COMMITTEE ON ACADEMIC PLANNING AND REVIEW
ANNUAL PROGRAM REPORT

College	CSCI
Department	Chemistry and Biochemistry
Program Unit	Chemistry and Biochemistry
Reporting for Academic Year	2013-2014
Department Chair	Ann McPartland
Date Submitted	10/06/14

1. SELF-STUDY (about 1 page)

A. Five-year Review Planning Goals

Our last five year program review was in 2012-2013. The goals listed in the plan for that review included course revisions and additions, improvements to the laboratory curriculum, tenure track faculty hiring, and staff replacement. The specific goals were:

1) Revise both the lecture and laboratory components of Introductory Chemistry (CHEM 1100) to better serve the liberal studies majors for whom the course is required
2) Teach the inorganic chemistry series (CHEM 4161-4162) every year instead of the current alternate year schedule to meet accreditation requirements and facilitate student graduation
3) Add the new Instructional Activities in Chemistry (CHEM 4400) course as a major elective to the B.S. Chemistry, B.A. Chemistry and B.A. Biochemistry degree programs, thereby allowing students to gain credit for service learning
4) Modify three of the degree programs to meet the CSU-wide goal of 180 maximum total units
5) Provide more 6000-level courses for the Master's program
6) Incorporate newly acquired instrumentation into the laboratory curriculum
7) Continue to upgrade the instrumentation used in teaching and research by seeking funding for new gas chromatographs and microwave synthesizers for the organic chemistry laboratory classrooms and a new high performance liquid chromatograph (HPLC) with fluorescence detection to be used in several laboratory classes and for research
8) Increase the number of biochemistry and chemistry courses taught by tenured or tenure track faculty by successfully completing current tenure track hires and continuing to apply for additional hires
9) Arrange for research laboratory space and office space for new faculty members
10) Hire a new Instructional Support technician to replace one of our classroom laboratory prep technicians who sadly passed away recently

B. Five-year Review Planning Goals Progress

The department made reasonable progress toward achieving the stated goals over the past year. Dr. LeDuc has nearly completed revision of the lecture component of Introductory Chemistry and is now

working on the lab. Most of the revisions should be in place for the Fall 2014 offering. Because of the successful hiring of a new tenure track Inorganic Chemist and increased enrollments, we are now in a position to offer the Advanced Inorganic Chemistry series (CHEM 4161-4162) every year, as required for accreditation of our B.S. Chemistry degree. We are offering CHEM 4161-4162 in 2013-14 and will again schedule it in 2014-15. We have not yet added Instructional Activities in Chemistry (CHEM 4400) as an elective for our B.S. Chemistry, B.A. Chemistry and B.A. Biochemistry degrees. Some faculty members are reconsidering the idea of including this course in the B.S. Chemistry degree. CHEM 4400 was developed for the B.A. Option in Chemistry Education degrees and is required for those programs.

The three degree programs that were over 180 units were modified to meet the 180 unit maximum dictated by recent amendments to Title 5 by the CSU Board of Trustees. In the case of the B.S. Chemistry program we were able to comply by reducing the elective units; the units for the B.S. Biochemistry degree were reduced by removing the computer science requirement. These changes should not impact the programs too seriously. Unfortunately it became necessary to delete the statistics course from the B.S. Chemistry, Option in Forensic Science and this does weaken the degree.

We have made some progress toward increasing the number of 6000-level courses for the Master's program. We proposed several ways of doing this. One was to increase the number of times the advanced topics courses CHEM 6310, CHEM 6410 and CHEM 6510 are taught each year. These courses cover modern chemistry or biochemistry topics, which can vary from offering to offering, and each Master's student is allowed to take each course twice. In recent years we have offered these courses just once a year because of faculty shortages. However, one of our new tenure track faculty members is developing a course on Computational Chemistry for CHEM 6510 to be taught in Spring 2014. As a result we will be able to offer CHEM 6510 twice during the 2013-2014 academic year.

We did incorporate our new instruments into the laboratory curriculum. These included a spectrofluorimeter, a microplate spectrometer and nanodrop spectrophotometers funded through the A2E2 Instructional and Research Equipment Program. We also obtained two refractometers through the College of Science. Dr. Kim designed a new experiment that employs the spectrofluorimeter for the Instrumental Methods of Analysis course, Dr. Sommerhalter designed experiments using the microplate spectrometer for the General Biochemistry Lab course, Drs. McPartland and Sommerhalter incorporated the Nanodrop Spectrophotometers into several lab courses and Drs. Groziak and Kotchevar used the new refractometers for the organic lab curriculum

The two 2012-2013 tenure track (TT) searches conducted by the department were both successful; we hired a new biochemist and a new inorganic chemist. These were sorely needed since about 67% of our course sections, including a number of majors-level and graduate courses, were taught by temporary faculty or teaching associates over the five years 2008-2013. The two new hires have allowed us to achieve goal 8, to increase the number of courses taught by tenured or TT faculty. However, we are still using a high number of temporary faculty. During 2013-2014 we are conducting a tenure track search for a physical chemist and we hope to search more tenure track faculty over the next several years. We were able to find research and office space for the new faculty members by rearranging the distribution of space in the department. However, there is no more to rearrange so we will look to the College of Science for help in finding additional space for new faculty. Finally we did hire a new Instructional Support Technician.

C. Program Changes and Needs

No needs for major changes in our Five Year Plan have emerged so far. One of our tenure track faculty members is currently on a two year professional leave and may not return. However, our Plan already includes attempts to acquire new faculty positions. We also lost two staff members over the last year but both have been replaced.

2. SUMMARY OF ASSESSMENT (about 1 page)

A. Program Student Learning Outcomes

Students graduating with a B.A./B.S. in Chemistry or Biochemistry from Cal State East Bay will:

1. demonstrate knowledge in the various areas of chemistry, including inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry, and biochemistry.
2. work effectively and safely in a laboratory environment to perform experimental procedures and operate modern chemical/biochemical instruments.
3. use quantitative reasoning to analyze chemical problems and evaluate chemical data.
4. write and speak clearly on chemical or biochemical issues.
5. work collaboratively in teams to solve chemical problems.

Students graduating with a Chemistry M.S. from Cal State East Bay will :

1. demonstrate specialized knowledge in the chemical sciences beyond the undergraduate level.
2. work effectively and safely in a laboratory environment using modern chemical/biochemical instrumentation and methods to test hypotheses or design solutions to problems.
3. understand, organize, and critically assess information from the chemical literature.
4. present complex chemical information via oral and written reports.
5. work collaboratively in teams to solve chemical problems.

B. Program Student Learning Outcome(s) Assessed

B.S./B.A. Chemistry or Biochemistry:

1. Demonstrate knowledge in the various areas of chemistry, including inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry, and biochemistry.
2. Work effectively and safely in a laboratory environment to perform experimental procedures and operate modern chemical/biochemical instruments.

M.S. Chemistry:

4. Present complex chemical information via oral and written reports.

C. Summary of Assessment Process

The undergraduate assessment is focused on specific learning outcomes in the areas of organic (CHEM 3301-02-03), physical (CHEM 3511-12-13), inorganic (CHEM 4161 and 4162) and biochemistry (CHEM 4411-12 and CHEM 4430). The methods include use of standardized national exams, capstone laboratory exercises, embedded exam questions and the ability to critically analyze experimental results.

D. Summary of Assessment Results

The detailed department assessment results for this reporting period are given in Appendix A. Undergraduate assessment of SLO-1 and SLO-2 focused on upper division courses in four areas of

chemistry: organic, physical, inorganic and biochemistry. Some of the results indicate that students are doing well and achieving the specific course outcomes whereas other results are difficult to interpret. The organic results (CHEM 3303) for SLO-2 indicate that most students (84-92%) are able to perform a capstone laboratory exercise on their own and identify at least one unknown chemical using techniques and instruments covered during the year-long series. This speaks to the success of the organic laboratory program. On the other hand the data for the standardized organic exam, which measures theoretical organic knowledge (SLO-1) was disappointing for the second year in a row (Table 2, Appendix A). The percentiles achieved by the student majors have decreased from a high of 47 in 2007 to 33 in 2013. Our goal for the students is to reach or exceed the national average (50). Since organic chemistry has been taught by the same faculty members using similar methods for the last six years one is tempted to blame random variation for the changes in scores. This year we will be able to substitute two new highly competent faculty members for teaching associates in the labs. We are hopeful this will provide better reinforcement of lecture concepts in the labs and lead to better mastery of the SLOs for organic chemistry.

The physical chemistry lecture series assessment measured SLO-1 by monitoring specific course outcomes through embedded exam questions for CHEM 3511-3512-3513. With the exception of a few questions where the results were strangely low, the data indicate that a majority of the students achieved the outcomes. However since our goal is for at least 75% of the students to master each outcome and this goal was reached for only a few questions, there is work to be done. The instructors plan to work collaboratively to develop strategies to improve the learning outcomes. Some possibilities include student group problem solving during lecture and extra review sessions to go over the homework.

The data for the standardized inorganic chemistry exam given to the CHEM 4162 students was reasonably good. Our student average was 54.6% and corresponds to approximately the national average. Although we hope for our students to achieve above the national average and will work toward this goal, we are pleased with the result.

The biochemistry results for SLO-1 (CHEM 4411-4412) were measured with embedded exam questions covering a series of course outcomes. The averages for the percentage of correct responses ranged from 40% to 82%, with most of the values above 55%. Again, however, we are aiming for 75% of the students achieving each outcome. Analysis via embedded questions is useful in providing information about specific areas of student weakness (or problems with the questions). Accordingly, during the upcoming year we will place special emphasis on the topics with the lower student scores. The biochemistry results (CHEM 4430) for SLO-2 indicate that by their senior year most students (73% to 100%) are able to correctly interpret experimental data and write a proper analysis in a laboratory notebook.

The results for SLO-4 for the graduate program clearly show an improvement in student ability to present complex chemical information in a seminar format as they proceed from their first presentation to the third seminar. Whereas the average student rating was 74.7% for students giving the first presentation, it rose to 80.3% for the second and to 85.9% for the third. We feel this shows student success in learning to analyze and present chemical information through our graduate seminar course (CHEM 6820), which the students are required to take three times.

For the upcoming year we will continue assessing the same courses and add assessment of SLO-1 for the graduate program through the Protein Chemistry Techniques course CHEM 6430.

3. STATISTICAL DATA (about 1 page)

Student demographic information was obtained for chemistry and biochemistry majors who graduated during the 2013-2014 academic year and is given below. The source was data warehouse (http://adhaydbp06.ad.csueastbay.edu/Reports_DWRESVT/Pages/Report.aspx?ItemPath=%2fCSUEB+Student+Administration%2fEnrollment+Reports%2fSummary+of+Degrees+Awarded+by+College+and+Department).

Academic Program Review (APR) Standard Data for College years 2009 to 2013 is provided in the table. This includes the number of student majors, degrees conferred, faculty and academic allocation data, student/faculty ratios and course history. The source for this information was: http://www20.csueastbay.edu/ir/academic-program-review/standard-data.html.

Student Demographics of Majors:

A. Undergraduate Chemistry and Biochemistry Majors:

Gender: 40% Male, 60% Female
US Citizens: 73%
Non-Citizens: 27%
Ethnicities of US Citizens: African American 0%; Asian 34%; Hispanic 21%; White 38%; Other 7%.

B. Master's Students:

Gender: 69% Male, 31% Female
US Citizens: 38%
Non-Citizens: 62%
Ethnicities of US Citizens: African American 20%; Asian 40%; Hispanic 0%; White 40%; Other 0%.

California State University, East Bay

APR Summary Data
Fall 2009 - 2013

Chemistry and Biochemistry					
	Fall Quarter				
	2009	**2010**	**2011**	**2012**	**2013**
A. Students Headcount					
1. Undergraduate	148	150	180	217	204
2. Post baccalaureate	12	8	2	0	0
3. Graduate	43	44	54	58	51
4. Total Number of Majors	203	202	236	275	255
	College Years				
B. Degrees Awarded	**08-09**	**09-10**	**10-11**	**11-12**	**12-13**
1. Undergraduate	28	22	30	34	38
2. Graduate	12	15	13	10	13
3. Total	40	37	43	44	51

	Fall Quarter				
	2009	**2010**	**2011**	**2012**	**2013**
C. Faculty					
Tenured/Track Headcount					
1. Full-Time	8	7	7	7	9
2. Part-Time	0	0	0	0	0
3a. Total Tenure Track	8	7	7	7	9
3b. % Tenure Track	40.0%	53.8%	36.8%	38.9%	45.0%
Lecturer Headcount					
4. Full-Time	0	0	0	0	0
5. Part-Time	12	6	12	11	11
6a. Total Non-Tenure Track	12	6	12	11	11
6b. % Non-Tenure Track	60.0%	46.2%	63.2%	61.1%	55.0%
7. Grand Total All Faculty	20	13	19	18	20
Instructional FTE Faculty (FTEF)					
8. Tenured/Track FTEF	6.3	5.6	6.3	5.1	6.3
9. Lecturer FTEF	6.6	6.2	7.4	8.6	7.3
10. Total Instructional FTEF	12.9	11.8	13.6	13.7	13.7
Lecturer Teaching					
11a. FTES Taught by Tenure/Track	152.7	158.3	168.0	157.8	156.4
11b. % of FTES Taught by Tenure/Track	52.2%	58.9%	55.6%	46.8%	45.9%
12a. FTES Taught by Lecturer	140.0	110.6	134.2	179.2	184.0
12b. % of FTES Taught by Lecturer	47.8%	41.1%	44.4%	53.2%	54.1%
13. Total FTES taught	292.7	269.0	302.2	337.0	340.4
14. Total SCU taught	4390.5	4034.5	4533.0	5055.0	5106.0
D. Student Faculty Ratios					
1. Tenured/Track	24.1	28.3	26.7	31.1	24.7
2. Lecturer	21.2	18.0	18.3	20.8	25.1
3. SFR By Level (All Faculty)	22.6	22.9	22.2	24.6	24.9
4. Lower Division	26.3	26.8	22.1	25.4	27.8
5. Upper Division	19.5	23.0	23.6	25.7	24.4
6. Graduate	11.2	7.0	14.9	14.4	10.8
E. Section Size					
1. Number of Sections Offered	79.0	63.0	71.0	83.0	80.0
2. Average Section Size	30.8	33.7	32.5	32.9	33.2
3. Average Section Size for LD	33.8	36.6	32.7	33.3	34.4
4. Average Section Size for UD	25.2	32.5	32.4	31.9	32.1
5. Average Section Size for GD	26.0	15.3	27.5	33.5	22.5
6. LD Section taught by Tenured/Track	10	4	10	9	6
7. UD Section taught by Tenured/Track	20	14	15	12	17
8. GD Section taught by Tenured/Track	16	16	14	20	19
9. LD Section taught by Lecturer	28	23	25	32	34
10. UD Section taught by Lecturer	6	6	6	11	4
11. GD Section taught by Lecturer	0	0	1	0	1

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

Headcount Enrollment	Fall Quarter 2009	2010	2011	2012	2013
Chemistry					
1. Undergraduate	56	62	76	90	89
2. Postbaccalaureate	6	4	0	0	0
3. Graduate	43	44	54	58	51
4. Total Number of Majors	105	110	130	148	140
Biochemistry					
1. Undergraduate	92	88	104	127	115
2. Postbaccalaureate	6	4	2	0	0
3. Graduate	0	0	0	0	0
4. Total Number of Majors	98	92	106	127	115

Degrees Awarded	College Years 08-09	09-10	10-11	11-12	12-13
Biochemistry					
1. Undergraduate	20	18	23	25	28
2. Graduate	0	0	0	0	0
3. Total Number of Majors	20	18	23	25	28
Chemistry					
1. Undergraduate	8	4	7	9	10
2. Graduate	12	15	13	10	13
3. Total Number of Majors	20	19	20	19	23

APPENDIX A - Assessment Data for 2013-2014

A. CHEM 3303: Capstone Lab Exercise (Identification of two unknown chemicals). Assesses Chemistry SLO 2.

Table 1. Results of Capstone Organic Laboratory Assignment for 2010– 2013

Year	# of Chem/Biochem Majors	# with both correct	% Both Correct	# with at least one correct	% At least one correct
Sp 2010	25	12	48	21	84
Sp 2011	26	15	58	23	88
Sp 2012	25	13	52	21	84
Sp 2013	24	11	46	22	92

B. CHEM 3303: Standardized National Exam. Assesses Chemistry SLO-1 for Organic Chemistry.

Table 2. Results of Capstone Organic Lecture Assessment for 2007 – 2013 for Chemistry and Biochemistry majors

Year	**Percentile**
2007	47
2008	N/A
2009	45
2010	34
2011	41
2012	28
2013	33

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

C. CHEM 3511: Embedded Exam Questions. Assess Chemistry SLO-1 for Physical Chemistry (Part I)

Table 3. Results of Physical Chemistry I Lecture Assessment for 2013

Question #*	% Correct, Chemistry Majors*	% Correct, Biochemistry Majors**
2	45	71
6	45	65
8	36	65
9	18	12
10	9	47
16	82	53
19	55	47
20	55	53

*Specific Course Outcomes tested with eight questions.

**11 students

***17 students

D. CHEM 3512: Embedded Exam Questions. Assess Chemistry SLO-1 for Physical Chemistry (Part II)

Table 4. Results of Physical Chemistry II Lecture Assessment for 2014

Question	% Correct, Chemistry Majors**	% Correct, Biochemistry Majors***
2	75	76
3	63	53
6ab	50	59
6cd	38	47

*Specific Course Outcomes tested with three multi-part questions.
**8 students
***17 students

E. CHEM 4411: Embedded Exam Questions. Assess Chemistry SLO-1 for Biochemistry (Part I)

Table 5. Results of Biochemistry I Lecture Assessment for 2013

Biochemistry Learning Outcome	% Correct, Chemistry Majors**	% Correct, Biochemistry Majors***
2 - Amino Acid Structure	55	61
4 - Protein Structural Motifs	61	70
4 - Protein Regulation	57	82
5 - Properties Enzymes	42	56
5 - Enzyme Kinetics	58	58

*Specific Course Outcomes tested with 13 questions.
**13 students
***21 students

F. CHEM 4412: Embedded Exam Questions. Assess Chemistry SLO-1 for Biochemistry (Part II)

Table 6. Results of Biochemistry II Lecture Assessment for 2014

Biochemistry Learning Outcome	% Correct, Chemistry Majors**	% Correct, Biochemistry Majors***
6	40	69
7	80	73
8	80	69

*Specific Course Outcomes tested with three questions.
**5 students
***26 students

G. CHEM 4430: Analysis of experimental results and laboratory notebooks. Assesses Chemistry SLO-2.

Table 7. Results of Biochemistry Lab Assessment for 2013

Tool	% Correct, Chemistry Majors*	# Correct, Biochemistry Majors**
Lab Notebook Analysis 1	83	91
Lab Notebook Analysis 2	83	82
Lab Notebook Analysis 3	83	82
Gel Photograph	100	100
Final Lab Notebook Score	100	73

*6 students; **11 students

H. CHEM 4162: Standard National Exam-Modified Use. Assesses Chemistry SLO-1 for Inorganic Chemistry.

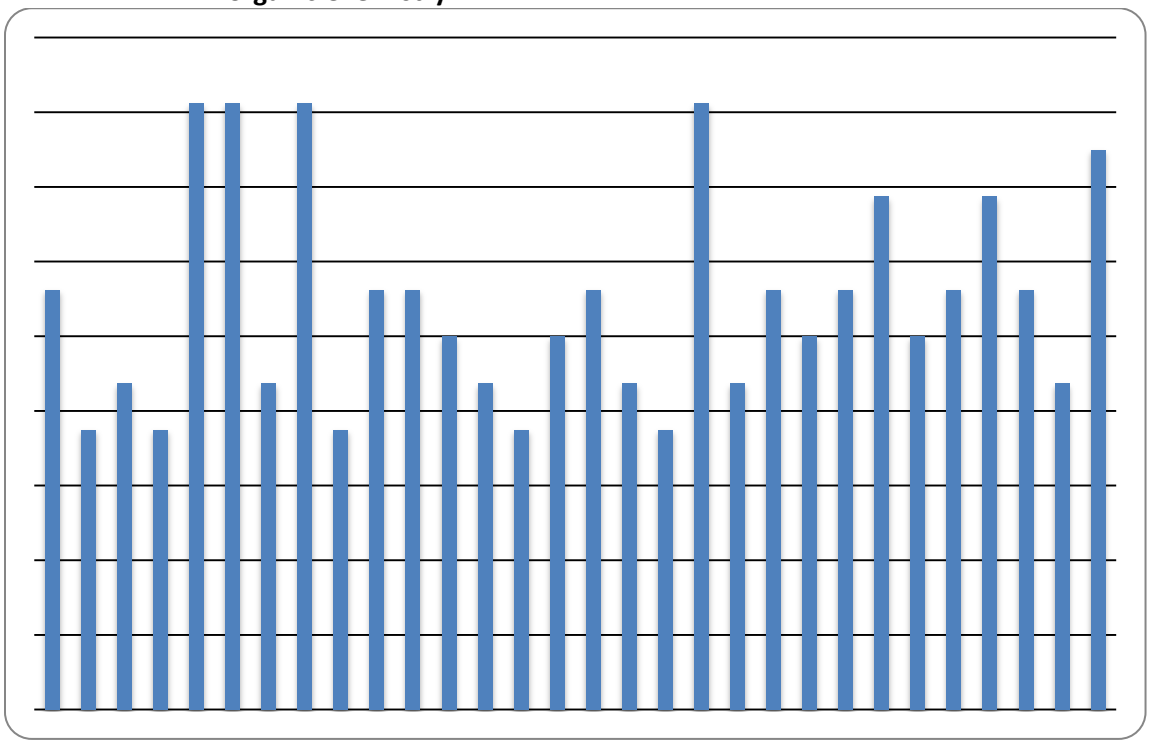

Figure 1. Results of Capstone Inorganic Chemistry Assessment for Chemistry Majors. A modified version of the 2009 national American Chemical Society exam reflecting the material covered in CHEM 4161-4162 was given to 14 Chem majors. The percentage of students who correctly answered the 30 questions used are given in the graph. The average score for the 30 questions was 54.6% which corresponds to an estimated percentile near the national average.

I. CHEM 6820 Graduate Seminar: Assessment of ability to convey complex chemical information via an oral presentation (M.S. Chemistry Program SLO-4).

Table 8. Results of Seminar Presentation Ratings for 2013-2014

Academic Year	**1st Seminar**		**2nd Seminar**		**3rd Seminar**	
	# of students	average score	# of students	average score	# of students	average score
2013-2014	12	74.7%	13	80.3%	18	85.9%