

California State University, East Bay
Department of Chemistry and Biochemistry

Annual Report – Chemistry and
Biochemistry Programs

2009 – 2010

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.

As planned in the 2007-2008 Five Year Program Review, we developed a new non-thesis M.S. Chemistry, Option in Biochemistry degree program and it was approved in 2009-10. The new degree provides a vehicle for students who work in industry or aren't able to do a thesis research project for other reasons to study chemistry with a biochemistry emphasis and obtain the M.S. degree. In other curriculum work we formulated the new B.A. Chemistry, Option in Chemistry Education and B.A. Biochemistry, Option in Chemistry Education degree programs and submitted them for review. As part of these programs a new two unit course entitled "Instructional Activities in Chemistry," (CHEM 4400) was proposed and approved for inclusion in the 2010 university catalog. The new course will have a lecture component and also a service requirement where the students will work as prospective educators, e.g. as tutors, teachers aides, etc.

The year was a rather tumultuous one for the department. We started a search for a badly needed tenure track biochemist only to have the administration halt all searches mid-year due to the worsening budget situation. One of our most productive faculty members, Dr. Joy Hayter, who had taken a professional leave in 2008-09 to work at Stanford University, retired permanently from CSU East Bay. Thus the number of working tenured or tenure track faculty is seven, not eight as indicated in the Statistics Report. Both of our office staff members left the department, one retired and the other moved on to a higher paying position. We currently have one temporary staff person manning the Chemistry office. Also, our longtime Instructional Support Technician III retired and will not be replaced. It has been a challenge to find substitutes to teach the classes taught by Dr. Hayter and to encourage the remaining staff members to pick up the workload previously handled by employees who will not be replaced in the near future because of the budget situation.

In June of 2009 the department submitted the Periodic Report for renewal of accreditation of our B.S. Chemistry degree to the American Chemical Society.

The total number of chemistry and biochemistry majors dipped slightly over the last year but remains about 15% higher than five years ago (see Part C). The department FTES has risen 28% since 2005. However, the effective number of tenured or tenure track faculty has remained at seven over the past five years. To teach the extra class sections necessitated by the higher enrollments, the number of part-time lecturers rose from six in 2006 to twelve in 2009 and the percentage of FTES taught by part-time lecturers increased from 28.7% to 47.8%. (The 47.8% figure is actually an underestimate since it assumes Dr. Hayter is

teaching in our department). 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 2009-2010 assessment results for our chemistry and biochemistry majors indicate the majority are achieving the defined learning objectives, although there remains room for improvement (see section B). The organic assessment numbers were better this year than in 2008-09 whereas the biochemistry assessment numbers dipped a little. The biochemistry instructors are experimenting with new learning methodologies in hopes of improving the success rates for the students. 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 pleased with the performance of our students (see below).

B. Summary of Assessment Results for 2009-2010

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 – 2009

Year	Percentile
2006	42
2007	47
2008	N/A
2009	45

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 – 2009

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

Key Results and Analysis of Organic Assessment for 2009-2010: The average student percentile for the standardized ACS exam was similar to the values recorded in earlier years and was just below the national average at 45%. Our goal for the students is to achieve the national average or above. The organic instructors will continue to strive toward this goal with continued attention to concepts and mechanisms. It should be noted that the standardized test is difficult and our student scores are respectable but could certainly be better. Evaluation of the capstone laboratory exercise indicated that the percentage of students able to identify at least one unknown chemical using the techniques learned during the year rose from 90% in Spring 2008 to 95% in Spring 2009. The percentage of students able to identify both compounds this year was 74%, a respectable number, and up slightly from Spring 2008. 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 independently 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

Assessment Method: Embedded exam questions

(See next page).

Table 3. Assessment Results for Biochemistry Majors - General Biochemistry Lecture Material 2009 – 2010

Learning Outcome	Question No.	No. of Students	% with Correct Answer	This year's Average (2009-10)	Earlier Average(s) 08-09	07-08
Know structures + properties of amino acids	1	17	71	61	67	72
	2	17	59			
	3	17	51			
Recognize common structural motifs in proteins	1	15	73	73	79	72
Know properties of enzymes	1	15	67	67	65	64
	2	15	67			
Understand basics of enzyme kinetics	1	15	73	73	76	68
	2	15	73			
Understand protein regulatory mechanisms	1	15	73	64	-	-
	2	15	73			
	3	15	47			
Understand the basic details of the major metabolic pathways	1	16	94	59	63	-
	2	16	44			
	3	16	31			
	4	16	69			
Know DNA and RNA structure	1	18	83	81	76	83
	2	18	78			
	3	18	83			
Understand molecular basis for DNA Replication	1	18	78	73	72	70
	2	18	67			

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 2006-2009

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

Key Results and Analysis for Biochemistry Assessment for 2009-2010: The scores for the general biochemistry knowledge or lecture goals given in Table 3 indicate that the percentage of student majors who achieved the outcomes ranged from 61% to 81% in 2009-2010. As a general goal, we are aiming for percentages of correct answers above 75% for all the outcomes. Many of the numbers for 2009-2010 are down slightly from the previous year and the 75% goal was achieved for only one of the outcomes compared with three for 2008-2009. However, a comparison of the values for the three years 2007 through 2010 shows reasonable consistency within the year to year results for each outcome. The instructors are working especially hard to improve student understanding of the outcomes in the 60-70% range, which represent the more difficult concepts.

The results for the Capstone Laboratory Exercise, which is designed to measure critical thinking skills, were also down a little this year. Whereas 80% of the students achieved the outcome in Spring 2008, only 74% were successful in Spring 2009 (see Table 4). Overall, we conclude that our students are doing reasonably well, but there is room for improvement. The instructors for the relevant courses are experimenting with active learning techniques in an effort to help as many students as possible achieve the learning goals.

C. Program Data Summary - 2009-2010

California State University, East Bay

Chemistry and Biochemistry

A. Students	Fall Quarter					
	2004	2005	2006	2007	2008	2009
1. Undergraduate	118	141	136	140	146	148
2. Graduate + Post-Baccalaureate	37	36	45	56	66	55
3. Total Number of Majors	155	177	181	196	212	203
4. FTES Generated	225.7	229.0	245.3	257.0	280.8	292.7

B. Degrees Awarded	College Years					
	03-04	04-05	05-06	06-07	07-08	08-09
1. Undergraduate	22	30	29	35	29	28
2. Graduate	4	5	4	11	7	12
3. Total	26	35	33	46	36	40

C. Faculty	Fall Quarter					
	2004	2005	2006	2007	2008	2009
Tenured/Track Headcount						
1. Full-Time	7	7	7	7	8	8
2. Part-Time	2	2	2	0	0	0
3. Total Tenure Track	9	9	9	7	8	8

Lecturer Headcount						
4. Full-Time	0	0	0	0	0	0
5. Part-Time	5	6	5	10	12	12
6. Total Non-Tenure Track	5	6	5	10	12	12
7. Grand Total All Faculty	14	15	14	17	20	20
Instructional FTE Faculty						
8. Tenured/Track	7.0	8.5	8.5	6.4	5.0	6.3
9. Lecturer	3.9	3.8	3.7	8.1	9.4	6.6
10. Total Instructional FTEF	10.9	12.3	12.2	14.4	14.3	12.9
Lecturer Teaching						
11. % Lecturer/Total Instructional FT	35.8%	30.9%	30.3%	56.3%	65.7%	51.2%
12. FTES Taught by Lecturer	89.9	65.7	64.9	121.5	164.8	140
13. % FTES Lecture/FTES Generated	39.8%	28.7%	26.4%	47.3%	58.7%	47.8%

D. Student Faculty Ratios	Fall Quarter					
	2004	2005	2006	2007	2008	2009
1. Tenured/Track	21.3	19.2	21.2	21.3	23.3	24.1
2. Lecturer	18.1	17.3	17.5	15.1	17.6	21.2
3. SFR By Level (All Faculty)	20.5	18.6	20.1	17.8	19.6	22.6
4. Lower Division	24.8	22.7	23.9	20.4	23.6	26.3
5. Upper Division	18.9	16.7	19.1	18.4	18.7	19.5
6. Graduate	5.2	5.9	9.1	5.4	6.0	11.2
7. Number of Sections Offered	48	59	64	80	82	79.0
8. Average Section Size	23	30.4	31.9	26.2	26.7	30.8
A. Students	Fall Quarter					
	2004	2005	2006	2007	2008	2009
Chemistry						
1. Undergraduate	37	50	46	56	66	56
2. Graduate + Post-Baccalaureate	25	27	37	50	61	49
3. Total Number of Majors	62	77	83	106	127	105
Biochemistry						
1. Undergraduate	81	91	90	84	80	92
2. Graduate + Post-Baccalaureate	12	9	8	6	5	6
3. Total Number of Majors	93	100	98	90	85	98

B. Degrees Awarded	College Years					
	03-04	04-05	05-06	06-07	07-08	08-09
Biochemistry						
1. Undergraduate	9	11	12	21	21	20
2. Graduate	0	0	0	0	0	00
3. Total Number of Degrees	9	11	12	21	21	20
Chemistry						
1. Undergraduate	10	9	8	8	7	8
2. Graduate	4	5	4	11	7	12
3. Total Number of Degrees	11	14	12	19	14	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>