California State University, East Bay

Department of Chemistry and Biochemistry

Annual Report – Chemistry and Biochemistry Programs

2008 – 2009

Submitted to
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A. Self Study

At the suggestion of the Committee on Academic Planning and Resources (CAPR) of 2007-2008, the Five Year Program Reviews for the Chemistry and Biochemistry programs were combined into one document. The two programs are quite intertwined, since the undergraduate Biochemistry degrees require many units of chemistry, and the Chemistry Master of Science Degree program includes both Chemistry and Biochemistry Options. In accordance with the CAPR decision for the last Five Year Review, one Annual Report is being submitted for the two programs. Consequently, sections A and B together take up five pages.

During 2008-2009 progress was made toward the goals outlined in the 2007-2008 Five Year Program Review, and some new initiatives were added. As planned, we were able to offer the Pre-Nursing Chemistry series on the Concord campus for the first time in 2008-2009. Structural renovation of one of the classroom laboratories to bring it up to code for chemistry experimentation was completed. The necessary equipment and supplies were purchased and organized, and a part-time laboratory technician was hired to prepare the reagents for the classes. The Pre-Nursing lecture/lab classes CHEM 1601 and CHEM 1602 were offered in Fall 2008 and Winter 2009, respectively. The plan to add computer-based structural analysis to the Protein Structure course (CHEM 4440) was also realized during this year. Dr. Sommerhalter introduced the use of the macro-molecular modeling and visualization software programs COOT, DS Visualizer, and Cn3D into the course.

Two proposed new courses were approved and offered for the first time in 2008-2009. These were a two unit Senior Thesis course (CHEM 4811) to be used as a vehicle for students who have completed an undergraduate research project to document their results, and the General Chemistry Supplemental Instruction courses CHEM 1112 and CHEM 1113.

In Fall of 2008, Dr. Tony Masiello joined our faculty as a new Assistant Professor. In January 2009 our only Full Professor, Dr. Joy Hayter, left on an extended Professional Leave to take a job at Stanford University. We hope she will return but it is likely she will not. For that reason, the statistics showing we gained a tenured/tenure track faculty member in Fall 2008 do not reflect the actual situation. The number of working faculty remains at seven. Dr. Chul Kim was awarded tenure and promotion to Associate Professor in Spring of 2009.

While the number of biochemistry majors has remained fairly constant over the last five years, the number of chemistry majors has risen about 69% and the number of graduate students has tripled. During that period the department FTES rose about 45% but the effective number of tenured or tenure track faculty remained at seven (or eight if Dr. Hayter is counted). To teach the extra class sections necessitated by the higher enrollments, the number of part-time lecturers rose from four in 2003 to twelve in 2008 and the percentage of FTES taught by part-time lecturers increased from 23.3% to 58.7%.

The efforts to improve the Chemistry and Biochemistry programs over the last few years have been relatively successful, in our view, although new issues have arisen. We now have a number of relatively young, enthusiastic faculty members who are excellent teachers and popular with the students, and this is helping us to cope with the increasing numbers of chemistry undergraduate majors, Master's candidates and higher FTES overall. Unfortunately, the hiring of tenured and tenure track faculty has not kept up with the enrollment increases (and

loss of faculty) so the percentage of FTES taught by part-time lecturers has risen significantly. This is impacting some of our majors-level courses, especially in the biochemistry and analytical chemistry areas.

The 2008-2009 assessment results for our chemistry and biochemistry majors indicate the majority (63-79%) are achieving the defined learning objectives, although there remains room for improvement (see section B). It is important to realize that inconsistencies arising from the use part-time lecturers for majors-level courses have the potential for impacting the success of our students. On the positive side, all of our tenured or tenure track faculty members now have active research programs and we routinely provide opportunities for undergraduate and graduate students to participate in supervised laboratory research projects; the development of the new CHEM 4811 course means undergraduates can now document their results in a Senior Thesis. These research experiences are invaluable for students planning to work in the chemical or pharmaceutical industries or to go on to graduate or professional school. The potential loss of one of our top faculty members (on professional leave at another job) will undoubtedly have an impact but we are happy to have been able to add a new tenure track faculty member during 2008-2009.

B. Summary of Assessment Results for 2008-2009

1. Performance measurements for Chemistry and Biochemistry majors at the end of the year-long Organic Chemistry lecture/laboratory series (CHEM 3301-02-03)

Learning Outcomes for lecture: To know the structures of major classes of organic compounds and the types of reactions they undergo; to be able to predict physical properties of organic chemicals and to use spectroscopic methods to identify them

Assessment Method: Standardized American Chemical Society (ACS) Organic Exam

Because the department agreed to beta test a new ACS Organic Chemistry exam in 2008 there were no national norms available. The exam was administered as the final exam for CHEM 3303 and student scores for the chemistry and biochemistry majors are available, but we are not able to compare the results with those of a nationwide student group.

Learning Outcomes for the laboratory: To be able to carry out standard organic laboratory techniques, demonstrate knowledge of chemical reactivities, obtain and interpret spectroscopic data, and use problem solving and critical thinking skills to identify two chemical unknowns

Assessment Method: A capstone laboratory assignment to be accomplished over several periods served as the performance test. Students were asked to identify two unknown chemicals using various reactions and techniques learned during the year.

Table 2. Results of Capstone Organic Laboratory Assignment for 2006 – 2008

Year	# of Chem/Biochem Majors	# with both correct	% with both correct	# with at least one correct	% with at least one correct
Sp 2006	22	18	82	22	100
Sp 2007	12	5	42	10	83
Sp 2008	10	7	70	9	90

Key Results and Analysis of Organic Assessment for 2008-2009: Student percentiles for the standardized ACS exam could not be calculated for 2008 since a new exam was beta tested. However the capstone laboratory exercise was evaluated. The percentage of students able to identify at least one unknown chemical using the techniques learned during the year rose from 83% in Spring 2007 to 90% in Spring 2008. The percentage of students able to identify both compounds was 70%, a respectable number, and much higher than the percentage able to achieve this goal in 2007. The dip in 2007 (to 42%) was very troubling and the instructors worked especially hard during the 2007-08 academic year to emphasize the importance of independent work and analysis to the students, and tried to formulate exercises that would prepare the students for the type of thinking required for the capstone laboratory assignment. While there is still room for improvement the department is reasonably pleased with this year's results which indicate that most of the Chemistry and Biochemistry majors are able to put the principles they have learned in the organic chemistry series to use in a practical way in the laboratory.

2. Performance measurements for Biochemistry majors in 4000 level required courses (CHEM 4411-12-13, CHEM 4431)

Learning Outcomes for lecture series: see Table 3. The outcomes tested are chosen from topics covered throughout the year-long course series.

Assessment Method: Embedded exam questions

Results: See Table 3 on the next page.

Table 3. Assessment Results for Biochemistry Majors - General Biochemistry Lecture Material, 2008 – 2009

Learning Outcome	Question No.	No. of Students	% with Correct Answer	This year's Average (2008-09)	Earlier Average(s) 2007-08)
Master the structures + properties of amino acids	1 2	21 21	62 71	67	-
Recognize common structural motifs in proteins	1	21 21	76 81	79	-
Know the properties of enzymes	1 2	21 21	62 67	65	67*
Understand basics of enzyme kinetics	1 2	21 21	76 76	76	-
Understand the basic details of the major metabolic pathways	1-16	14	63 (Aver.)	63	-
Know DNA and RNA structure	1 2 3	24 24 24	50 79 100	76	83
Understand molecular basis for DNA Replication	1 2	24 24	65 79	72	-

Learning Outcome for laboratory: To correctly analyze the data for a multipart experiment designed to localize an RNA initiation site on *E. coli* DNA; to interpret the results and define the site.

Assessment Methods: Embedded multi-part essay question on exam; laboratory write-up in lab notebook.

Table 4. Assessment Results for Capstone Laboratory Exercise for Biochemistry majors for 2006-2008

Year	# of Biochem Majors	# successful	% successful
Sp 2006	16	12	75
Sp 2007	21	18	86
Sp 2008	25	20	80

Key Results and Analysis for Biochemistry Assessment for 2008-2009: As a general goal, we are aiming for percentages of correct answers above 75% for all the outcomes. The data for the general knowledge or lecture outcomes shown in Table 3 indicate the student majors either achieved that goal or were not too far from it in 2008-2009. The scores ranged from 63% to 79% of the students achieving the outcome, with values above 75% for three of the seven outcomes tested. The results for the Capstone Laboratory Exercise, which is designed to measure critical thinking skills, were down a little this year. Whereas 86% of the students achieved the outcome in Spring 2007, only 80% were successful in Spring 2008 (see Table 4). From the data we have for 2006 through 2008 we can speculate that there may be some yearly fluctuations related more to the particular student group than to the teaching methods.

Overall, we conclude that our students are doing reasonably well, but there is definitely room for improvement. The instructors for the relevant courses are working to improve student learning using a variety of teaching tools such as student discussion sessions, specialized homework problems and group data analysis sessions for the laboratory course.

C. Program Data Summary - 2008-2009

California State University, East Bay

Chemistry and Biochemistry

	Fall Quarter					
A. Students	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
1. Undergraduate	118	118	141	136	140	146
2. Graduate + Post-Baccalaureate	28	37	36	45	56	66
3. Total Number of Majors	146	155	177	181	196	212
4. FTES Generated	194.6	225.7	229.0	245.3	257.0	280.8

	College Years					
B. Degrees Awarded	**02-03**	**03-04**	**04-05**	**05-06**	**06-07**	**07-08**
1. Undergraduate	19	22	30	29	35	29
2. Graduate	3	4	5	4	11	7
3. Total	22	26	35	33	46	36

	Fall Quarter					
C. Faculty	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Tenured/Track Headcount						
1. Full-Time	7	7	7	7	7	8
2. Part-Time	2	2	2	2	0	0
3. Total Tenure Track	9	9	9	9	7	8
Lecturer Headcount						
4. Full-Time	0	0	0	0	0	0
5. Part-Time	4	5	6	5	10	12
6. Total Non-Tenure Track	4	5	6	5	10	12
7. Grand Total All Faculty	13	14	15	14	17	20
Instructional FTE Faculty						
8. Tenured/Track	7.0	7.0	8.5	8.5	6.4	5.0
9. Lecturer	2.5	3.9	3.8	3.7	8.1	9.4
10. Total Instructional FTEF	9.5	10.9	12.3	12.2	14.4	14.3
Lecturer Teaching						
11. % Lecturer/Total Instructional FT	26.3%	35.8%	30.9%	30.3%	56.3%	65.7%
12. FTES Taught by Lecturer	45.3	89.9	65.7	64.9	121.5	164.8
13. % FTES Lecture/FTES Generated	23.3%	39.8%	28.7%	26.4%	47.3%	58.7%

D. Student Faculty Ratios	Fall Quarter					
	2003	**2004**	**2005**	**2006**	**2007**	**2008**
1. Tenured/Track	20.4	21.3	19.2	21.2	21.3	23.3
2. Lecturer	22.5	18.1	17.3	17.5	15.1	17.6
3. SFR By Level (All Faculty)	21.2	20.5	18.6	20.1	17.8	19.6
4. Lower Division	23.7	24.8	22.7	23.9	20.4	23.6
5. Upper Division	17.8	18.9	16.7	19.1	18.4	18.7
6. Graduate	7.5	5.2	5.9	9.1	5.4	6.0
7. Number of Sections Offered	37	48	59	64	80	82
8. Average Section Size	26	23	30.4	31.9	26.2	26.7
	Fall Quarter					
A. Students	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Chemistry						
1. Undergraduate	39	37	50	46	56	66
2. Graduate + Post-Baccalaureate	22	25	27	37	50	61
3. Total Number of Majors	61	62	77	83	106	127
Biochemistry						
1. Undergraduate	79	81	91	90	84	80
2. Graduate + Post-Baccalaureate	6	12	9	8	6	5
3. Total Number of Majors	85	93	100	98	90	85

	College Years					
B. Degrees Awarded	**02-03**	**03-04**	**04-05**	**05-06**	**06-07**	**07-08**
Biochemistry						
1. Undergraduate	7	9	11	12	21	21
2. Graduate	0	0	0	0	0	0
3. Total Number of Degrees	7	9	11	12	21	21
Chemistry						
1. Undergraduate	8	10	9	8	8	7
2. Graduate	3	4	5	4	11	7
3. Total Number of Degrees	11	14	14	12	19	14

Fall HC Enrollment by Program & Degree Level: http://www.csueastbay.edu/ira/tables/FallHeadcountEnrollment/Fall.Headcount.Enrollment.1-2.pdf

Degrees Conferred by Program & Degree Level: http://www.csueastbay.edu/ira/tables/DegreesConferred/Degrees.Conferred.5-3.pdf

Student Faculty Ratios by Program: http://www.csueastbay.edu/ira/tables/UniversityEmployees/SFRs20012005.xls

Source and definitions available at: http://www.csueastbay.edu/ira/apr/summary/definitions.pdf