

The Physical Sciences Resource Center Vision Paper

Background

In February 1997, AAPT's Electronic Services Advisory Group (ESAG) met at the American Center for Physics to discuss enhancing electronic services provided by AAPT. As a result of the Campaign for Physics, funds were available to fund a resource center for physics teachers and the advisory group decided that this should be a web-based, virtual resource center where educators could access materials in electronic form, rather than a physical resource center with books and other non-electronic materials. There was a great deal of discussion about what material should be included in the center, how the material should be evaluated, and who would decide what material should be included. Warren Hein, the new AAPT Associate Executive Officer, was given responsibility for developing this resource, which would be known as the Physical Sciences Resource Center or PSRC. Physical Science Resource Center was chosen as a name for the site instead of a name like Physics Resource Center that might have resulted in fewer K-8 teachers visiting the site.

Jeannie Kim, a graphics artist intern with a strong computer background from the University of Maryland-Baltimore County was hired to design the site and work with Hein to put physical science related educational materials on the site. The site went live in July 1997 with content that included annotated links to web sites, curriculum materials arranged by grade level, assessment materials, a problem of the month, a demo of the month, and other similar resources for teachers and students, K-16. In the four years since the site went live, many resources have been added including a Science Job Market, a searchable list of mentors, searchable abstract databases from all AAPT meetings starting with the 1998 Winter Meeting, and a searchable database of online course syllabi. Over the four-year lifetime of the site, five interns have been employed to maintain and update the site: Jeannie Kim, Patrick Sok Son, Carlos Mendes, Ralph Dixon, and Ian Douglas.

The PSRC site now has approximately 1800 pages (a page has a unique URL starting with <http://www.psrc-online.org/>) and was accessed 78,000 times in July and 98,354 times in August 2001 as recorded by AccessWatch Analysis software. For August 2001, there were 451,571 hits and each visitor viewed an average of 7.2 pages and downloaded 300 kilobytes. Hosts visited the PSRC an average of 1.7 times for a total of 13,692 unique visits by 8,036 unique hosts.

Except for the Science Job Market, Hein has been solely responsible for selecting the material that is included on the PSRC site. A PSRC Advisory Committee representing K-16 physical science educators has been in place since the site went live (see Appendix A). However, the committee has been underutilized and has provided very little in the way of input or advice on the structure of the PSRC or the content that should be included on the site. A search engine has been added to the site recently and is of limited use due to the inconsistent tagging of the pages and the lack of a consistent set of metadata and keywords. The site has grown mainly by accretion and has some very good

material, including an excellent list of annotated links to a variety of educational resources arranged according to the various sub fields of physics.

What's Next for the PSRC

It is clear that Hein has a limited amount of time that can be devoted to the continued development of the PSRC. At the present, there is no longer a PSRC intern and all PSRC updates are done through the AAPT Internet Services Specialist. For the PSRC to become the resource for K-16 teachers that was envisioned more than four years ago, additional staff resources must be made available to restructure the site and devise a plan for the continued orderly development of the PSRC.

A meeting of AAPT members interested in the future development of the PSRC and Web-based physics education resources was held at the American Center for Physics on June 18-19, 2001. A listing of this PSRC Subgroup can be found in Appendix B. The subgroup recommended that the following issues be addressed in order for the PSRC to be a more viable physics education resource:

1. A set of metadata should be developed for the materials already included in the PSRC and any new materials that are added.
2. The PSRC needs a site map that will help users find the materials and assist in the orderly development of the site.
3. A consistent set of templates and fonts that would improve the appearance and functionality of the site.
4. A procedure for collecting, peer reviewing, and cataloguing materials on the site.
5. Tools should be put in place that would make it easy to find and access information on the site.

In order to make these improvements in the PSRC, the subgroup proposed that a full-time director for the PSRC be hired by January 1, 2002. This person should have a physics background and a good knowledge of Web-based technologies that would allow him/her to address items 1-5 above. This person would function much like a journal editor and he/she would have the option of appointing assistant directors, an editorial board, reviewers, etc.

In addition, the subgroup proposed that the new PSRC Director would be responsible for the development of a proposal to the NSF for funding of the astronomy and physics component of the National SMETE Digital Library (NSDL). These proposals are due by April 2002, so this would occupy the first three months of the director's time. It is suggested that the proposal would be a joint AAPT/APS/AIP proposal with some input from astronomy community through AAS. The current PSRC Subgroup as well as representatives from MERLOT (Multimedia Educational Resources for Learning and Online Teaching), SMETE.ORG (Science, Math, Engineering, and Technology Education), and DELESE (Digital Library for Earth Systems Education) would serve in an advisory capacity to the Director as the proposal is developed.

AAPT Commitment

Of the original \$315,000 available from the Campaign for Physics for the development of the PSRC, approximately \$105,000 will remain on January 1, 2002. This would provide a reasonable salary, benefits, and support for a period of one year for a well-qualified person who could direct the preparation of the NSF proposal and make the improvements in the PSRC described above.

If the proposal is funded, there will be adequate funds in the proposal to continue support for the PSRC and to begin the development of the astronomy and physics components of the NSDL. Depending on the level of funding, additional technical staff will be needed and travel support, stipends, etc. will be available to support participation in the project by members of the astronomy and physics communities. Indirect costs will cover the additional facilities needed in the AAPT office.

If the proposal is not funded, it is expected that the position of PSRC Director would become a permanent position similar to the position of AJP or TPT Editor. The director would no longer need to remain on site but could be located at a college or university as are our current editors. The director could have direct access to the PSRC server and be able to maintain the site entirely by electronic communication. The director could have an Editorial Board and reviewers similar to AJP and TPT that might be voluntary or honorarium positions. These positions would be new and would result in additional budget expenditures. The PSRC Director and AAPT staff would be responsible for exploring revenue sources such as advertising or payment for Web-based services that could result in long-term financial stability for the site.

Additional Comments

Members of the PSRC Subgroup are interested in participating in the NSDL effort and will be an excellent resource for efforts to enhance the PSRC as well as for the preparation of the NSDL proposal. Chuck Bennett from the University of North Carolina at Asheville and Marty Gelfand from Colorado State University, participants in the MERLOT project, are interested in collaborating with AAPT on a project to make physics education resources available on Web. Bennett and Gelfand are both AAPT members and Gelfand is a member of the APS Committee on Education.

NSF is clearly interested in having a physics education component to the NSDL and this has been communicated by NSF Program Officers to Jack Hehn, AIP Director of Education. Many physics education resources already exist on the Web that could be considered part of the Digital Library for Astronomy and Physics Education (DLAPE). For example, AIP has the *Statistical Research Center*, the *History Center*, and *Physics Today* available online. APS has *Physics Central* and AAPT has the *PSRC*. All three associations have online access to numerous publications and permit online searches of journal abstracts. In addition, many individual physics educators have developed physics education materials ranging from Wolfgang Christian's *Physlets* to Ken Koehler's physics hypertextbook *College Physics for Students of Biology and Chemistry*. What is

needed is a way of making these materials known and available to users in an organized and coherent manner and providing a level of review that will insure the materials meet a minimum quality standard.

Of the NSDL programs already in existence, the most successful has probably been the Digital Library for Earth Systems Education. Participants in this project have developed many of the components needed for a digital library including a governance structure, standing and working committees (see Appendix C), and Articles of Federation (see Appendix D). Much of the structure and many of the materials developed by the DLESE project could be used in the development of the astronomy and physics education component of the digital library.

It is clear that the Web will continue to grow and be the main source of information for students and teachers in the foreseeable future. Building the astronomy and physics education component of the digital library is a sufficiently complex and demanding undertaking that the cooperation of all three societies (AAPT, AIP, and APS) will be necessary. If AAPT wants to be recognized as the leader in physics education, it is appropriate that it provide the leadership for this component of the NSDL.

References

DLESE is conceived as an information system dedicated to the collection, enhancement, and distribution of materials that facilitate learning about the Earth system at all educational levels. The form and function of DLESE are defined by its unique focus on Earth system education. <http://www.dlese.org/>

MERLOT is a free and open resource designed primarily for faculty and students in higher education. With a continually growing collection of online learning materials, peer reviews and assignments, MERLOT helps faculty enhance instruction. MERLOT is also a community of people who strive to enrich teaching and learning experiences. <http://www.merlot.org/Home.po>

SMETE.ORG, pronounced \smEt\, is a dynamic new online library and set of services for teachers and students. It is a gateway to a comprehensive collection of science, math, engineering and technology (SMET) education content and services to learners, educators, and academic policy-makers. The URL is <http://smete.org/>

Appendix A

PSRC Advisory Board

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Appendix B

2001 AAPT Web Services Advisory Group PSRC Subgroup

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Appendix C DLESE Committees Standing committees

Collections

Is concerned with the resources in the DLESE collection. This includes the scope and emphasis of the collection; the "collections policy"; selection for the "reviewed collection"; collection quality and breadth; and contributor incentives, such as academic career recognition.

Website: <http://www.ldeo.columbia.edu/DLESE/collections>

Services

Based on input from the community, this committee identifies, articulates, and helps to develop and implement a wide range of services needed by users and developers to successfully carry out the DLESE mission.

Website: <http://www.atmos.uiuc.edu/dlese>

Technology

Acts as the technical liason between the DPC, the DLESE Steering Committee, content/service providers, and the DLESE user community. The committee provides technical advise and guidance to the DPC, the DLESE Steering Committee, and other content/service providers.

Website: http://www.mines.edu/fs_home/tboyd/DLESE/techhome.html

Users

This is where all library users can discuss issues related to the access and use of DLESE. It's the ideal way to submit comments and suggestions about using the library and related services. The User Committee also uses the list to solicit input on specific issues. We hope that all library users will subscribe to this list. DLESE is a community effort whose success rests on your success as a teacher, publisher, programmer, or service provider.

Working and interest groups

2-year colleges

Discusses DLESE as an information and communication resource for two-year college instructors and students.

Business planning

Discusses DLESE business plans and policies surrounding corporate sponsorship and foundation support.

Dataset working group

Discusses issues related to developing student-friendly interfaces to Earth data and tools that students can use to explore those data.

Website: <http://www.dlese.org/people/workgroups/dawg/index.html>

Diversity

Discusses issues related to helping all students learn about the Earth and increasing the diversity of the Earth system science workforce. The Diversity working group uses the list-server to develop and implement action plans for DLESE, including the Diversity website. Membership is open to all interested parties.

Website: <http://www.dlese.org/people/workgroups/diversity/index.html>

DLESE Community

Is used to keep track of the size and breadth of our community and deliver DLESE announcements and information. It does not host discussion. It is also used to elect steering committee and sub-committee members.

Environmental Issues

Shares information about environmental issues (particularly those that have not yet caught the attention of our policy-makers) and their use in teaching about the Earth.

Evaluation

Discusses the DLESE Evaluation Plan and its implementation. Evaluation is a critical aspect of determining if DLESE is accomplishing its goals of serving the needs of the Earth system education community and supporting learning about the Earth.

Geo Wall Working Groups

The GeoWall Consortium is an interdisciplinary group of researchers and educators that is developing curriculum to be used at the general introductory Earth Science education level using stereo display devices. We take a consortium approach, where Earth Science faculty at multiple institutions develop and adapt course content optimized for stereo viewing that can form material to support existing textbooks and lab manuals. There are two groups, Community and Technical:

The Geo Wall - *Community* Working Group hosts discussion of the general use of stereo display devices in the classroom and the development of curriculum employing this technique.

The Geo Wall - *Technical* Working Group hosts discussion of technical work related to stereo display devices.

Global Outreach Working Group

Explores mechanisms to collaborate with international organizations involved with the upcoming World Summit on Sustainable Development (Johannesburg, September 2002) as a means of giving DLESE global outreach.

Graphical user interface (GUI)

Welcomes anyone interested in the look and feel of the library. This is very closely related to discussions of the users and use cases lists because it deals with using the library efficiently. We'll use information on how users use the library to enhance it. We'll also look at such issues as navigation techniques, use of menus and other selection mechanisms, and emerging interface interaction technologies on the Human-Computer Interaction (HCI) front.

Website: http://www.dlese.org/people/workgroups/GUI/gui_activity.html

Impact of Technology

Discusses issues related to the impact of technology primarily via the list-server.

Intellectual property

Discusses DLESE intellectual property.

K-12

Intended for communication on K-12 issues and the development and implementation of DLESE. Discusses issues about collection activities, web-based resources, assessments, teaching strategies, and services, etc. Sprang from the K-12 interest group formed at the July 2000 DLESE workshop in Bozeman, Montana.

Website: <http://www.dlese.org/people/workgroups/k12/index.html>

Linking research and education

Discusses how geoscience research and education can be successfully linked to better benefit learners, faculty, the geoscience enterprise, and the greater public.

Website: http://www.dlese.org/people/workgroups/research_education/index.html

Metadata

The Meta-data Committee page welcomes those interested in making DLESE resources well documented for efficient and effective searching and retrieval.

Website: <http://www.dlese.org/Metadata/index.htm>

Oceanography

The purpose for this group is to collect materials suitable for an introductory college level oceanography course. The materials will support inquiry activities using real earth data.

Website: http://oceanography.geol.ucsb.edu/dlese/wg_oceanog/Index.html

Privacy and tracking

Discusses DLESE privacy policy and related issues.

Science policy

Supports DLESE's Science Policy Working Group set up to articulate the vision of the community.

Strategic planning

Supports the development of a DLESE strategic plan including strategic priorities, business plans, and intellectual property policies. Membership is open to all interested parties.

Use cases

Facillitates discussion about the requirements phase of DLESE development, which is done via a use case approach. Focuses on the content of the Requirements documents (posted on the web). Membership is open to anyone who wishes to monitor or participate.

Website: <http://www.dlese.org/SoftwareArchitecture/UseCaseDocs/TextualDocs/Requirements.html>