California State University, East Bay

Department of Chemistry and Biochemistry

Annual Report – Chemistry and Biochemistry Programs

2011 – 2012

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. Accordingly, one Annual Report is being submitted for the two programs. Consequently, sections A and B together take up five pages.

No major curricular initiatives were conducted during 2011-2012. We did change the grading for the seminar class required for the Master's students from Credit / No Credit to a letter grade in order to emphasize the importance of planning and executing a meaningful presentation. Students taking the Chemical Literature class were required to prepare a poster presentation. In accordance with Senate Bill 1440, which is designed to facilitate a smooth transition into a major at CSU for community college transfer students, we expect to align a chemistry Transfer Model Curriculum (TMC) with our major curricula once it is approved. A chemistry TMC was drafted in 2010-2011 by Discipline Input Groups (DIG) consisting of chemistry faculty from the CSU and the California Community Colleges representing northern and southern California. However, it has not yet been approved by the CSU Chancellor's Office and is currently under review by the chemistry Faculty Discipline Review Groups.

The department took advantage of the Provost's Instructional and Research Equipment program to apply for new equipment during 2011-2012. We were successful in obtaining funding for a new spectrofluorometer with polarization capability, a triple resonance probe for our 500 MHz nuclear magnetic resonance (NMR) spectrometer, a microplate reader with UV/VIS, fluorescence and luminescence detection, 16 new nucleic acid electrophoresis apparatuses and several protein electrophoresis and western blotting apparatuses. We also collaborated with the Department of Biological Sciences in requesting a new steam sterilizer, which was funded. Most of this new equipment will be useful both for research and for enhancing our classroom labs. We are especially excited about using the new spectrofluorometer and the microplate reader to introduce fluorescence-based experiments into our courses. The new electrophoresis equipment will replace aging apparatuses and provide a better classroom environment for the biochemistry labs. Through the Dean's new Contracts and Equipment Repairs program we were able to upgrade the software on our HP1100 High Performance Liquid Chromatograph (HPLC) and purchased a new computer to run the software. HPLC is used to introduce large instrumentation into our curriculum in Quantitative Analysis and is also used in four other courses. We also obtained two new melting point apparatuses and a new refractometer for the organic chemistry teaching laboratories. Additionally, the Dean's program funded service contracts for the NMR, GC-Mass Spectrometer and HPLC instruments.

The total number of chemistry and biochemistry majors rose from 202 in 2010 to 236 in 2011 and is 30% higher than five years ago (see Part C). The department FTES has also risen 23% since 2006. However, the effective number of full-time tenured or tenure track faculty has remained at seven over the past five years and actually decreased when two part-time tenured faculty left in 2006. It has been necessary to hire part-time lecturers to teach the extra class sections generated by the higher enrollments. This is reflected in the statistics showing that the percentage of FTES taught by part-time lecturers increased from 26.4% in Fall 2006 to 44.7% in Fall 2011. After several years without significant new tenure track hires, the administration announced funding for new faculty positions in 2010 and we were able to conduct a search for a new biochemist this year. Unfortunately, the search failed when all three candidates deemed

acceptable by the search committee took other jobs. We re-applied for the position as a rollover and also requested a position for an Analytical or Inorganic Chemist. Both requests were approved so we will conduct two tenure track searches in 2012-2013. Several of our existing faculty were promoted in 2012. Monika Sommerhalter earned tenure and promotion to Associate Professor and Anne Kotchevar and Michael Groziak were both promoted to Professor.

The 2011-2012 assessment results for our chemistry and biochemistry majors are presented in Part B. The organic assessment numbers were better this year than in 2010-2011 and the biochemistry assessment numbers also showed improvement. The average percentile earned on the standardized exam given at the end of the organic chemistry series rose from 34 in Spring 2010 to 41 in Spring 2011. Our goal for the students is to reach the national average of the 50th percentile or close to it. The exam is difficult but we think our students can reach this goal and the organic instructors continue to emphasize the concepts and mechanisms that will build the student knowledge base. The capstone laboratory assessment data for organic and the values for the biochemistry assessment indicate the majority of our majors are achieving the defined learning objectives, although there remains room for improvement. 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. However, overall we are reasonably pleased with our students' performance.

B. Summary of Assessment Results for 2011-2012

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

Table 1. Results of Standardized ACS Exam for 2006 – 2011

Year	Percentile
2006	42
2007	47
2008	N/A
2009	45
2010	34
2011	41

Note: In 2008 we beta tested a new exam so there were no national norms available.

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 – 2011

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
Sp 2009	17	10	74	14	95
Sp 2010	25	12	48	21	84
Sp 2011	26	15	58	23	88

Key Results and Analysis of Organic Assessment for 2011-2012: The average student percentile for the standardized ACS exam increased significantly over 2010, from 34% to 41% and was closer to the values recorded in earlier years. The organic instructors worked hard on improving student understanding of concepts and mechanisms over the last year and the student scores did improve. Our goal for the students is to achieve the national average or above and we will continue to strive toward this aim. The results for the capstone laboratory exercise also improved over last year. The percentage of students able to identify at least one unknown chemical using the techniques learned during the year rose from 84% in Spring 2010 to 88% in Spring 2011. The percentage of students able to identify both compounds this year was 58%, up from 48% in Spring 2010. There is still considerable room for improvement, especially for the number of students able to identify both compounds. The instructors will continue to work with the students on critical thinking skills as they relate to use of laboratory techniques to solve problems. For now we can say that the majority of the chemistry and biochemistry majors completing the organic chemistry series in Spring 2011 were able to put the principles they learned over three quarters 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

Assessment Method: Embedded exam questions

(See next Page)

Table 3. Assessment Results for Biochemistry Majors - General Biochemistry Lecture Material 2011-2012

Learning Outcome	Question No.	No. of Students	% with Correct Answer	This year's Average (2011-12)	Earlier Average(s) 09-10	10-11
Know structures + properties of amino acids	1 2	26 26	69 73	71	61	-
Recognize common structural motifs in proteins	1	26	77	77	73	-
Know properties of enzymes	1	26	62	62	67	69
Understand basics of enzyme kinetics	1 2	26 26	81 77	79	73	74
Understand protein regulatory mechanisms	1 2 3	26 26 26	73 81 85	80	64	-
Understand the basic details of the major metabolic pathways	1 2 3	21 21 21	76 90 81	83	59	51
Know DNA and RNA structure	1 2 3	31 31 31	77 81 81	80	81	80
Understand molecular basis for DNA Replication	1 2	-	-	70	73	-

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 essay question on exam; laboratory write-up in lab notebook.

Table 4. Assessment Results for Capstone Laboratory Exercise for Biochemistry majors for 2006-2011

Year	# of Biochem Majors	# successful	% successful
Sp 2006	16	12	75
Sp 2007	21	18	86
Sp 2008	25	20	80
Sp 2009	19	14	74
Sp 2010	-	-	-
Sp 2011	33	26	79

Key Results and Analysis for Biochemistry Assessment for 2011-2012: As a general goal, we are aiming for percentages of students with correct answers above 75% for all the outcomes. The results for the general knowledge or lecture outcomes for 2011-2012 look fairly good

(Table 3). The scores ranged from 62% to 83% and most were up from the previous year; for five of the eight outcomes tested the values were above 75%. The results for the Capstone Laboratory Exercise, which is designed to measure critical thinking skills, were also good, with 79% of the students successful in achieving the outcome in Spring 2011 (Table 4). From the data we have for 2006 through 2011 we can conclude that on average a high majority of the biochemistry majors graduating from our program are achieving the goal of applying critical thinking skills to practical problems in their field.

Overall, we conclude that our biochemistry students are doing reasonably well, but there is room for improvement. The instructors for the relevant courses are continuing to experiment with a variety of teaching tools such as specialized homework problems, student discussion groups and data analysis sessions in an effort to help as many students as possible achieve the learning goals.

C. Program Data Summary - 2011-2012

California State University, East Bay

Chemistry and Biochemistry

	Fall Quarter					
A. Students	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
1. Undergraduate	136	140	146	148	150	180
2. Graduate + Post-Baccalaureate	45	56	66	55	52	56
3. Total Number of Majors	181	196	212	203	202	236
4. FTES Generated	245.3	257.0	280.8	292.7	269.0	302.2

	College Years					
B. Degrees Awarded	**05-06**	**06-07**	**07-08**	**08-09**	**09-10**	**10-11**
1. Undergraduate	29	35	29	28	22	30
2. Graduate	4	11	7	12	15	13
3. Total	33	46	36	40	37	43

	Fall Quarter					
C. Faculty	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Tenured / Track Headcount						
1. Full-Time	7	7	8	8	7	7
2. Part-Time	2	0	0	0	1	0
3. Total Tenure Track	9	7	8	8	8	7
Lecturer Headcount						
4. Full-Time	0	0	0	0	0	0
5. Part-Time	5	10	12	12	Not Available	Not Available
6. Total Non-Tenure Track	5	10	12	12	-	-
7. Grand Total All Faculty	14	17	20	20	-	-

Instructional FTE Faculty						
8. Tenured/Track	8.5	6.4	5.0	6.3	5.6	6.3
9. Lecturer	3.7	8.1	9.4	6.6	6.2	7.4
10. Total Instructional FTEF	12.2	14.4	14.3	12.9	11.8	13.7
Lecturer Teaching						
11. % Lecturer/Total Instructional FT	30.3%	56.3%	65.7%	51.2%	52.5%	54.0%
12. FTES Taught by Lecturer	64.9	121.5	164.8	140	112	135
13. % FTES Lecture/FTES Generated	26.4%	47.3%	58.7%	47.8%	41.6%	44.7%

D. Student Faculty Ratios	**Fall Quarter**					
	2006	**2007**	**2008**	**2009**	**2010**	**2011**
1. Tenured/Track	21.2	21.3	23.3	24.1	28.3	26.7
2. Lecturer	17.5	15.1	17.6	21.2	18.0	18.3
3. SFR By Level (All Faculty)	20.1	17.8	19.6	22.6	22.9	22.2
4. Lower Division	23.9	20.4	23.6	26.3	26.8	22.1
5. Upper Division	19.1	18.4	18.7	19.5	23.0	23.6
6. Graduate	9.1	5.4	6.0	11.2	7.0	14.9
7. Number of Sections Offered	64	80	82	79.0	63.0	71.0
8. Average Section Size	31.9	26.2	26.7	30.8	33.7	32.5
	Fall Quarter					
A. Students	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Chemistry						
1. Undergraduate	46	56	66	56	62	76
2. Graduate + Post-Baccalaureate	37	50	61	49	48	54
3. Total Number of Majors	83	106	127	105	110	130
Biochemistry						
1. Undergraduate	90	84	80	92	88	104
2. Graduate + Post-Baccalaureate	8	6	5	6	4	2
3. Total Number of Majors	98	90	85	98	92	106

	College Years					
B. Degrees Awarded	**05-06**	**06-07**	**07-08**	**08-09**	**09-10**	**10-11**
Biochemistry						
1. Undergraduate	12	21	21	20	18	23
2. Graduate	0	0	0	0	0	0
3. Total Number of Degrees	12	21	21	20	18	23
Chemistry						

1. Undergraduate	8	8	7	8	4	7
2. Graduate	4	11	7	12	15	13
3. Total Number of Degrees	12	19	14	20	19	20

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