

Lake Michigan College

Benton Harbor, MI

- **IPEDS enrollment, Fall 2010:** 4,739 students
- **Type of community:** Small city
- **Number of campuses:** 3 campuses and 1 center
- **Number of chemistry students, Fall 2011:** 180
- **Number of full-time chemistry faculty:** 3; 2 teach only chemistry; 1 teaches chemistry and biology.
- **Number of adjunct chemistry instructors:** 8
- **Structure:** Chemistry is part of the Science Department, along with biology, physics, and geology.
- **Focus of chemistry program:** Transfer preparation and support of the college's allied health programs and its Energy Production program.
- **Sections of the Guidelines used:** 2.2, 3.1–3.4, 4.1, 4.2, 4.5

Bal Barot used the *American Chemical Society (ACS) Guidelines for Chemistry in Two-Year College Programs* to

- Address safety issues through policy, staff, and infrastructure improvements
- Improve curriculum
- Redesign teaching facilities
- Inform faculty policies, such as those addressing contact hours, professional development, and communication of effective practices

Several less-than-optimal practices had evolved over the years at Lake Michigan College (LMC) that were symptomatic of outdated curricula, instrumentation, and labs. For instance, chemistry faculty members used their personal autos to transport the chemicals they used for laboratory sections at two branch campuses. Funds for professional development were limited. Poor student performance and low persistence were discouraging the college's and community's desire to expand LMC's transfer and technical programs in advanced technology and scientific fields.

Justifying Curricular and Infrastructure Changes

In October 2007, the college was awarded a 5-year, \$1.9 million U.S. Department of Education Strengthening Institutions Title III grant to improve its science programs. Paige E. Eagan, a chemistry professor who wrote the Title III grant and later coordinated its implementation, cited various sections of the ACS Guidelines to explain why the college needed to revise its curriculum, remodel its lab

facilities, and purchase new equipment.

Part of the grant application addressed insufficient safety resources and support staff in science laboratories. It stated: "A 2005 audit conducted by the Laboratory Safety Institute graded LMC science labs a 'D+' for safety. Safety components are outdated and in need of renovation. Audit recommendations include: establish a system-wide method for chemical storage; repair existing and install additional fume hoods; improve chemical storage procedures and facilities; and hire a chemical hygiene officer. According to the *American Chemical Society's Guidelines for Chemistry in Two-Year Colleges*, at least one full-time laboratory technician for every 4 full-time or full-time equivalent chemistry faculty teaching a 15-hour contact load in chemistry is needed. Applying these guidelines to LMC science faculty, two part-time lab assistants support 11 full-time faculty and 14 adjunct."

Revising the Curriculum

One of the most unusual aspects of the college's improvement efforts was the release of all full-time faculty from teaching, so they could concentrate on revising their courses. In Fall 2008, the biology faculty revised their courses while adjunct instructors taught their classes. In Fall 2009, the chemistry, physics, and geology faculty members were released from their teaching duties to concentrate on revising their courses. Eight chemistry courses and a total of 22 science courses were revised. The college considered four options for accomplishing the curriculum revisions before determining that the mass release was the least expensive and fastest way to

implement the changes.

Influenced by the Guidelines' recommendation to teach chemistry as an experimental science "using appropriate and substantial laboratory work that provides opportunities for open-ended investigations," the chemistry faculty adopted a more interactive pedagogy. It blends lectures with demonstrations and discussions with experiments. In 2010, the college also added student resource rooms where molecular kits and computer equipment are available for students to study individually or in groups.

Addressing Infrastructure Issues

About the time the current edition of the Guidelines was released in 2009, chemistry faculty members and college administrators attended a chemical safety program presented by James A. Kaufman, chief executive officer of The Lab Safety Institute. Kaufman also analyzed the condition of the college's labs. The improvements he recommended were based on the ACS Guidelines as well as the safety procedures that his nonprofit consulting organization had developed for instructors at secondary schools and colleges. Armed with this more-detailed information, Barot and his colleagues engaged college administrators in conversations about ways to improve the college's procedures for handling the chemicals used for teaching.

With the Title III funds, the college hired a full-time lab manager who oversees operation of both the chemistry and biology labs at the main campus and two branch campuses. The lab manager's duties include visiting every chemistry course section early each semester to talk with students about chemical safety and keeping the chemical hygiene plan up to date. The manager also makes sure that chemicals are transported to and stored at all three campuses in accordance with the ACS Guidelines and other

relevant regulations. A part-time lab assistant now helps faculty and students in the chemistry laboratories. The college has a plan to sustain both positions from the college operating budget when the federal grant ends.

Redesigning Laboratories

Barot, Eagan, and their colleagues used the Guidelines to influence plans for the renovation of the chemistry labs on the main campus. The faculty wanted to reconfigure the space to combine classrooms and laboratories in order to implement the new curriculum and pedagogy. However, the architect's initial plan for these combined spaces called for large lecture halls and labs that would hold many more people than the 25-student limit the Guidelines recommend.

At subsequent meetings with the architect, contractor, and administrators, the chemistry faculty explained that the larger lecture rooms were fine, but that the laboratories should be built to accommodate only 24 students at a time for safety reasons. With the Guidelines to support the faculty's points, the issues were quickly resolved. "There is absolutely no way to convince them to cap enrollment at 24 students without the Guidelines," Eagan said. The renovated chemistry classrooms have new instruments and accommodate both labs and lectures, with approximately 50 square feet of lab table and bench space per student.

Informing Faculty Policies and Practices

In addition to influencing the recent hiring of lab personnel, the Guidelines have historically been a factor in faculty contract negotiations at LMC. A chemistry professor, William Rudman, led the faculty union for many years, Barot explained. Rudman's leadership ensured that the recommendation in the Guidelines that contact hours "not exceed 15 total

hours per week" became part of the of the faculty's negotiated agreement.

About five years ago, the college began allocating \$1,000 per year for each full-time faculty member to use for professional development. In 2011, the professional development allotment increased to \$1,700 per year. Additionally, the college holds an open competition for summer professional development funds. A faculty committee reviews their colleagues' proposals and makes awards in increments of several thousand dollars from a pool of professional development funds. When a new dean was hired, Barot talked with his new boss about the Guidelines' recommendations for professional development. He wanted to be sure that the dean understood the rationale for keeping professional development in the budget despite financial constraints.

Barot has been an ACS member since the 1980s. Because not all of his full- and part-time colleagues are ACS members, Barot makes sure that copies of the Guidelines are available in the faculty meeting room for his colleagues' reference. He also tries to talk with the adjunct instructors about the Guidelines to build a community of support for the effective practices that ACS advocates.

The content of this case study was provided by Bal Barot. In 2011, Barot received a Fulbright U.S. Scholar award and was named College Science Teacher of the Year by the Michigan Science Teachers Association. He holds a Ph.D. in chemistry from Oklahoma State University. As a Fulbright Scholar, Barot taught chemistry for six months at Cochin University of Science and Technology in southern India. Before joining Lake Michigan College's faculty in 1993, he taught at Otero Junior College, La Junta, CO.