

EDUCATION | [Contents \[contents.html\]](#) | [Next \[caida.html\]](#)

Enhancing Undergraduate Curriculum through NPACI's Ed Center

PROJECT LEADER

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Upon entering the [Education Center on Computational Science and Engineering \(Ed Center\)](#) (<http://www.edcenter.sdsu.edu/>) in San Diego State University's (SDSU) newly constructed Malcolm Love Library Addition, visitors are met by a mural that fills the wall behind one of several workstations. The mural blends architecture and statuary from around the campus into a colorful mosaic representing SDSU's seven academic colleges.

The mural also represents the objectives of the National Science Foundation's (NSF) vision to join the education and outreach efforts of NPACI and the National Computational Science Alliance in the national Education, Outreach, and Training Partnership for Advanced Computational Infrastructure (EOT-PACI): to foster the incorporation of high-performance computing and research tools into undergraduate curricula nationwide and to expand the use and understanding of computational tools in areas of science and society not traditionally associated with high-performance computing (Figure 1).

"The overarching goal behind the Ed Center is to have a systemic impact on both education and society at large," said Kris Stewart, the center's director and an associate professor of Mathematical and Computer Sciences at SDSU. "To do so, we need to influence not just computer science majors, but all types of students--the future teachers, researchers, policy makers, workers, and professionals. If we're to be successful at this, the center must aggressively reach out to the faculty of the entire campus and help them discover how software and tools developed within the PACI program can be relevant to their teaching."

[MAKING DAILY CONTACT \[#MAKING\]](#)

[NATIONAL EXPERIENCE AND EXPERTISE \[#NATIONAL\]](#)

[FUTURE CONNECTIONS \[#FUTURE\]](#)



Figure 1:
The Ed Center Mural
The mural reads, "Enhancing Undergraduate Curricula with High Performance Computing Tools and Technologies for the California State University System and the National Education Community." SDSC artist Rosemarie McKeon discussed the mural she created with SDSU President Stephen Weber at the Ed Center opening.

MAKING DAILY CONTACT

[Top](#) [[#Top](#)] | [Contents](#) [[contents.html](#)] | [Next](#) [[caida.html](#)]

Visitors to the Ed Center can take advantage of both human and computing resources. The center currently has a Sun UltraSPARC 2, two Windows NT workstations, a Sun SPARC, a Macintosh, a Java station, and a Pentium notebook available, supporting Unix, Macintosh, and Windows NT applications.

It also has Stewart and staff members Ilya Zaslavsky and Dolores Candelera. Zaslavsky holds a Ph.D in geography and is the center's expert on geographic information systems, software of particular interest to faculty from the social sciences and geography (Figure 2). Candelera handles the administrative responsibilities of the center, including logistical arrangements for workshops, training seminars, and special events.

Stewart and Roscoe Giles, co-chair of EOT-PACI steering committee, have been absorbed with determining what applications should be made available and when. "We find ourselves in a push-pull scenario because our science and technology partners are developing tools concurrently with our effort to deploy them in the educational community," Giles said. "We're learning the wants and needs of educators and communicating them back to the developers, and at the same time we're migrating tools developed within PACI to educators and helping them to learn how these might fill existing needs or spur new teaching."

Molecular science was chosen as the first discipline to have materials available through SDSU's Ed Center. Two applications, the Molecular Interactive Collaborative Environment (MICE) project and the Biology Workbench, will be disseminated to faculty and supported through training materials.

MICE was developed at SDSC for molecular modeling, interactive visualization, and remote collaboration. To test the value of MICE in a learning environment, students at Southwest High School in San Diego participated recently in a mock lecture series supported over the Internet with molecular views and models enabled through MICE.

The Biology Workbench--an application developed at the National Center for Supercomputing Applications (NCSA)--supports remote identification and manipulation of protein sequences. It has been used by university faculty nationwide in biology courses.

"Molecular biology is, of course, just the first step into the academic community and the first discipline that we will be enhancing through tools made available through the Ed Center," Stewart said. "We may not be originally equipped to meet the needs of some disciplines--say the arts or business--but that's where working with other partners comes in."

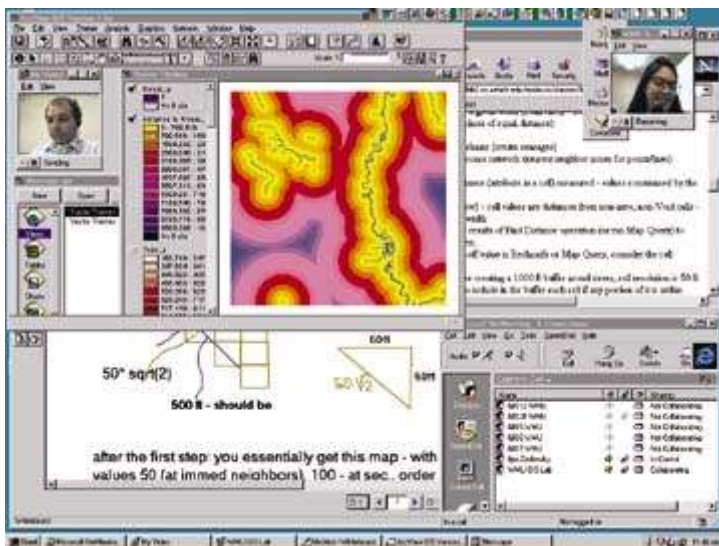


Figure 2: Distance Learning
Staff member Ilya Zaslavsky (upper left) is exploring tools for distance learning, including Web-based collaborative environments. Zaslavsky is currently teaching classes in spatial analysis and GIS to students at Western Michigan University using this technology.

NATIONAL EXPERIENCE AND EXPERTISE

[Top](#) | [#Top](#) | [Contents](#) | [contents.html](#) | [Next](#) | [caida.html](#)

The Ed Center officially opened its doors October 10, 1997--10 days after the start of the NSF's Partnerships for Advanced Computational Infrastructure (PACI) program--as a funded activity of NPACI's Education and Outreach thrust area. While continuing to plan workshops, seminars, and other events for the center and campus, Stewart has been meeting since before the center's opening with the deans, faculty, and support staff of the various colleges to formulate a strategy for bringing HPC and computational tools to the undergraduate curriculum at SDSU.

At the request of the NSF, education and outreach activities of both NPACI and the Alliance are being coordinated through EOT-PACI, which is guided by a steering committee on which Stewart sits. In this way, the experience and expertise of both partnerships is brought to bear on several targeted areas: K12, undergraduate, and graduate curricula; universal access to computing for women, minorities, and people with disabilities; outreach to new communities in government, the social sciences, the humanities, and museums; the evaluation of educational programs; and training programs, workshops, and virtual manuals to disseminate information about PACI resources, tools, activities, and programs.

The Ed Center is envisioned as the first of several such educational facilities to be founded at universities around the country. "These Education Centers are to serve as our in-road to the university community," Giles said. "They provide access to the software, tools, and technology being created within NPACI and the Alliance and allow faculty and students to suggest valuable feedback as they are trained how to use and adapt the technology to meet their own needs."

FUTURE CONNECTIONS

[Top](#) | [#Top](#) | [Contents](#) | [contents.html](#) | [Next](#) | [caida.html](#)

At the January 1998 NPACI All-hands Meeting, Stewart wrote a "contract" with NPACI partner John Unsworth of the Institute for Advanced Technology in the Humanities (IATH) at the University of Virginia. IATH's goal is to explore and expand the potential of information technology as a tool for humanities research, in part through a Fellows program that supports both residence-based and Net-based participation.

"The Ed Center will work with Unsworth's program to determine how faculty and students at SDSU can take advantage of the computing environment of the IATH program to enhance studies in the humanities," Stewart said. Other connections are being explored with projects of the Earth Systems Science and Data-intensive Computing thrust areas.

The center is charged to work not only with SDSU faculty and staff, but also the entire California State University (CSU) system, of which SDSU is a part. To that end, Stewart has made several presentations before representatives of the other 23 CSU campuses. In November 1997, she addressed a meeting of the chairs of CSU Math and Computer Science departments and, in December, presented the center's mission to CSU's multi-campus GIS Special Group. According to Stewart, faculty throughout the CSU system have been enthusiastic about using HPC tools and resources on their own campuses.

"This interaction and training is the natural spur for institutionalizing the use of high-performance computing tools and technologies into undergraduate curricula," Stewart said. "When the faculty become comfortable working with the technology, and the information technology staff are trained to support the various platforms, then we have successfully created an environment that is ripe for an educator to use various NPACI and Alliance applications in their teaching." --AF ▼

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