resources that reflect scientifically accurate content and presenting educational best practices representing a spirit of scientific inquiry, and 9) maintaining a robust, participatory review system representing multiple perspectives.

The strand developed evaluation questions for these objectives. See the Detailed Strand Summaries to find the complete objectives and the evaluation questions.

The strand's plans for after the meeting included 1) writing a case scenario about successful use in classroom instruction, 2) exploring ways to distribute evaluation capacity, 3) analyzing alignment of the set of goals developed during the meeting with the existing plan, and 4) recommending determination of what DLESE can do to influence state policy makers concerning standards and testing.

E2: What Can 25 Years of Educational Research Tell DLESE?

<http://swiki.dlese.org/ReportOut2003/33>

The goal of this strand was to identify ways to apply educational research to improve the quality of collections and assessment. The strand identified five main strategies to address the goal. These included 1) raising the level of understanding of teaching and learning in our community (informal and formal communities), 2) applying what we know about teaching and learning to resource development, 3) determining how to document effectiveness of a resource in formal and informal educational contexts, 4) applying educational research to guide development of threshold criteria, review processes, and descriptive vocabulary of the learning materials in the Broad and Reviewed collections, and 5) advancing and incorporating understanding of learning with visualizations into the resources of DLESE.

Each issue was broken down into specific subgoals, research questions, and action items to achieve the goal. The action items include 1) creating an *education research* resource type and associated vocabulary in the library, 2) providing a simple feedback mechanism to facilitate communication between users and developers of educational resources, 3) developing an education research-oriented

vocabulary for characterizing resources, 4) developing a targeted list of DLESE research questions on spatial visualizations, and 5) developing a best practices catalog to improve teaching and student skills with respect to multi-dimensional visualizations. The strand also examined and concurred with the recommendation of the Collections Quality Workshop for criteria for the Broad Collection.

The strand also broke into several working groups. One group addressed “Raising the Level of Understanding of Best Practices in Teaching and Learning for Formal/Informal Communities.” They developed two action items: 1) creating an *Educational Research Toolkit* for formal and informal instructors of Earth system science, and 2) developing a conceptual model of an idealized 3-D framework in which the axes represent a) cognitive development of the learner (age), b) level of understanding of the instructor, and c) content areas.

The second working group addressed “Developers Information on Pedagogy.” The associated action items included a) seeking funding to create a *developers pedagogical toolkit* which would be an instructional design primer containing pedagogical strategies for different audiences, b) developing an expanded glossary for pedagogy in the library metadata, c) conducting a workshop in the spring of 2004 for a small set of researchers, content and service developers, and science educators to examine research needs, best practices, and the pedagogical needs of the community, and d) developing guidelines for including core learning goals and ways how to influence/impact the daily experiences of citizens in resources.

The post-meeting plans incorporated many of the action items stated above. They included 1) creating an *education research* resource type and associated vocabulary in the library, 2) developing guidelines for adding core learning goals to resources, 3) creating pedagogical toolkits and workshops for developers and users including a glossary for pedagogy and a best practices catalog to improve teaching and student skills (e.g. visualization), 4) linking the resource development-pedagogical toolkit to the *Evaluation Toolkit* to provide examples for developers, evaluators. and educators, 5) developing a list of education research questions related to Earth system science education (e.g. spatial reasoning, mental models), and 6) providing a simple feedback mechanism to facilitate communication between users and developers of educational resources

E3: Student-Teacher-Scientist Partnerships: Bringing Research to Students and Educators

<http://swiki.dlese.org/ReportOut2003/34>

The goals of this strand were 1) to foster opportunities for research and education partnerships, 2) to broker the student-teacher-scientist (STS) partner relationship, 3) to facilitate the implementation of the STS partnership relationships, and 4) to promote the availability of DLESE resources for STS partnerships to the education and research communities.

The strand went on to develop objectives to address each of these goals (see Detailed Strand Summaries) and then activities that would help address those objectives. These activities include 1) developing tools/protocols for creating personalized user pages, 2) facilitating communication between educators and scientists, 3) developing resources that prepare partners for participating effectively in the partnership, 4) developing resources that provide a workshop for the collaboration, 5) developing a collection of online resources related to STS partnerships, 6) developing tools/protocols for partnership assessment and feedback, 7) developing formal partnerships with large research programs, and 8) promoting DLESE STS partnership resources to educators and scientists.

Given the nature of student-teacher-scientist partnerships the strand also felt that this group could collaborate with a number of other strands. Collaboration with the DLESE Ambassadors and Place-Based Resources strands would help in getting the word out to teachers who don't attend national conferences and workshops. Resource Developers and Earth Science Data Tools strands as well as the Student-Teacher-Scientist Partnership strand would benefit from a personalized "My DLESE." The Promoting Quality and Successful DLESE strands could help in addressing the expansion of assessment and evaluation and feedback of the program and use of DLESE resources. Collaboration with the Diversity strands could help facilitate development of virtual research experiences, which could be valuable in reaching and enhancing the science inquiry experience of resource-limited school systems that are often minority-serving programs. There is a natural collaboration that can be developed with the Data strands and Digital Resources and Field Work strands.

Plans for after the meeting include 1) continuing strand member dialog, 2) establishing a www.dlese.org/STSP/ strand web page, 3) encouraging development of DLESE STSP-related tools, and 4) promoting DLESE everywhere (both to scientists and teachers.)

Follow-on recommendation: Form a DLESE Student-Teacher-Scientist Partnership Committee or working group to facilitate group interactions.

Appendix 1
Broadening DLESE
 2003 Annual Meeting Strands and Strand Leaders

2003 DLESE Annual Meeting Strands		
CODE	STRAND	STRAND LEADERS
U1	DLESE Ambassadors Program (<i>User Base</i>)	Ashanti Pyrtle University of South Florida
U2	Develop Strategies for Including Diverse Communities in All Aspects of DLESE (<i>User Base</i>)	Vivian Williamson University of St. Thomas
U3	Developing Place Based (Local) Resources As Transferable Models (<i>User Base</i>)	Stuart Birnbaum, University of Texas at San Antonio
D1	Using Data in the K-12 Classroom (<i>Data</i>)	John Moore, Burlington County Institute of Technology
D2	Using Data in the College/University Classroom (<i>Data</i>)	Cathy Manduca Carleton College
D3	Integrating Digital Resources and Field Work and Developing a Transferable Template (<i>Data</i>)	Mark Francek Central Michigan University
C1	Develop/Review Strategies for Collection Building: To Help Collection Builders (<i>Collections</i>)	Robert R. Downs CIESIN, Columbia University
C2	Develop/Review Strategies for Collection Building: To Help Resource Developers (<i>Collections</i>)	LuAnn Dahlman TERC
C3	Develop/Review Strategies to Build a Collection to Address the Needs of Diverse Communities (<i>Collections</i>)	Shermane Austin Medgar Evers College
C4	Promoting Collection Quality: Reviewing the Review Systems from the Users Point of View (<i>Collections</i>)	Martin Ruzek Universities Space Research Association (USRA)
E1	A Successful DLESE: What Does It Look Like and How Do We Evaluate It? (<i>Evaluation</i>)	Tom Reeves, University of Georgia Lecia Barker, University of Colorado
E2	What Can 25 Years of Educational Research Tell DLESE? (<i>Evaluation</i>)	Michelle Hall-Wallace University of Arizona
E3	Student-Teacher-Scientist Partnerships—Bringing Scientific Research to Students and Educators (<i>Evaluation</i>)	Missy Holzer, NJ Earth Science Teachers Assoc & Chatham High School, New Jersey

Appendix 2
Broadening DLESE
Online Information Related to Strand Activities

Each strand had available a listserv to communicate with the members of the strand, a listserv archive which archived all emails sent to the listserv, and a Swiki into which the members of the strand recorded their discussions during the meeting, and recorded resources that they had identified or created, or used for post-meeting follow-up activities. In addition, the strand leaders as a group had a listserv and listserv archive. Following are the listserv email addresses, the URLs for the archives and Swikis for each strand, and the listserv and listserv archive for the strand leaders.

DLESE 2003 Annual Meeting Swiki
<http://swiki.dlese.org/ReportOut2003/1>

Strand Leaders Listserv, and Listserv Archive
strands03@dlese.org
<http://www.dlese.org/MailingLists/archives/html/strands03/index.html>

U1: DLESE Ambassadors Program
am-ambassadors@dpc.ucar.edu
<http://www.dlese.org/MailingLists/archives/html/am-ambassadors/index.html>
<http://swiki.dlese.org/ReportOut2003/22>

U2: Develop Strategies for Including Diverse Communities in All Aspects of DLESE
am-diversity@dpc.ucar.edu
<http://www.dlese.org/MailingLists/archives/html/am-diversity/index.html>
<http://swiki.dlese.org/ReportOut2003/23>

U3: Developing Place Based (Local) Resources as Transferable Models
am-placebased@dpc.ucar.edu,
<http://www.dlese.org/MailingLists/archives/html/am-placebased/index.html>
<http://swiki.dlese.org/ReportOut2003/24>

D1: Using Data in the K-12 Classroom
Am-k12data@dpc.ucar.edu
<http://www.dlese.org/MailingLists/archives/html/am-k12data/index.html>
<http://swiki.dlese.org/ReportOut2003/25>

D2: Using Data in the College/University Classroom
am-universitydata@dpc.ucar.edu
<http://www.dlese.org/MailingLists/archives/html/am-universitydata/index.html>
<http://swiki.dlese.org/ReportOut2003/26>

D3: Integrating Digital Resources and Field Work and Developing a Transferable Model

Am-fieldwork@dpc.ucar.edu

<http://www.dlese.org/MailingLists/archives/html/am-fieldwork/index.html>

<http://swiki.dlese.org/ReportOut2003/27>

C1: Develop/Review Strategies for Collection Building: To Help Collection Builders

am-collectionbuilders@dpc.ucar.edu

<http://www.dlese.org/MailingLists/archives/html/am-collectionbuilders/index.html>

<http://swiki.dlese.org/ReportOut2003/28>

C2: Develop/Review Strategies for Collection Building: To Help Resource Developers

am-resdevelopers@dpc.ucar.edu

<http://www.dlese.org/MailingLists/archives/html/am-resdevelopers/index.html>

<http://swiki.dlese.org/ReportOut2003/29>

C3: Develop/Review Strategies to Build a Collection to Address the Needs of Diverse Communities

am-divcommunities@dpc.ucar.edu

<http://www.dlese.org/MailingLists/archives/html/am-divcommunities/index.html>

<http://swiki.dlese.org/ReportOut2003/30>

C4: Promoting Collection Quality: Reviewing the Review Systems from the Users Point of View

am-promotequality@dpc.ucar.edu

<http://www.dlese.org/MailingLists/archives/html/am-promotequality/index.html>

<http://swiki.dlese.org/ReportOut2003/31>

E1: A Successful DLESE: What Does It Look Like and How Do We Evaluate It?

am-successfuldlese@dpc.ucar.edu

<http://www.dlese.org/MailingLists/archives/html/am-successfuldlese/index.html>

<http://swiki.dlese.org/ReportOut2003/32>

E2: What Can 25 Years of Educational Research Tell DLESE?

am-25years@dpc.ucar.edu

<http://www.dlese.org/MailingLists/archives/html/am-25years/index.html>

<http://swiki.dlese.org/ReportOut2003/33>

E3: Student-Teacher-Scientist Partnerships: Bringing Research to Students and Educators

am-partnerships@dpc.ucar.edu

<http://www.dlese.org/MailingLists/archives/html/am-partnerships/index.html>

<http://swiki.dlese.org/ReportOut2003/34>