Computational Science Education Reference Desk (CSERD)
Pathway Report — August 2007

The focus of CSERD this year was on infrastructure, forming domain partnerships, recruiting reviewers and editors as well as improving the user experience.

Great Accomplishments

CSERD, as well as Project Interactivate, were selected as Official Honorees in the 11th Annual Webby Awards by the International Academy of Digital Arts and Sciences. CSERD and *Interactivate* were honored in the categories of Science and Education, respectively. The Official Honoree distinction has been awarded to sites that score in the top 15% of submissions. With over 8,000 entries received from all 50 states and over 60 countries, this is an outstanding accomplishment.

The CSERD resource *Project Interactivate* was featured by Kim Komando on the national radio show. Kim's review of the site can be found at
http://www.komando.com/collsites/index.aspx?id=2617

The Education Program of the International Conference for High Performance Computing, Networking, Storage, and Analysis (SC- Education) began an annual Dr. Robert M. Panoff Student Award for Explorations in Science Through Computation. This program will promote and recognize the creative use of computer-based models, simulations, and visualizations as problem-solving tools among high school, undergraduate, and graduate students. Shodor received the 2006 Undergraduate Computational Engineering and Science Award for national education excellence at the annual Supercomputing Conference for High Performance Computing and Networking. The award citation recognizes Robert Panoff and the National Computational Science Institute that he leads for work supporting computational science education across the nation at colleges and universities. Per Omniture web metrics, CSERD is recording approximately 280K site visits per month. Project Interactivate exercises in computational science have become standard classroom resources, and over 130,000 people visit the site each month to browse and to download free tools.

Shodor's Interactivate website was featured in the January 2007 Education World site review and given A+ ratings, both for content and site design. Education World (education-world.com) is a highly rated website for educators that features 12 education-related websites each month.

Technical Developments

CSERD's initial back-end systems, CWIS and Plone, were evaluated for effectiveness in implementing and managing a digital library with a review workflow. The evaluation focused on ease of use and maintenance and for ease with which the infrastructure could be adopted and implemented by other digital libraries.

We performed a full evaluation of our systems thus far, and concluded that, while CWIS was an excellent tool for managing metadata, that Plone required too much effort and expertise for modification and maintenance. After evaluating several alternatives, the new infrastructure for CSERD is an extension of an existing PHP-based framework used by Shodor. The new system will allow us to:

- Add and evaluate more features for CSERD that help our audience find and choose resources
- Generate in-depth reports that summarize users' reviews and their uses of the site

- Solicit reviews from users in the growing CSERD community
- Maintain the system more efficiently while scaling it to include more users, more reviews, and more resources

In addition, tracking and controlling usage via Ominiture web metrics was completed for CSERD.

In the area of verification, validation and accreditation (VVA), tutorials for the editors were written so that they could fully understand the review process and how to navigate the site. We have tested the review process by having faculty at computational science workshops sign up as reviewers, pick items from the catalog to review, and complete the reviews. This will be translated into a larger-scale effort to proceed with reviews using multiple editors and contributors from a wider part of the community. Current review status for CSERD:
- 345 reviews total
- 140 catalog items have reviews
- Over 220 new catalog items were submitted this past Fall and Spring
- When all submitted items are finalized, the catalog will have over 1000 items (prior count was 814 items)
- 40 reviews have been added successfully for 19 catalog items since switching to the new system
- Six new Chemistry-related sites have been added to the CSERD.
- Seven additional Chemistry-related sites have been identified and will soon be added.

We are preparing to have an expanded review system including additional editors or assistant editors, an expanded list of reviewers, and a mature process for receiving, reviewing, and updating materials in the CSERD catalog.

Outreach Activities
CSERD outreach will have engaged many educators (middle and high school teachers, and undergraduate faculty) locally and nationally. CSERD and NSDL have been introduced to a number of education and scientific audiences through 1 book, 2 journal publications, 4 papers, 1 poster, 15 conferences, and 6 presentations at colloquia and meetings. In addition, team members presented at workshops for regional meetings at NSTA in Chicago and Alaska. We already have evidence that faculty from the workshops will pursue the integration of CSERD resources into their courses. Faculty have begun to use the VV&A tools to review resources. Faculty have indicated that being part of a larger community of practice is of direct value to them. Educators have repeatedly indicated that the goal of providing quality educational resources is very important to them!

Shodor continues to train undergraduate interns to teach workshops using computational science resources. These students are leading workshops using CSERD materials and resources at the W.D. Hill Community center, Weaver Street Community center, Emily K Family Center and Antioch Builds Center in Durham, North Carolina.

Shodor is working with the SCO7 Education Program to offer workshops. Participants will take part in hands-on activities to engage them in applying computational science, grid computing and high performance computing resources in education. The SC07 Program will occur November 10-13, 2007 at Reno, Nevada. Workshops are open to undergraduate faculty, undergraduate and graduate students, and high school teachers.

With the CI-TEAM (Cyberinfrastructure Team) grant, Shodor has the opportunity to scale and reproduce its workshops at various public and faith-based community centers, first in

the surrounding Durham area and then nationwide. Materials developed for CI-TEAM will leverage methods and materials developed for NSDL, and all materials developed will be vetted for verification, validation, and accreditation through the CSERD.

A number of the project staff are involved in the National Computational Science Institute (NCSI), through which educators are being introduced to CSERD to help them integrate the resources into their courses. Project team members Panoff, Joiner, and Sendlinger are instructors for these workshops. The workshops are week-long each with 20-30 faculty participants.

Shodor continues to reach out through "Other People's Workshops" (OPWs) which applies the idea that adding CSERD computational science workshops to other organization's events and activities effectively leverages students' and teachers' interest in science and math and by showing how computational tools can elucidate math and science concepts in many different contextual settings.

Dr. Robert Panoff presented via teleconference the ways that outreach can help boost traffic to NSDL websites/portals, and tracking website growth with web metrics. He introduced some of the ways in which traffic comes to CSERD, including as a result of outreach activity, and as a result of educational portal sites listing specific CSERD pages and/or resources.

Shodor's *Interactivate* project was translated to Spanish. The Spanish-language education technology web portal Eduteka (eduteka.org), run by the Gabriel Piedrahita Foundation of Colombia, has completed the translation of the second of four units of Shodor's Interactivate website into Spanish. The site, Matematica Interactiva, is available at www.eduteka.org/MI/master/interactivate/.

CSERD has achieved market penetration from Google and other search sources. For example, search in Google for CSERD and Shodor shows up first. Also, if one googles computational science, NCSI is the number one hit. January 2007 marks the 20th year anniversary of getting computational and parallel computing nationally distributed.

Shodor has 25 interns currently working with some aspect of each of their work benefiting CSERD, even while funded via other grant activity. Shodor is integrating the VV&A process into its daily project management. This requires all interns to become aware of and perform VV&A on all applications, tools, applets, curriculum materials, etc.

Shodor's SUCCEED Apprenticeship Program provides 53 students with authentic and appropriate experiences in the use of the technologies, techniques, and tools of IT, within the context of STEM. During their participation in the program, apprentices will take classes, work in project teams on local, regional and nationally funded projects, and have numerous opportunities to demonstrate competence and confidence in the use of technology, critical and analytical thinking skills, and communication and leadership skills.

Pathway Workshop
Shodor's Bob Panoff, with funding from the National Science Foundation, offered Student Science Enrichment Program (SSEP) Directors an opportunity to participate in a "state-wide" model for introducing teachers to National Science Digital Library (NSDL) resources. The two-day workshop was held at the Burroughs Wellcome Fund headquarters in Research Triangle Park on April 24-25, 2007. The goal of the workshop was to expose SSEP Directors or selected staff to the richness of the resources in NSDL, especially the new Pathways projects in biology, chemistry, physics, mathematics, and engineering, alongside Shodor's own Pathway portal in computation science education. Project directors or staff who attend

will help identify resources in the digital library that can improve their own projects, while learning how to use the NSDL as a repository and dissemination channel for their work. There were 22 educators who attended the workshops. Presenters from BEN and Math Gateway/MathDL also provided an overview of their projects at the meeting.

Dr. Robert Panoff has continued to work with students in Germany doing math and science workshops offered through the Department of Defense Education Activity (DoDEA) at high schools in Heidelberg, Mannheim, Wiesbaden, Giessen, and Hanau. During "Real World" day at the schools Panoff also offered a presentation to parents, students, and teachers about NSDL exploring life after high school. DoDEA oversees schools for the children of service men and women stationed in the United States, Europe, and the Pacific.

Shodor hosted a computational biology workshop. Subject matter experts contributed new items to CSERD and submitted verification, validation, and accreditation reviews testing the current catalog items. The participants willingness to contribute to our catalog demonstrates the growing excitement over a common place to publish, review, and search for computational science resources.

Patricia Jacobs and Bethany Hudnutt of Shodor presented "Learning by Doing: Computational Science" for the December 2006 NSDL/NSTA Web Seminar. The seminar focused on the powerful methods of using technology in the classroom and how to use technology to solve problems and to visualize concepts. A variety of fun and interactive math and science and models and activities were presented. Teachers of grades 2-12 from around the country participated in the presentation, archived on the nsta.org website.

Partnership Building
During 2007, Shodor added a Biology expert, Dr. Jeff Krause, to its staff for CSERD and partnered with two additional North Carolina Central University (NCCU) professors, Dr. Darlene Taylor and Dr. Jim Ellenson for performing verification, validation and accreditation reviews.

Shodor partnered with the Students Making Another Science Success Story (SMASSS) program at North Carolina Central University (NCCU). SMASSS, one of the programs of the NCCU Center for Science, Math and Technology Education, is a science and math enhancement program consisting of a summer camp and school year Saturday Academies. Shodor will provide computational resources and materials through CSERD as well as offer programs for the students to attend.

Significant work has proceeded to align working groups, integrate our Pathway with fellow Pathways, regular interaction with the CI team and other NSDL partners, participation in regular conference calls and PI meetings, and participation in a number of regional and national education meetings in which NSDL and CSERD were showcased. Input from current and potential users of both the Reference Desk and the NSDL has improved the design and operation of CSERD.