CALIFORNIA STATE UNIVERSITY
EAST BAY

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2015-2016 CSCI EETF Assessment Year End Report, June, 2016

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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

3. understand, organize, and critically assess information from the chemical literature.

C. Summary of Assessment Process

As stated in our five-year assessment plan, in 2015-2016 we specifically concentrated on Program Learning Outcome #3 which concerns understanding, organizing, and critically assessing information from the chemical literature. In addition we continued to assess the ability to critically assess information through Program Learning Outcomes #1 and 2 (demonstrate specialized knowledge in the chemical sciences beyond the undergraduate level and work effectively and safely in a laboratory environment using modern chemical/biochemical instrumentation and methods to test hypotheses or design solutions to problems.).

The assessment for the ability to critically assess information was through the Seminar course CHEM 6820. The laboratory assessment and the ability to critically analyze experimental results was conducted through capstone laboratory exercises in CHEM 6430 Protein Chemistry Techniques and CHEM 4240 Methods of Instrumental Analysis.

D. Summary of Assessment Results

CHEM 6820 Seminar
Graduate Program SLO-1: Understand, organize, and critically assess information from the chemical literature.
Assessment Tool: Rubric.
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.

Selected Specific Learning Goals:

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

Assessment Data:

During the 2015-2016 academic year, 7 students gave their first seminar. The average score for these students was 13.1/16 or 82%. The average score for the 11 students giving their second seminar was 14.5/16 or 90%. The average score for the 12 students giving their third seminar was 14.8/16 or 92%.

Academic Year	1st Seminar		2nd Seminar		3rd Seminar	
	# of students	average score	# of students	average score	# of students	average score
2015-2016	7	82%	11	90%	12	92%

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	
		#	%	#	%
2015-2016	7	7	100	3	43

Second Seminar

Academic Year	# of Students	Met Expectations		Exceeded Expectations	
		#	%	#	%
2015-2016	11	11	100	11	100

Third Seminar

Academic Year	# of Students	Met Expectations	Exceeded Expectations

		#	%	#	%
2015-2016	12	12	100	9	75

Analysis: 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. By their third seminar, more than 75% of the graduate students enrolled in the seminar class gave a seminar that exceeded expectations.

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.

CHEM 6430 Protein Chemistry Techniques

Selected Specific Learning Goals:

1) Explain the rationale for the use of differential solubility in protein purification (Exam I, Q 4)
2) Analyze the effectiveness of a protein purification experiment by calculating increases in Specific Activity (Exam I, Q 5)
3) Explain the theoretical basis for the improved separation efficiencies obtained with high performance liquid chromatography (HPLC) (Exam I, Q 11; Exam II, Q 6)
4) Describe the principles underlying non-denaturing and denaturing protein gel electro-phoresis (Exam II, Q 7)
5) Describe the theoretical basis for isoelectric focusing (Exam II, Q 11)
6) Explain the principles of mass spectrometry as applied to the analysis of peptides derived from proteins identified in proteomics experiments (Exam II, Q 12)

Assessment Tool: Embedded exam questions

Assessment Results for SLO #1-6: Three M.S. Chemistry majors

Embedded Exam Question*	Specific Learning Goal	No. Students with Correct Answer	% Students Meeting Expectations
Ex I, Question 4	Differential Solubility (SLO #1)	2	67
Ex I, Question 5	Specific Activity (SLO #2)	0	0

Ex I, Question 11	HPLC (SLO #3)	3	100
Ex II, Question 6	HPLC (SLO #3)	3	100
Ex II, Question 7	PAGE (SLO #4)	3	100
Ex II, Question 11	Isoelectric Focusing (SLO #5)	3	100
Ex II, Question 12	MS Proteomics (SLO #6)	2	67

*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 sample was unusually small this year, with only three M.S. Chemistry majors taking this class. For that reason it is difficult to draw far reaching conclusions. The performance of these three students was excellent or generally good for all of the learning goals except number two. Whereas some other students in the class (M.S. Biological Sciences majors) were able to master this outcome, the three chemistry students did not master it. Of eleven students who took the class, only 45% mastered the specific activity outcome.

Plans: The assessment results definitely draw attention to Learning Outcome 2. Because an examination of the class as a whole shows that only about 45% mastered this outcome, it is obvious that this topic needs more emphasis. A special exercise on analysis of protein purification data that includes calculation of specific activity will be assigned next year as a group activity with a subsequent discussion of the class results planned.

Selected Specific Laboratory Learning Goals:

1) Purify a hybrid protein using affinity chromatography (effective use of a biochemical method to solve an experimental problem)
2) Identify and quantify biomolecules from a mixture by high performance liquid chromatography
(effective use of instrumentation to solve an experimental problem)
3) Demonstrate induction of specific protein synthesis from an expression vector with SDS-polyacrylamide gel electrophoresis and immunoblot detection (effective use of a biochemical method to test a hypothesis)

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.

Assessment Results for laboratory SLO 1-3: Three M.S.Chemstry majors

Laboratory Notebook Learning Goal	No. Exemplary	No. Basic	No. Insufficient	% Students Meeting Expectations**
1 - Effective use of biochemical method to solve an experimental problem (lab SLO #1)	1	2	-	100
2 – Effective use of biochemical method to test a hypothesis (lab SLO #2)	-	3	-	100
3 – Effective use of instrumentation to solve exoerimental problem (lab SLO #3)	1	1	1	67

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

Analysis: As noted previously the student sample was unusually small this year, with only three M.S. Chemistry majors taking this class. Using the lab notebook criteria given above for

documentation and analysis of methods for solving experimental problems and testing hypotheses, this year's M.S. Chemistry students generally met expectations. While there were some areas of excellence noted for one student, overall the three students did mostly acceptable but not exemplary work.

Plans: In the future more class time will be devoted to explaining the value of thorough analyses of experimental results, with proper display of data in the form of tables or graphs where appropriate. Students will be encouraged to provide more detailed evidence for conclusions listed in their lab notebooks.

CHEM 4240 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:

Assessment Tool: Embedded Questions in the lab reports and the final exam

Embedded Question	SLO #	# of master's degree students	# of students with correct answer	% with correct answer*
Midterm Q4	1	2*	2	100
Final Q5	1	2	1	50
Midterm Q1	2	2	2	100
Midterm Q2	2	2	1	50
Final Q9	3	2	2	100
FT-IR Lab question	3	2	1	50
Final Q3	4	2	1	50

Final Q4	4	2	2	100
Final Q1	5	2	2	100
Final Q2	5	2	0	0
Final Q12	5	2	0	0
Final Q7	6	2	2	100
Final Q10	6	2	2	100
HPLC-lab question	6	2	2	100
Lab #7(building your own Spectrometer) question	7	2	2	100
Final Q3	7	2	1	50

*Where partial credit was given, the answer was counted as correct if at least 75% of the total possible points were awarded.
* Only two master's degree students took this course in 2016 winter quarter. More data points were needed for more meaningful assessment.

Summary

Student Learning Outcome	Average Percentage of Students Able to Answer the Questions
1	75 %
2	75 %
3	75 %
4	75 %
5	33 %
6	100 %
7	75 %

Conclusion: In this quarter, none of our master's degree students reached their learning outcome #5, which suggests their lacking in understanding the basic working principle behind NMR spectroscopy. However, due to lack of enough data points (only two masters' degree students took Chem4240 for this year, it was difficult to draw meaningful assessment. Both of the master' degree students passed this course with good grades (A and A-).

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