Annual Assessment Report

M.S. in Chemistry AY 22-23

Program Information:

Name of Program: M.S. in Chemistry

Degree Type: Graduate

Coordinating Faculty: Herman Nikolayevskiy (hnikolayevskiy@usfca.edu), Michael Stevenson (mstevenson3@usfca.edu), Chemistry Graduate Program Director

Mission Statement: (No changes)

To deliver a broad-based, challenging research experience that will train students to participate effectively as PhD researchers, health professionals, government and industry professionals, or as teachers. The program will foster a culture that: values strong researcher-faculty-staff interactions and strives to help researchers become self-learners and to discover the excitement and creativity of chemical research. We strive to instill values of social responsibility with ethical behavior as part of a chemical research community culminating in the writing of a research thesis.

Program Learning Outcomes:

1. Students demonstrate a broad knowledge in areas of chemistry relevant to their research interests.
2. Students will become safe and proficient in laboratory practice and instrumental techniques necessary for their research area.
3. Students will be able to communicate the subject of chemistry, especially their own research project, in written and oral forms including: correspondence, reports and short presentations that may utilize multimedia tools that support effective communication
4. Students will become critical thinkers who are able to judge scientific arguments and make their own arguments based on experiments conducted during their research project
5. Students who graduate with an MS degree in chemistry from USF will be well prepared to pursue further graduate studies or employment in chemistry or related scientific fields.

Program Learning Goals:

1. Students will demonstrate competency in two subdisciplines of chemistry relevant to their research goals.
2. Students will acquire and analyze data demonstrating safe, proficient laboratory practice / instrumental techniques, and analyze that data as necessary for their research area
3. Students will be able to communicate their own research project, in written and oral forms.

4. Students will guide undergraduates in laboratory work.

Curricular Map: (No Changes)

MS CHEMISTRY	PLG1	PLG2	PLG3	PLG4
Program Learning Goals X Courses	Students will demonstrate competency in two subdisciplines of chemistry relevant to their research goals.	Students will acquire and analyze data demonstrating safe, proficient laboratory practice / instrumental techniques, and analyze that data as necessary for their research area.	Students will be able to communicate their own research project, in written and oral forms.	Students will guide undergraduates in laboratory work
Courses of Program Requirement				
Entrance Examinations	I, D, M			
Opt 1: Diagnostic Test	x			
Opt 2: Independent Study	x			
Opt 3: Undergraduate Coursework	x			
CHEM 698 Graduate Research Methods		I, D, M	I, D	I, D, M
CLO1		x		
CLO2			x	
CHEM 699: Thesis Writing			M	
CLO1			x	
CLO2			x	
Teaching Assistantship				I, D, M
		Key: I = Introductory D = Developing M = Mastery		

Assessment Schedule:
F21 – PLO1
F22 – PLO3
F23 – PLO2 (*current*)
F24 – PLO4
F25 – PLO5

Program Assessment:

Assessment Methodology:

For AY22-23, we chose to evaluate PLO2, which notes that students will become *safe* and *proficient* in laboratory practice and instrumental techniques as relevant to their research area. Given the turnover in the department in recent years, we had no previous rubric or institutional memory on which to base the evaluation of this PLO. As such, we developed a new rubric (see attached) that attempted to generalize, to the extent possible, a very lab-specific metric. The rubric asked research-active faculty to define what safety means in their lab, and on what basis it was evaluated. The rubric also asked faculty to define 1-5 lab skills that were essential to demonstrating proficiency in their particular subdiscipline – each participating faculty member chose to assess 5 different laboratory skills. Each of the aforementioned categories could then be assessed on a numerical scale of 1-6 (least safe/proficient to most safe/proficient). Once the rubric was distributed, research active faculty members observed each graduate student in their lab over the course of a particular experiment, and evaluated them on the basis of this rubric.

In total, 7 graduate students (out of 11) were assessed in Fall 2023 – this represented all of the graduate students in 4 out of 6 research active laboratories. 3 of the 7 students started the program in Fall 2023, while the other 4 students were in their 3rd or 5th semester. The assessments were conducted on 9/18 at the earliest and 11/1 at the latest. Of the two laboratories not assessed, one belonged to a faculty member who is no longer on campus and whose research is mostly computational, and the other just joined USF in Fall 2023.

Results:

Student	Safety	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5
1	6	6	6	6	6	6
*2**	5	6	6	6	4	6
3	6	6	6	6	6	4
4	6	6	6	6	6	6
*5**	6	6	6	6	6	6
6	6	6	5	6	6	5
*7**	6	6	6	6	6	6
Avg	*5.86*					*5.83*

As can be seen in the table above, our students scored very high on both safety (5.86) and proficiency (5.83). Students 1, 3, 4, and 6 were senior students in their 3rd semester of the program (with the exception of student 3, who was in their 5th semester). Students 2, 5, and 7 (indicated with a *) were junior students in the 1st semester of the program. These scores indicate that our program largely does a good job preparing students to be safe and proficient in laboratory techniques in their subdiscipline. Since some of the junior students were assessed only 1-2 months after starting the program, these results suggest that either students are coming in with good levels of training, indicative of a strong selection process, or intensive early training in the program itself is successfully achieving these results. To get at this level of detail, each student would need to be assessed when first starting the program, prior to any training.

Closing the loop:

Although the safety and proficiency scores are generally high, individual students are scoring 4s or 5s on particular lab skills or on safety. I will recommend that faculty follow up with individual students to improve on these metrics.

Feedback to the Previous Year's Report:

Prof. Lendvay's feedback to the previous year's report was circulated at department meeting. Prof. Lendvay noted that a group of 3 faculty should be used to assess all of the CARD posters, rather than a variable number (1–3). The department wholeheartedly agrees with this suggestion, and will solicit faculty commitments further in advance. One hurdle is that CARD

usually occurs during prime teaching hours, so it has been difficult for faculty to find the time to do this. An alternative strategy would be to assess poster PDFs at a time outside of the CARD event itself.

Research Lab Student Assessment

This form is designed to help assess PLO2 of the Chemistry MS program, which states that students will "become safe and proficient in laboratory practice and instrumental techniques necessary for research."

MS Student Name: _____

Assessment of Safety

- Briefly describe what safety means in the context of your laboratory, and ***how*** safety was assessed.

- On a scale of 1 (***least safe***) to 6 (***most safe***), how would you rate your MS student with regards to laboratory safety?

  1 2 3 4 5 6

- ***Comments***:

Assessment of Proficiency

Please select 1–5 laboratory skills relevant to your discipline for the purpose of assessing your MS student. Label each skill, rate on a scale of 1 (***least proficient***) to 6 (***most proficient***), and note down any relevant comments.

1. ***Laboratory Skill Assessed:*** _____

   1 2 3 4 5 6

   Comments:

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2. ***Laboratory Skill Assessed:*** _____

1 2 3 4 5 6

Comments:

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3. ***Laboratory Skill Assessed:*** _____

1 2 3 4 5 6

Comments:

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4. ***Laboratory Skill Assessed:*** _____

1 2 3 4 5 6

Comments:

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5. ***Laboratory Skill Assessed:*** _____

1 2 3 4 5 6

Comments:
