

Weber State University Chemistry Program Review - March 2008

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Introduction

The above program review team was provided with a detailed self study prepared by the chemistry department chair that was completed in November 2007 and, following an initial meeting with the Dean of the College and Chemistry Department Chair, spent a full day interviewing most of the faculty and several chemistry students. A brief tour of the facilities provided insight into laboratory and research space and available instrumentation to support the teaching mission of the department.

A - Mission Statement

The chemistry department graduates about a dozen majors annually but averages over 14,000 SCH annually due to a large service teaching role in support of other majors and pre-professional programs on campus. The teaching mission of the department occupies most of the time of the 12 tenured/tenured track faculty and many participate in overload teaching particularly through online distance education classes at the introductory level. This area has been an active one for scholarship in chemical education with significant and effective efforts in novel course development and implementation.

B - Curriculum

Owing to the influence of the American Chemical Society Committee on Professional Training, Chemistry Curricula nation-wide are quite uniform and Weber State is no exception with continuing ACSCPT approval obtained in 2006. New ACS guidelines to be implemented in 2008 provide an opportunity to more creatively reassess how chemistry is taught at Weber and elsewhere. Students noted that CHEM 3400 (Molecular Symmetry and Applied Math for Physical Chemistry) is a particularly effective course in preparing them for physical chemistry compared to the more usual approach of simply requiring additional courses taught by the Mathematics Department.

The addition of a 2 credit hour Independent Research and Study (CHEM 4800) course to increase the number of upper division hours in the major presents a real challenge to the department faculty and facilities. Functional, modern instrumentation required to perform credible modern chemistry laboratory experiments, let alone research, is essentially absent in the department and seriously compromises the educational experiences of students. Although the recent funding of a new 90 MHz FT-NMR (useful for teaching and *some* organic chemistry research) and GC-MS are important steps in the right direction, additional resources are required to have modern instrumentation in the advanced teaching labs and to support research projects in CHEM 4800. A doubling of the student lab fee (as was recently approved at the University of Utah) might be one mechanism to provide ongoing funding for new instrumentation. A new staff member with expertise in instrument maintenance would be ideal - perhaps shared with other science departments across campus. Lab space for faculty/student research remains limited. It is not clear if the modern instrumentation in the CTC is available for routine educational use for projects beyond the scope of the corporate partners.

It is unusual that the chemistry minor does not require any upper division courses since the requirements (18 hrs) can be satisfied by simply taking general (1210, 1220) and organic (2310, 2320) chemistry courses. Including at least 3 hours of upper division chemistry would make this more credible and increase SCH.

C - Student Learning Outcomes and Assessment

The faculty have identified a reasonable set of student learning outcomes. Assessment (and feedback into the curriculum) remains a challenge. Quantitative information is available at least for second year students through use of the ACS National Organic Exam Scores. This provides a means of comparing local student performance to national standards. Graduation Exit Surveys were reviewed by the committee and showed good student satisfaction with their education. As noted above, the department is accredited by the ACS CPT. Standards for evaluation of student CHEM 4800 activities need to be developed.

D - Academic - Advising

Advising is formally handled by the chair of the department with assistance for routine matters from the departmental secretary. However it is clear that much of the faculty informally advise and are quite accessible to students. The department has large enrollments in the preparatory chemistry (CHEM 1200) and even general education (CHEM 1010) courses so it may be effective to introduce and advising "lecture" in these courses as a way of promoting further study of chemistry. This might also alleviate the problem of pre-professional students taking a non-calculus based physics course and then discovering that the calculus-based course is required for chemistry majors. This point could also be shared with College & University advisers. Consideration should be given to attracting academically strong and motivated pre-professional students to the department and perhaps the new flexibility allowed by changing ACS guideline will provide an appropriate curricular framework to achieve this goal.

E - Faculty

The department has 12 full-time tenure track positions and 6 adjunct faculty slots to cover teaching of service and majors courses. The bulk of faculty time is spent teaching including supervision of laboratory courses. Perhaps increased use of undergraduate teaching assistants in introductory courses could free up some faculty time for junior/senior level research projects with students. Teaching represents the major area of scholarship within the department with several senior faculty having authored nationally published texts and others have created in-house lab manuals and related materials. Online course development provides another mode of scholarship in Chemical Education, additional income for faculty, and tuition dollars for the University. It is clear that the faculty are dedicated educators. It is stated that increased participation of undergraduates in research is an important University goal. This presents a serious challenge to the department given the nature of modern chemistry research. As noted above, instrumentation and research space is limited. Perhaps the key limitation is faculty time as research projects often require significant one-on-one supervision of (also time-limited) students. A major challenge facing the department is how to grow in this area and meet University-wide expectations for promotion and tenure of junior faculty. A concern is that the department does not seem to have the respect of the College in the tenure process.

F - Program Support

The professional staff in the department consists of secretary (who also helps with advising), a lab manager and a science store manager. As noted above an engineer or technician proficient with instruments would be ideal to maintain and upgrade laboratory instrumentation. It is noted that ACS journals will be switched to electronic subscriptions. In conjunction with the University Library, the department should consider a site license to SciFinder Scholar™ as a user-friendly way to access the chemical literature. Funding for even modest laboratory chemicals and supplies is limited. Consideration to increasing the student lab fee is warranted given the central role laboratory work plays in the education of scientists and pre-professionals

G - Relationships with External Communities

The Chemical Technology Center (CTC) maintains modern instrumentation which largely serves its industrial partners located on campus. It does provide internships and future employment to some students. Students are able to tour the facilities and in some cases, depending on training and instrument availability, have access to the facilities for research projects. Educational outreach in the form of science fairs and presentations in local schools is carried out by some faculty.

H - Program Summary

The central mission of the Weber State University Chemistry department involves education of undergraduate students in the chemical sciences including pre-professional students and chemistry majors. This is done in a caring and competent environment where students feel

valued by their professors. Faculty seem to recognize the limitations of facilities and funding, but maintain high standards in their teaching. Moving to the next level of providing a strong undergraduate research environment for students and new faculty will require careful planning and additional resources from the College and University. It will also require the same sort of reward system and entrepreneurial spirit that have supported faculty involved in on-line courses and the CTC center.

BULLET SUMMARY

Program Strengths:

- Faculty commitment to education and their students.
- Strong relationships between faculty and students.
- Strong core base of faculty in all fields of chemistry.
- Innovative online chemistry courses at the 1000-level.
- CTC is an innovative way of interacting with the local business/technology community.
- Associates degree program imbedded in BS program provides a useful waypoint for students.

Program Challenges:

- Lack of modern and functional laboratory equipment required for teaching and undergraduate research.
- Mentoring of junior faculty. Department chair needs to be more proactive in the tenure/mentoring process to ensure requirements for tenure are transparent.
- Address the inherent conflict between research and full-load teaching (12 hr).
- Achieve a department and college consensus as to research and scholarship expectations for tenure and promotion.