CALIFORNIA STATE UNIVERSITY EAST BAY

College of Science (CSCI)
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2016-2017 CSCI EETF Assessment Year End Report, June, 2017

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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

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

C. Summary of Assessment Process

As stated in our five-year assessment plan, in 2016-2017 we specifically concentrated on Program Learning Outcome #4 which concerns presenting complex chemical information via oral and written reports. In addition we continued to assess program content through Program Learning Outcomes #1 and #2 (demonstrate specialized knowledge in the chemical sciences 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 present complex chemical information via oral and written reports was through the Seminar course (CHEM 6820) and in Protein Chemistry Techniques (CHEM 6430). Demonstrating knowledge in the various areas of chemistry was conducted through the course Advanced Topics in Organic Chemistry (CHEM 6310). The laboratory assessment and the ability to critically analyze experimental results was conducted through capstone laboratory exercises in Protein Chemistry Techniques (CHEM 6430) and Methods of Instrumental Analysis (CHEM 4240).

D. Summary of Assessment Results

CHEM 6820 Seminar

Graduate PLO-4: present complex chemical information via oral and written reports.
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 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 2016-2017 academic year, 11 students gave their first seminar. The average score for these students was 11.4/16. The average score for the 14 students giving their second seminar was 13.2/16. The average score for the 11 students giving their third seminar was 13.3/16.

Academic Year	1st Seminar		2nd Seminar		3rd Seminar	
	# of students	average score	# of students	average score	# of students	average score
2016-2017	11	11.4	14	13.2	11	13.3

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	
		#	%	#	%
2016-2017	11	5	45	3	27

Second Seminar

Academic Year	# of Students	Met Expectations		Exceeded Expectations	
		#	%	#	%
2016-2017	14	11	79	6	43

Third Seminar

Academic Year	# of Students	Met Expectations		Exceeded Expectations	
		#	%	#	%
2016-2017	11	9	82	5	45

Analysis: By their third seminar, 82% of the graduate students enrolled in the seminar class gave a seminar that met expectations. And almost half gave seminars that exceeded expectations. On average, students improved the most between their first seminar and their second seminar.

Plans: Based on the assessment data, students exhibited 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. Therefore we do not plan any changes to the seminar class at this time.

Protein Chemistry Techniques
CHEM 6430

Graduate PLO-2: Work effectively in a laboratory environment using modern chemical/ biochemical instrumentation and methods to test hypotheses or design solutions to problems
Graduate PLO-4: present complex chemical information via oral and written reports.
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,	Most observations are clearly presented and experimental data is mostly consistent. Most calculations are accurate and tables and graphs are mostly included with proper	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

sources of error considered and conclusions written in a coherent manner.	units. Most of the results are analyzed critically, some sources of error considered and conclusions are mostly written in a coherent manner.	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) Apply the techniques of isoelectric focusing (IEF) and denaturing polyacrylamide electrophoresis (SDS-PAGE) to the two dimensional separation of a complex protein mixture (effective use of instrumentation to solve an experimental problem)

2) Partially purify the enzyme lactate dehydrogenase using group specific column chromatography (cibacron blue) and gradient elution (effective use of a biochemical method to solve an experimental problem)

3) Demonstrate induction of specific protein synthesis from an expression vector using Immunoblot Detection (effective use of a biochemical method to test a hypothesis)

Assessment Results for SLO-2: Eleven M.S. majors

Laboratory Notebook Learning Goal	No. Exemplary	No. Basic	No. Insufficient	% Students Meeting Expectations*
1 - Effective use of instrumentation to solve an expt'l problem	3	8	-	100
2 – Effective use of a biochemical method to solve an expt'l problem	4	7	-	100
3 – Effective use of a biochemical method to test a hypothesis	1	8	2	81.8

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

Analysis: 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. students generally met expectations and several did exemplary work. Two students failed to meet expectations for one of the learning goals (testing a hypothesis), but these same students did well for the other goals. While we are happy with these results, there is room for improvement.

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 asked to share the elution profiles from their column chromatography experiments with the class as a whole. These presentations will form the basis for class discussions of proper methods for data documentation and analysis. Students will be encouraged to provide more detailed evidence for the conclusions listed in their lab notebooks.

Advanced Topics in Organic Chemistry
CHEM 6310 Fall 2016

Graduate PLO #1: demonstrate specialized knowledge in the chemical sciences beyond the undergraduate level.
Assessment Tool: Embedded questions in Final Exam that map to the course SLOs.

SLO#2. predict conformational preference of organic molecules and the stereochemical preference in reactions
Final Exam Questions #12, #13 and #14
Meets expectation on question #12 if answered correctly
Meets expectation on question #13 if answered correctly
Meets expectation on question #14 if answered correctly

Question #12		Question #13		Question #14	
Meets expectation	Does not meet expectation	Meets expectation	Does not meet expectation	Meets expectation	Does not meet expectation
5/11 students	6/11 students	6/11 students	5/11 students	6/11 students	5/11 students

SLO#4. evaluate and apply different techniques for the determination of mechanisms of organic reactions
Final Exam Questions #16 and #17
Meets expectation on question #16 if answered correctly
Meets expectation on question #17 if answered correctly

Question #16		Question #17	
Meets expectation	Does not meet expectation	Meets expectation	Does not meet expectation
10/11 students	1/11 students	11/11 students	11/11 students

SLO#5. design syntheses to introduce or interconvert different functional groups and to form carbon-carbon bonds
Questions #20 and #21

Meets expectation on question #20 if 3 out of 4 parts or more answered correctly
Meets expectation on question #21 if 2 out of 3 parts or more answered correctly

Question #20		Question #21	
Meets expectation	Does not meet expectation	Meets expectation	Does not meet expectation
2/11 students	9/11 students	3/11 students	8/11 students

Analysis: Close to 100% of the students were able to meet the expectation for SLO#4, so SLO #4 appears to have been mastered adequately by the vast majority of the students. About 50% of the students were able to meet the expectation for SLO#2. SLO#2 builds on principles that were expected to have been learned in previous undergraduate courses that are prerequisites to this graduate class. Approximately 20% of the students met expectations for SLO#5.

Plans: In the future, more time will be devoted to a short review of these principles behind SLO #2 in order to bring students up to speed and enable them to learn the more advanced material. Unfortunately only about 20% of the students were able to meet the expectation for SLO#5. In the future, more practice problems will be provided on these concepts and more time will be devoted on how to develop strategies to solve these kinds of problems.

Methods of Instrumental Analysis
CHEM 4240 Winter 2017

Chemistry PLO #1: demonstrate knowledge in the various areas of chemistry, including inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry, and biochemistry.
Graduate PLO #2: work effectively and safely in a laboratory environment using modern chemical/biochemical instrumentation and methods to test hypotheses or design solutions to problems.
Assessment Tool: Embedded questions in the lab reports and on the final exam

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 biochemical research.
3. Understand the principle behind LASER and FT-IR.
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. Acquire the hands-on knowledge regarding how an optical spectrometer works.

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	7	7	100
Midterm Q3	1	7	5	71
Midterm Q2	2	7	5	71
Final Q1	2	7	5	71
Final Q4	3	7	3	43
FI-IR Lab questions	3	7	3	43
Final Q9	4	7	5	71
Final Q8	4	7	7	100
Final Q3	5	7	5	71
Final Q5	5	7	5	71
Final Q6	5	7	2	29
Final Q7	6	7	6	86
Final Q11	6	7	5	71
Lab #7(building your own Spectrometer) question	7	7	5	71
Midterm Q7	7	7	4	57

*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	86 %
2	71 %
3	43 %
4	86 %
5	57 %
6	79 %
7	64 %

Conclusion: In 2017, the MS degree students did much better than undergraduate students. A majority of the students have accomplished most of SLO except for SLO #3, which was FT-IR lab along with its theoretical understanding. Last year, only two graduate students took this course, so it is a little hard to compare this with the result of the last year. But, compared to 2015 (8 graduate students), the students this year showed better performance in almost all SLO except for SLO #2 which is about the same (75% for the 2015 class). The graduate students this year were a lot more active in asking questions and studying together and their better performance was not surprising at all.

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