

**University of San Francisco**  
**MS Program in Chemistry**  
**AY2014 - 2015 Assessment Report**  
**Report prepared by M. Bolitho and T. Spector**

**Mission Statement:** USF's Master of Science in Chemistry provides graduate students with a thesis-based degree with personalized direction from research advisers and training from experienced full-time faculty. Hands-on laboratory experiences through independent projects prepare our students for a future in the chemical industry, further studies in a PhD program or medical school, and teaching positions at the high school and community college level.

Program Goal	Learning Outcomes
<b>1. Students demonstrate competency in two subdisciplines of chemistry relevant to their research goals.</b>	Students will score at or above the 60% percentile on two American Chemical Society (ACS) subject exams by the end of their second semester on campus.
<b>2. Students will acquire and analyze data demonstrating safe, proficient laboratory practice / instrumental techniques, and analyze that data as necessary for their research area</b>	a) Students can safely operate instrumentation & equipment, and use chemicals with appropriate PPE and environmental controls.
	b) Students can analyze results from research quality instruments necessary for their research project.
<b>3. Students will be able to communicate their own research project, in written and oral forms.</b>	a) <i>Written communication:</i> Students will exhibit the ability to prepare professional reports, including research plan(s), progress report(s), and a thesis that include their results plus a literature survey.
	b) <i>Oral communication:</i> Students will exhibit the skills and competencies necessary for professional and effective oral presentations, including groups meetings and a thesis seminar.
<b>4. Students will guide undergraduates in laboratory work.</b>	a) Students will serve as teaching assistants.
	b) Students serve as research mentors.
<b>5. MS graduates can pursue further graduate studies or employment in chemistry or related scientific fields.</b>	Students will obtain appropriate entry-level scientific jobs with reasonable chance for advancement or will be accepted into PhD programs in chemistry related fields.

We assessed Program Goals 1 and 5 for this academic year. There were 9 students in the program during this academic year.

### Program Goal 1

The standardized American Chemical Society (ACS) exams are administered during orientation week. The exams are multiple-choice with 60 -70 questions. The entrance exams are administered in analytical, inorganic, organic, biochemistry, and physical chemistry. Students each take two exams, one in their research area and the other in an area of their choice. Proficiency is demonstrated by scoring at or above the 60th percentile level. Percentiles are based on the median score of all U.S. students who have taken the exam. A score below the 60th percentile on an exam means the student will take a course in that area (if offered) or retake the exam the next semester. A grade of "B" or above is required in any chemistry course as a graduate student.

### Data

This academic year 3 incoming students (X, Y, Z) took the exam and 1 student matriculated the previous academic year retook the analytical chemistry exam. The data is below:

Fall 2014: Graduate Students (Continuing student's retake noted in red type)					
Name (Last, First)	ACS Exam Taken	Date Exam Taken	Score (# correct/total questions)	Percentile	Average of Both Exams for Student in Percentile
X	Organic Chemistry, Form 2004	Aug. 2014	24/70	12th	48th
X	Biochemistry, Form 2003	Aug. 2014	32/60	37th	
retake	Analytical Chemistry, Form 2007	Aug. 2014: Retake	30/50	65th	

Spring 2015: Graduate Students					
Name (Last, First)	ACS Exam Taken	Date Exam Taken	Score (# correct/total questions)	Percentile	Average of Both Exams for Student in Percentile
Y	Analytical Chemistry, Form 2007	Jan. 2015	32/50	74th	56th
Y	Physical Chemistry, Form 2006	Jan. 2015	29/60	38th	
Z	Analytical Chemistry, Form 2007	Jan. 2015	26/50	44th	
Z	Organic Chemistry, Form 2004	Jan. 2015	62/70	97th	

### Data Analysis

Some students are unable to obtain the 60% benchmark even with further study. Typically these are students who did very poorly on one or both exams. In most cases, however, incoming students who did well in one area are able to improve their performance on the second given the chance. This is borne out by the current data set:

- Student X, who showed the lowest proficiency among the three incoming students, is no longer in the MS program.

- The retake student increased their performance from 21/50 (19<sup>th</sup> percentile) to 30/50 (65<sup>th</sup> percentile).
- Student Y retook the ACS Analytical Chemistry exam in August 2015 and scored 33/50 (81<sup>st</sup> percentile).
- Student Z retook the ACS Physical Chemistry exam in August 2015 and scored 27/60 (in the 31<sup>st</sup> percentile) and that is not a passing score. They are currently taking Physical Chemistry I (CHEM 340) and must pass with a "B" or better to remain in the program.

### **Program Goal 5:**

At the start of AY2014-2015 there were 11 students total in the program however 2 students withdrew during this same period and therefore by the end of the year there were 9 students enrolled. Often students physically leave the program when they finish their bench research but prior to writing their MS thesis.

### **Data for students who graduated with MS and Students who left but have not completed MS thesis**

	<b>Total #</b>	<b>Ph.D. Program</b>	<b>Industry**</b>	<b>Other***</b>
<b>MS Graduates</b>	3*	2	1	0
<b>Students Without MS Complete</b>	4	0	4	0

\* All students left program prior to 2014 before completing their MS thesis

\*\*Job involves chemistry

\*\*\*Teaching/non-chemistry industry job/MD or other professional program

### **Data Analysis**

We (attempt) to keep records of where our students go after they graduate with a MS degree, however we do not have a systematic method for keeping these records instead relying on research advisors and fellow graduate students for data/information. We have tried to remedy this though a departmental LinkedIn Page, but clearly this involves voluntary self-reporting, which is not best practice. Optimally we would like to track our MS graduates over a 5-year period. It is easier to track MS graduates in part because they are in continual contact with their research advisors through the thesis writing aspect of their degree.

Based on the data we are clearly achieving our goal of readying students for entry into Chemical Industry or a Ph.D. program. Since our MS degree is a purely research based program and therefore students who go through our program are well situated for successfully applying for jobs as bench scientists. As shown the majority of our students go on to industrial positions, which validates the value of our degree for getting STEM job.

Finally, the number of students leaving the program prior to writing their thesis and obtaining their MS is not optimal. We have found that a subset of these students never write their thesis and therefore never obtain their degree even after completing many hours of research. The department should develop a mechanism for keeping these students on track to complete their thesis in a reasonable timeframe.