Cerro Coso Community College

Ridgecrest, CA

- IPEDS enrollment, Fall 2010: 6,642 students
- Type of community: Rural
- Number of campuses: 5
- Number of chemistry students, Fall 2011: 80
- Number of full-time chemistry faculty: 1
- Number of adjunct chemistry instructors: 1
- Structure: Chemistry is part of the Sciences and Engineering Department
- Focus of chemistry program: Transfer
- Sections of Guidelines used: 4.1, 5.1–5.11, 7.1–7.6, 10.4

John Stenger-Smith, a chemistry professor at Cerro Coso Community College, has used the *American Chemical Society (ACS) Guidelines for Chemistry in Two-Year College Programs* to

- Support articulation by providing a rigorous curriculum
- Maintain hands-on laboratory experiences in the curriculum
- Inform the design of a $4 million renovation of the college's science laboratories
- Obtain permission for students to use nuclear magnetic resonance spectroscopy at a naval base

The size of Cerro Coso Community College's service area creates unusual challenges for faculty and students. At 18,000 square miles, the college has the largest geographical service area of any community college in California. The area, which borders the Mojave Desert, is bigger than several New England states and has just 85,000 residents. How to serve students appropriately online and on campus is a key issue for the college, particularly its one full-time chemistry instructor.

Influencing Curriculum

Because almost all of the 80 students whom Stenger-Smith teaches each year transfer to baccalaureate institutions or research universities, his priority is making sure their chemistry credits will be accepted wherever and whenever they matriculate. "I want to make sure…that they transfer," he said, referring to students and their credits. Students generally transfer to public California universities, but each year a few students move on to four-year institutions in other parts of the country. With students transferring to so many different colleges, Stenger-Smith finds it beneficial to use both the *ACS Guidelines for Chemistry in Two-Year College Programs* and the *ACS Guidelines and Evaluation Procedures for Bachelor's Degree Programs* to structure his lectures and labs.

By using ACS's standardized exam as the final exam for his rigorous organic chemistry sequence, Stenger-Smith has been able to provide evidence, even several years later, that students have mastered the same concepts, theories, and practices as students at four-year institutions. He has persuaded both the University of Chicago and the University of California, Berkley to grant credit to former students by sharing information about his curriculum and documenting students' scores on the standardized exam.

Former student Michael Garrison is one beneficiary of the rigorous curriculum. Garrison's perfect score on the ACS exam in May 2006 was recognized by the ACS Mojave Desert Section. John McMurry, the author of the organic chemistry textbook used at Cerro Coso, also sent Garrison a letter with his congratulations. Garrison transferred to the University of California, Irvine, where he earned a bachelor's degree in chemistry with honors. He has received a fellowship to continue his graduate studies in chemistry there.

In response to the recommendation in the 2009 edition of the Guidelines that science majors "be able to use the peer-reviewed scientific literature

and evaluate technical articles critically," Stenger-Smith has added critical evaluations of media reports about scientific breakthroughs to class assignments. In 2010 he had students examine the "arsenic-loving bacteria" studies, as well as critiques of those studies.

Addressing the Use of Computer Simulations

Around 2005, an administrator (who is no longer at the college) suggested that Stenger-Smith teach chemistry online with virtual labs. Stenger-Smith used the Guidelines to inform the administrator of the value of hands-on experiences.

Section 5.10 of the Guidelines states, "To learn chemistry, students must directly manipulate chemicals, share their properties and reactions, and use laboratory equipment and modern laboratory instruments ... This hands-on experience is necessary for students to understand, appreciate, and apply chemical concepts." Consequently, "Computer simulations that mimic laboratory procedures have the potential to be useful supplements, but should not be considered equivalent replacements for hands-on experiences critical to chemistry courses at any level." After several conversations, the administrator understood the value of hands-on experiences, and the pressure to use computer simulations faded away. "Our current administrative environment is very supportive of hands-on labs for chemistry," Stenger-Smith explained.

To deal with the issue of online labs and hybrid classes in a more comprehensive way, however, Stenger-Smith convinced the Sciences and Engineering Department to adopt a procedure using the ACS Guidelines and other professional societies' standards to guide departmental decisions about class sizes and curriculum. The procedure states: "New iTV (the college's interactive television system) or online classes will not be offered in this department unless the technology exists to offer the class as closely as possible to the on-ground course and the Science Class can be taught with the appropriate level of rigor via online or iTV. Online and iTV classes in particular will also be evaluated with respect to appropriateness and professional society guidelines. In the Science Department all lab classes will follow the safety procedures dictated by the discipline's professional society."

Informing Laboratory Design

Improving the safety of Cerro Coso's chemistry laboratories was one of several reasons the college sought a bond issue for the $4 million renovation of its science laboratories. The new facilities opened in 2010–2011.

Stenger-Smith said he and other faculty members in the Sciences and Engineering Department who were part of the facility planning process persuaded the architect to abandon his pod design for the chemistry laboratory by showing him the recommendation in the Guidelines that facilities include laboratory tables and benches. The architect also raised the possibility of virtual laboratories. "It took about four very strongly worded statements on my part to stop his pushing virtual labs," Stenger-Smith recalled. The new laboratory has a chemical storage cabinet, updated fume hoods, eye washes, and other safety equipment.

Accessing Equipment at a U.S. Navy Base

ACS policies are behind the long partnership the chemistry faculty at Cerro Coso Community College has had with the Naval Air Warfare Center Weapons Division in China Lake. The chemists who work at the base include ACS members who support the Society's recommendation that nonacademic institutions share their resources with educators and students, according to Stenger-Smith. His predecessor at the college had developed the agreement that allows the college's chemistry professor and students to use the nuclear magnetic resonance spectrometer at the naval base.

"Being able to do real mass spectroscopy on research-grade equipment is a huge advantage for students," Stenger-Smith said.

The content of this case study was provided by John Stenger-Smith. Stenger-Smith joined the Cerro Coso faculty in 2000, after working as a chemical engineer for the U.S. Department of the Navy. He earned his bachelor's degree in chemical engineering from the University of Delaware and his Ph.D. in chemical engineering from the University of Massachusetts Amherst. Stenger-Smith has been granted 22 patents. He has written or co-authored more than 100 articles and edited three books on nonlinear optical polymers, electroactive polymers for charge storage devices, and electroactive polymers for corrosion inhibition.