CALIFORNIA STATE UNIVERSITY
EAST BAY

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2014-2015 CSCI EETF Assessment Year End Report, June, 2015

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[NOTE: Items A, B, C, and D are identical to your Page 2 on your Annual Report for CAPR. Please simply cut and paste from there. Item E is unique to the CSCI EETF.]

A. Program Student Learning Outcomes

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

2. work effectively and safely in a laboratory environment using modern chemical/biochemical instrumentation and methods to test hypotheses or design solutions to problems.

C. Summary of Assessment Process

As stated in our five-year assessment plan, in 2014-2015 we specifically concentrated on Program Learning Outcome #2 which concerns assessing laboratory performance. In addition we continued to assess the ability to critically assess information through Program Learning Outcome #3 (understand, organize, and critically assess information from the chemical literature).

The laboratory assessment was conducted through capstone laboratory exercises and the ability to critically analyze experimental results in CHEM 6430 Protein Chemistry Techniques. The assessment for the ability to critically assess information was through the Seminar course CHEM 6820.

D. Summary of Assessment Results

CHEM 6430 Protein Chemistry Techniques

Graduate Program SLO-1: Demonstrate specialized knowledge in the chemical sciences beyond the undergraduate level

Selected Specific Learning Goals:
1) Be able to predict protein behavior on ion exchange columns (Exam I, Q 7)
2) Explain the theoretical basis for the improved separation efficiencies obtained with high performance liquid chromatography (HPLC) (Exam I, Q 11)
3) Describe the principles underlying non-denaturing and denaturing protein gel electrophoresis (Exam II, Q 6)
4) Describe the theoretical basis for isoelectric focusing (Exam II, Q 9)
5) Explain the principles of mass spectrometry as applied to the analysis of peptides derived from proteins identified in proteomics experiments (Exam II, Q12)

Assessment Results for SLO-1: Six students

Embedded Exam Question*	No. Students with Correct Answer	% Students Meeting Expectations
Question 6	4	67
Question 7	4	67
Question 9	5	83
Question 11	4	67
Question 12	5	83

*Partial credit was given for embedded exam questions. If 75% of the possible points were earned the answer was counted as correct.

Analysis: The student performance was very good for learning goals 4 and 5 and reasonably good for the other goals. However, since our desired standard is at least 75% of the students achieving each goal, there is definitely room for improvement for learning goals 1,2 and 3. Special emphasis will be put on these topics in the coming year.

Graduate Program SLO-2: Work effectively in a laboratory environment using modern chemical/ biochemical instrumentation and methods to test hypotheses or design solutions to problems

Assessment Tool: Analysis of student laboratory notebooks using the criteria given below for three specific learning goals.

Laboratory Notebook Assessment Criteria:

Exemplary (90-100 points)	Basic (75-89 points)	Insufficient (0-74 points)
All observations are clearly presented. Experimental data is internally consistent. All calculations are correct and tables and graphs are included with proper units. Results are analyzed critically, sources of error considered and conclusions written in a coherent manner.	Most observations are clearly presented and experimental data is mostly consistent. Most calculations are accurate and tables and graphs are mostly included with proper units. Most of the results are analyzed critically, some sources of error considered and conclusions are mostly written in a coherent manner.	Many observations are not clearly presented and/or experimental data is not internally consistent. Many calculations are incorrect or missing . Many tables and graphs are missing or lacking information or proper units. Many of the results are not analyzed critically, sources of error are not considered sufficiently and conclusions are not written in a coherent manner.

Selected Specific Laboratory Learning Goals:

1) Identify and quantify biomolecules from a mixture by HPLC (effective use of instrumentation to solve an experimental problem)
2) Use affinity chromatography to purify a hybrid protein (effective use of a biochemical method to solve an experimental problem)
3) Apply the techniques of isoelectric focusing and SDS-polyacrylamide gel electrophoresis to the two-dimensional separation of a complex protein mixture (effective use of a biochemical method to test a hypothesis)

Assessment Results for SLO-2: Six students

Laboratory Notebook Learning Goal	No. Exemplary	No. Basic	No. Insufficient	% Students Meeting Expectations**
1 - Effective use of instrumentation to solve expt'l problem	4	1	1	83
2 – Effective use of biochemical				

method to solve an expt'l problem	2	3	1	83
3 – Effective use of biochemical method to test a hypothesis	3	3	0	100

**A rating of Exemplary or Basic indicated the student met expectations.

Analysis: Using the above criteria for documentation and analysis of methods used for solving experimental problems and testing hypotheses, our students are doing quite well.

Chem4240 Methods of Instrumental Analysis

Student Learning Outcomes

Students who successfully complete this course will be able to:

1. Understand the fundamental principles behind various spectroscopic techniques.
2. Understand the concept of Beer's law and its application for UV/Vis spectroscopy.
3. Understand the principle behind LASER as a radiation source.
4. Acquire knowledge upon the basic components and the layout of optical instruments.
5. Understand the physical principles of NMR and analyze the first order NMR spectra of organic compounds for calculation of their mass percentages in a sample.
6. Understand the principles of chromatography and its application for analysis on a mixture of organic compounds.
7. Assess average sensitivity as well as limit of detection of an optical spectrometer.

Assessment Data on master's degree students:

Embedded Questions in the lab reports and the final exam (accumulated)

Embedded Question	SLO #	# of master's degree students	# of students with correct answer	% with correct answer*
Midterm Q4	1	8	5	63
Final Q4	1	8	5	63
Final Q1- (a) to (e)	2	8	6	75
Final Q5	3	8	0	0
Final Q6 – (a) to (d)	5	8	3	38
Lab #5 (NMR) question	5	8	3	38
Final Q7	4	8	6	75

Final Q8	4	8	4	50
Final Q12 (a) to (i)	6	8	6	75
Lab #7 (AA) question	7	8	3	38

*Where partial credit was given, the answer was counted as correct if at least 75% of the total possible points were awarded.

Summary

Student Learning Outcome	Average Percentage of Students Able to Answer the Questions
1	63%
2	75%
3	0 %
4	63%
5	38%
6	75%
7	38%

Conclusion: In this quarter, none of our master's degree students reached their learning outcome #3, which suggests their lacking in understanding the basic working principle behind Laser. In addition, more than half of our students did not accomplish their learning outcomes #5 and #7 as well, which indicates that they did not acquire adequate knowledge and understanding regarding analysis of NMR spectra as well as calculation of the average sensitivity and the detection limit of an optical instrument. Thought all of eight master's degree students passed this course with passing grades (at least B-), their lack of understanding in specific topics is concerning.

Seminar CHEM 6820

Students who successfully complete this course three times should:
1) be able to understand information from the chemical literature.
2) be able to organize and critically assess information from the chemical literature.
3) be able to present complex chemical information via an oral seminar.

Each faculty member coordinating the Seminar course evaluated each student seminar with respect to the organization of scientific content, oral presentation, proper use of visual-aids, and

the ability to answer questions about the topic using a common rubric. Assessment was measured by the number of students presenting a seminar that met or exceeded the expectations by their third seminar presentation.

During the 2014-2015 academic year, 12 students gave their first seminar. The average score for these students was 11.3/16 or 70.6%. The average score for the 12 students giving their second seminar was 12.8/16 or 80.0%. The average score for the 13 students giving their third seminar was 13.25/16 or 82.5%.

Academic Year	1st Seminar		2nd Seminar		3rd Seminar	
	# of students	average score	# of students	average score	# of students	average score
2014-2015	12	70.6%	12	80.0%	13	82.5%

This assessment data demonstrates that, on average, students improved from their first seminar to their last seminar in their ability to understand, organize and present a journal article.

A score of 12/16 was defined as meeting expectations and a score of 14/16 was defined as exceeding expectations.

First Seminar

Academic Year	# of Students	Met Expectations		Exceeded Expectations	
		#	%	#	%
2014-2015	12	5	41.7.0	2	16.7

Second Seminar

Academic Year	# of Students	Met Expectations		Exceeded Expectations	
		#	%	#	%
2014-2015	12	9	75.0	5	41.7

Third Seminar

Academic Year	# of Students	Met Expectations		Exceeded Expectations	
		#	%	#	%
2014-2015	13	10	76.9	7	53.8

Based on the assessment data, students exhibit dramatic improvement as they move through the MS program in their ability to understand information from the chemical literature, organize and critically assess the information and present it clearly via an oral seminar.

E. Suggestions and Recommendations for the CSCI EETF in the Future
