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COMMITTEE ON ACADEMIC PLANNING AND REVIEW

14-15 CAPR 7  
Thursday, November 06, 2014

**TO:** The Academic Senate

**FROM:** The Committee on Academic Planning Review (CAPR)

**SUBJECT:** 14-15 CAPR 7: CAPR Report of the [Chemistry and Biochemistry Five-year Review](#) (2008-2013)

**PURPOSE:** For Action by the Academic Senate

**ACTION REQUESTED:** Acceptance of the Five-Year Program Review of the Department of Chemistry and Biochemistry; it is recommended that the program continues without modification. The date of the next five-year review will be 2017-2018.

**BACKGROUND INFORMATION:**

At the CAPR meeting on April 3, 2014, as the CAPR Representative for the Department of Chemistry and Biochemistry, I invited Drs. Ann McPartland (Chair) and Anne Kotchevar from the Department of Chemistry and Biochemistry to discuss their program. Dr. McPartland gave an overview of the Department program for the years 2008-2013. She indicated that between 2006 and 2008 they had lost several faculty members and began this review period short on tenured and tenure track faculty. In Fall 2007 one new faculty member, Dr. Tony Masiello, joined the department. Over the course of the next five academic years the department remained low on tenured/tenure track faculty and enrollments increased. However, two new hires came on in Fall 2013 and a third position has been filled for Fall 2014. These new faculty bring expertise in inorganic/computational chemistry, biochemistry and physical chemistry.

During the five-year review period the Department also experienced turnover among the staff. A key Instructional Support Technician retired and was not replaced. He was "stockroom manager," which means he oversaw the chemical, equipment and safety support for the academic laboratory program of the Department and supervised the other stockroom personnel; he was also responsible for most of the instrument maintenance. The other instructional support technicians took over some of his duties, but other duties have been left undone. In 2012 another instructional support technician, Earl Harris, passed away from cancer; Earl has recently been replaced. The long-time Department Administrative Support Coordinator, Ms. Linda Steele, unexpectedly retired, and the part-time Administrative Support Assistant (ASA), Sandi Jones, transferred to another program. The Department office staff was reduced from 1.5 to 1.0 and temporary and then part-time ASAs were used for several years, with ASC duties farmed out to other staff in the College. Now that the budget crisis has eased somewhat, the Department has been authorized to hire a new ASC and that position should be filled soon. Overall, the Department has had to deal with a quite a bit of turmoil these past few years and is in the process of hiring faculty and staff to return to normal functioning.

Dr. McPartland stated that the Department has implemented three new options into the Department curricula. These include a new MS Chemistry, Option in Biochemistry program, a BA Chemistry degree with Option in Chemistry Education and a BA Biochemistry degree with Option in Chemistry Education. The new MS option fills a growing demand for the biochemistry specialization among graduate students in chemistry. The Option in Chemistry Education programs reflect the department commitment to STEM education; they incorporate the prerequisites for entry into a credentialing program into a strong chemistry curriculum. In addition to strengthening the curriculum at the Hayward Campus, the Department of Chemistry and Biochemistry also established a basic chemistry laboratory on the Concord Campus in 2008. The Basic Chemistry lecture/lab series is now taught every year on the Concord Campus as part of the Concord arm of the Pre-Nursing program.

Though some CAPR committee members expressed concern that the Department had too many degree options, especially for a department that still has issues with faculty hiring, both Dr. McPartland and Dr. Kotchevar were adamant that the Department was comfortable with number of options offered. They pointed out that except for one new two-unit course (Instructional Activities in Chemistry), the newer options did not require new courses and instead employed chemistry classes already part of the older degree programs as well as established courses offered by other departments. They argued that the administration of these options does not involve significant additional work for the faculty and that increased numbers of majors would be welcome. Enrollment has increased over the five-year review period and the number of options will only benefit incoming students. Detailed assessment will be reviewed in the next section. The Department has also maintained their association with the American Chemical Society (ACS), which has rigorous guidelines the Department must follow in order for the BS Chemistry degree to be accredited by that organization. The Department of Chemistry and Biochemistry has been an active member of ACS over the five-year period and continues to maintain accreditation.

Over the past five years the Department has improved the chemistry and biochemistry laboratory experiences for students by taking advantage of A2E2 grants. Novel and state of the art equipment has been purchased and is providing much better technical training than was previously available. The new equipment includes two Fourier Transform Infrared (FTIR) Spectrometers, a Fluorimeter, 14 Nanodrop Spectrophotometers and corresponding computers to run the instruments, 50 Vernier Graphing Calculators with temperature, pH and voltage probes, and an ultra-low temperature freezer. Software programs such Chemdraw, Spartan and Trinity have been purchased to help the students understand complex topics in chemistry and identify chemical compounds.

All in all the Department of Chemistry and Biochemistry has suffered set-backs in the areas of faculty and staff support over the review period, but is now recovering. Dr. McPartland has initiated the search for a new Departmental Administrative Support Coordinator. Enrollments have steadily increased and the Department has started to implement several curricular changes that will strengthen the services to chemistry and biochemistry students. The Department has hired a new instructional support technician and three new tenure track faculty and will continue to request new tenure track faculty positions for at least two more years. Moreover, course sections at the Concord Campus

are being increased to strengthen the Pre-Nursing program and manage increasing enrollments.

## **OVERVIEW OF DOCUMENTS SUBMITTED TO CAPR:**

### ***Overview Description of the Program***

The Department of Chemistry and Biochemistry submitted a dossier of its five year review for the academic years 2007-2012. The Department currently has eight tenure-track/tenured faculty, 12 part-time instructors and 4.5 FTE (Full-Time Equivalent) staff. At present, Dr. Ann McPartland is the Chair of the Department. The Department now offers seven baccalaureate degrees: the B.S. in Chemistry (American Chemical Society Certified), a B.S. in Chemistry with an Option in Forensic Science, a B.S. in Biochemistry, a B.A. in Biochemistry, a B.A. in Chemistry, a B.A. in Chemistry with an Option in Chemical Education and a B.A. in Biochemistry with an Option in Chemical Education. Additionally, the Department offers an M.S. Chemistry graduate degree, with four options: Chemistry Plan A (thesis), Chemistry Plan B (non-thesis), Biochemistry Plan A (thesis) and Biochemistry Plan B (non-thesis).

According to Fall 2011 enrollment data compiled by the Department of Chemistry and Biochemistry, there were 182 undergraduate majors (an 18% increase since 2007) and 54 graduate students served by a tenured/tenure-track full-time equivalent faculty (FTEF) of 6.3, generating a full-time equivalent student (FTES) level of 302.2, an increase of 18% from 2007, which reflects the growth of the Department in the past five years. In the fall of 2011, the Department had a Total Instructional FTEF (Tenured-Track FTEF + Lecturer FTEF) of 13.6, down from a high of 14.4 in 2007, which is most likely due to the deficiency of tenured-tenure track faculty over the past five years. So, as expected the student-faculty ratio increased from 17.8 in 2007 to 22.2 in 2011.

### ***Overview of Documents Submitted to CAPR***

The Department of Chemistry and Biochemistry provided a report concerning all their degree programs, including a detailed self-study, which included a summary of their programmatic assessment strategies and data, their five-year plan, the external reviewer's report, program response to external reviewer's report and eight appendices (listed as A – H). The documents include the expected content for five-year review documentation as specified by the Academic Program Review Procedures. CAPR notes that a summary of the previous five-year review is included in the Department self study.

### ***Program's Five-Year Review Self-Study***

The Department of Chemistry and Biochemistry provided a detailed self-study. The self-study includes thorough descriptions of the changes that have been developed and implemented since the last five-year review, notable achievements of the department, and areas of need and focus for continued improvements for the coming five years. It should also be noted that the Department of Chemistry and Biochemistry five-year proposal was extremely well written, and detailed with excellent presentation of past and present data.

## **CAPR ANALYSIS OF THE PROGRAMS FIVE-YEAR REVIEW:**

### ***The Department***

The Department of Chemistry and Biochemistry currently consists of eight full-time Tenure-Track faculty and at least ten part-time lecturers in any given quarter. At the beginning of the Fall quarter in 2007 the department had 149 undergraduates, nine post-baccalaureate, and 47 graduate students. By 2011, the Department increased the number of majors to 182, which is an 18% increase from 2007 enrollments. There were 47 graduate students enrolled in the Department at the beginning of the Fall quarter in 2007, which had increased to 54 by the beginning of the Fall quarter of 2011, a 17% increase in graduate enrollments, but only two post-baccalaureates in 2011. This last result should not be of concern since the CSU system eliminated post-baccalaureate status and in 2012 implemented the Pre-Professional Health Academic Program (PHAP) for Science students. Many of the Science-oriented post-baccalaureate students now enter PHAP to gain the additional chemistry/biochemistry courses they need to continue on with their education. In fall of 2007 the Department generated 257 FTES. The Department has experienced significant growth in the number of undergraduate and graduate students enrolled in program courses and the FTES generated in the last five years has increased to 302. Highlights of the program are given below.

### ***Curriculum***

Since its last five-year review, the Department has revised and significantly grown its programs. The Departmental revisions include the addition of an MS degree in Chemistry with an Option in Biochemistry-Plan B (Comprehensive Review), a B.A. in Chemistry with an Option in Chemical Education and a B.A. in Biochemistry with an Option in Chemical Education. The Department has added a new major course, Instructional Activities in Chemistry (CHEM 4400) and two non-major-courses, Foundational Chemistry (CHEM 3011) and Foundational Chemistry Laboratory (CHEM 3012). CHEM 3011 is an on-line course, which prepares future and in-service teachers to do well on the CSET General Science Subset in Chemistry, with the ultimate goal for future educators to obtain a Science Foundational Credential.

The Chancellor's Office has decided that all degree programs need to be at 180 units. Three of the degree programs in the Department exceeded the 180-unit requirement: the B.S. in Chemistry, B.S. in Chemistry-Forensic Science Option and the B.S. in Biochemistry. The B.S. in Chemistry is accredited by the American Chemical Society (ACS), which has strict requirements to maintain accreditation. To meet the 180 unit requirement, the Department has dropped courses that are not required for accreditation for the B.S. Chemistry degree or where instruction can be gained in other courses (e.g. Introduction to Computers).

Due to the untimely death of one of their esteemed biochemists and the retirement of several others, the number of major courses taught by tenured-faculty took a dramatic hit early in this review period. Over the years, with the hiring of new faculty, the trend is now reversing itself and faculty are now teaching many of the major courses. Additionally, with the hiring of new tenure track faculty, new courses will be added to the curriculum. As stated above, the Department added an Option in Chemistry Education to their degree programs and a new course was created (CHEM 4400 Instructional Activities in Chemistry) to help future educators gain valuable experience by having a service-learning component to the course (i.e. tutoring, working with middle or high

school teachers). This course will also be available as an elective to students pursuing the B.A. Chemistry and B.A. Biochemistry degree programs. As additional faculty members are hired they will be expected to create new courses that will help to strengthen the overall curricula.

Through the University A2E2 grants, the Department has been able to upgrade and purchase new equipment for the lab courses. Moreover, the College of Science has provided funds to extend service contracts on expensive and important instruments or to fix equipment that is in need of repair. These two funding opportunities have begun to modernize the instrumentation that is used for labs and graduate student research in the Department of Chemistry and Biochemistry. The Department has strengthened its curriculum at the CSUEB Concord Campus as well by offering the Pre-Nursing courses Basic Chemistry I and II (CHEM 1601-02).

In all, the curriculum offered by the Department of Chemistry and Biochemistry has increased and strengthened between 2007 and 2011. By hiring new faculty, developing more courses and continuing to purchase new equipment the Department is becoming one of the strongest in the College of Science.

***Assessment of Student Learning:***

The Department of Chemistry and Biochemistry Mission Statement is in line with those of other Departments within the College of Science. The Department provides thorough, clear descriptions of its mission in terms of educational purpose and goals with regards to students enrolled in the major. The objective is to increase problem-solving and critical thinking skills for all majors and help to educate and make non-science students appreciate the power of chemistry in everyday life. A major goal is to train students to think at an advanced chemical level. This mission is very much in line with the Mission of the University, which is to provide an academically rich learning experience that prepares students to realize their goals, to pursue meaningful work and to contribute to the community. The Department wants to ensure that the Master's program will graduate students who will be competitive and successful in the next step of their academic journey, be it industry, government work or on to a terminal degree program.

The best way to understand how successful a department is at realizing its Mission is to have an effective system of self-assessment. I want to congratulate the Department of Chemistry and Biochemistry on an excellent method of self-assessment. The Department has listed nine General Learning Objectives (GLO) that students should have achieved at the completion of their Bachelor of Science (B.S.) or Bachelor of Arts (B.A.) degree program. The Department goes on to list and give supplementary information on each GLO. The Department has similar, but distinct differences, regarding the B.S. and B.A. GLOs. Additionally, the Department implements similar criteria for the M.S. in Chemistry, which includes four different options (Plan A and Plan B, either for Chemistry or Biochemistry). The Plan A options require a University thesis, i.e., completion of an experimental research project and the writing of a thesis, while the Plan B options require a comprehensive examination based on a literature review. The learning outcomes for students in the Masters program are in line with the Masters program at other CSUs in the system.

To assess each degree program, overall student learning objectives/goals are stated in quantifiable/observable terms (e.g., "to carry out accurate and careful analyses, both

experimental and statistical, of real world problems and to express these analyses as the meaningful oral and written communication), as are specific competencies (e.g., “working as a group and individually for analysis of data and reaching shared conclusions based on experimental data”).

***Resources:***

The Department of Chemistry and Biochemistry has started to replace old and outdated equipment with state of the art instruments currently used in modern chemistry and biochemistry labs. This will give students much needed experience to be successful in industry, government or academic laboratory positions. The faculty supervise large number of students for individual research projects and should be given assigned time for this work, as it takes a great amount of time to train a student to accomplish publication quality research. This is also in line with the suggestions from the outside reviewer. CAPR supports the association between the Department of Chemistry and Biochemistry and the American Chemical Society. This strengthens the Department and provides students with awards and criteria needed to have a successful career in chemistry/biochemistry.

**CAPR RECOMMENDATIONS FOR CONTINUING THE PROGRAM**

Recommendations for the Department of Chemistry and Biochemistry include working with the Provost's office on addressing faculty and staffing resources. Allocation for faculty hires needs to provide an adequate breadth of courses, advising, and allow for the ability to meet the demands of the several options within the majors. In addition, it is recommended the Department continue its excellent assessment work and include mapping Institutional Learning Outcomes (ILOs) to program and student learning outcomes. The Department is also encouraged to explore other course professional development opportunities such as an oral defense for Plan A Master's students who plan on moving into Ph.D. programs, where an oral defense will be a requirement to successfully obtain the degree.

**DATE OF THE PROGRAM'S NEXT FIVE-YEAR REVIEW: AY 2017-2018**