

Program-Level Assessment: Annual Report

Program Name (no acronyms): Chemistry PhD

Department: Chemistry

Degree or Certificate Level: Graduate

College/School: Science & Engineering

Date (Month/Year): September 2023

Assessment Contact: Marvin Meyers

In what year was the data upon which this report is based collected? 2022-2023

In what year was the program's assessment plan most recently reviewed/updated? 2018

Is this program accredited by an external program/disciplinary/specialized accrediting organization? No

1. Student Learning Outcomes

Which of the program's student learning outcomes were assessed in this annual assessment cycle? (Please list the full, complete learning outcome statements and not just numbers, e.g., Outcomes 1 and 2.)

This is Year 3 of a three year cycle. The following Outcomes were evaluated according to the program assessment plan.

Outcome 1: Demonstrate advanced level knowledge in both (i) synthesis and materials chemistry and (ii) analytical and physical chemistry methods, with a higher level of knowledge expected in the student's area of focus.

Outcome 2: Use standard search tools and retrieval methods to obtain information about a topic, substance, technique, or an issue relating to chemistry and assess relevant studies from the chemical literature.

Outcome 3: Communicate scientific findings from literature and original findings from the student's own advanced research in written publications and oral presentations.

Outcome 4: Apply learned chemical practices and theories to proposed problems.

Outcome 5: Adhere to accepted ethical and professional standards in chemistry.

2. Assessment Methods: Artifacts of Student Learning

Which artifacts of student learning were used to determine if students achieved the outcome(s)? Please describe the artifacts in detail and identify the course(s) in which they were collected. Clarify if any such courses were offered a) online, b) at the Madrid campus, or c) at any other off-campus location.

For Outcome 1, using a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent), rubrics on the student's "Demonstrated advanced level knowledge..." for the PhD defense were used. The PhD defense is an oral presentation on the summation of knowledge, research and conclusions from 5 years in the program.

For Outcome 2, using a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent), rubrics on the student's "Background Knowledge" for the PhD proposal were used as the student's work includes a 5 page literature review component.

For Outcome 3,

- a) using a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent), the overall score on a rubric for the PhD proposal were used as it includes communication of their own research findings, relevant literature findings and both an oral and written component.
- b) using a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent), the overall score on a rubric for the PhD Dissertation and Final Defense were used as it includes communication of their own research findings, relevant literature findings and both an oral and written component.

For Outcome 4, using a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent), the overall score on a rubric for the PhD dissertation was used as this written work requires application of chemical practices and theories to proposed problems in an overall manner.

For Outcome 5, we devote a class period in CHEM-5000, our introductory research course, devoted to discussion of research ethics. Students are given real world examples as pre-reading, preparing them to participate in discussion.

No courses were offered online. Madrid does not have a graduate program in Chemistry.

3. Assessment Methods: Evaluation Process

What process was used to evaluate the artifacts of student learning, and by whom? Please identify the tools(s) (e.g., a rubric) used in the process and **include them in/with this report document** (please do not just refer to the assessment plan).

Rubrics (attached) were used for the first 4 artifacts. These were completed by the student's research mentors.

4. Data/Results

What were the results of the assessment of the learning outcome(s)? Please be specific. Does achievement differ by teaching modality (e.g., online vs. face-to-face) or on-ground location (e.g., STL campus, Madrid campus, other off-campus site)?

For Outcome 1, using a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent), rubrics on the student's "Demonstrated advanced level knowledge..." for the PhD defense were used (Row 1 in table below).

PhD Final Defense (oral)		Individual Students										# in each category					Total #	
Row	Rubric Component / Student #	1	2	3	4	5	6	7	8	9	10	Avg	Median	4 (Excellent)	3 (Good)	2 (Fair)		1 (poor)
1	Demonstrate advanced level knowledge in both (i) synthesis and materials chemistry and (ii) analytical and physical chemistry methods, with a higher level of knowledge expected in the student's area of focus	4	4	4	4	4						4.0	4	5	0	0	0	5
2	Acquire the basic tools, including chemical practices and theories, needed to conduct advanced chemical research. Students will become proficient in their specialized area of chemistry and complete an advanced, independent research project resulting in peer-reviewed publications.	4	4	4	4	4						4.0	4	5	0	0	0	5
3	Communicate scientific findings from literature and original findings from the student's own independent research.	4	4	4	4	4						4.0	4	5	0	0	0	5
4	Overall (avg)	4.0	4.0	4.0	4.0	4.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	4.0	4.0	5.0	0.0	0.0	0.0	5.0
5	Median	4	4	4	4	4	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!			5	0	0	0	5

Assessment of Outcome 1: These are all students at the end of their PhD programs. All students received excellent scores, thereby exceeding our expectations.

For Outcome 2, using a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent), rubrics on the student's "Background Knowledge" for the PhD proposal were used (Row 3 in the table below).

Research Proposal (written and oral)		Individual Students										# in each category					Total #	
Row	Rubric Component / Student #	1	2	3	4	5	6	7	8	9	10	Avg	Median	4 (Excellent)	3 (Good)	2 (Fair)		1 (poor)
1	Research Proposal Format	4	4	4	4	4	4	3	3			3.8	4	6	2	0	0	8
2	Aims/Objectives	3	3	3	4	4	4	3	3			3.4	3	3	5	0	0	8
3	Background Knowledge	3	3	4	3	3	4	3	4			3.4	3	3	5	0	0	8
4	Experimental Approach	4	4	3	3	4	4	3	4			3.6	4	5	3	0	0	8
5	Research Progress	4	4	4	3	4	4	1	4			3.5	4	6	1	0	1	8
6	Written Communication	3	4	3	3	3	4	2	3			3.1	3	2	5	1	0	8
7	Oral Communication	3	4	3	3	3	3	3	4			3.3	3	2	6	0	0	8
8	Overall (avg)	3.4	3.7	3.4	3.3	3.6	3.9	2.6	3.6	#DIV/0!	#DIV/0!	3.4	3.4	3.8	3.8	0.3	0.3	8.0
9	Median	4	4	3	3	4	4	3	4	#NUM!	#NUM!			4	4	0	0	8

Assessment of Outcome 2: These are all students in the third year of their PhD programs. All students received good and excellent scores, thereby meeting or exceeding our expectations.

For Outcome 3: Communicate scientific findings from literature and original findings from the student's own advanced research in written publications and oral presentations,

- a) using a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent), the overall score on a rubric for the PhD proposal were used (Rows 8&9, plus # in each category section in table below).

Research Proposal (written and oral)		Individual Students										# in each category					Total #	
Row	Rubric Component / Student #	1	2	3	4	5	6	7	8	9	10	Avg	Median	4 (Excellent)	3 (Good)	2 (Fair)		1 (poor)
1	Research Proposal Format	4	4	4	4	4	4	3	3			3.8	4	6	2	0	0	8
2	Aims/Objectives	3	3	3	4	4	4	3	3			3.4	3	3	5	0	0	8
3	Background Knowledge	3	3	4	3	3	4	3	4			3.4	3	3	5	0	0	8
4	Experimental Approach	4	4	3	3	4	4	3	4			3.6	4	5	3	0	0	8
5	Research Progress	4	4	4	3	4	4	1	4			3.5	4	6	1	0	1	8
6	Written Communication	3	4	3	3	3	4	2	3			3.1	3	2	5	1	0	8
7	Oral Communication	3	4	3	3	3	3	3	4			3.3	3	2	6	0	0	8
8	Overall (avg)	3.4	3.7	3.4	3.3	3.6	3.9	2.6	3.6	#DIV/0!	#DIV/0!	3.4	3.4	3.8	3.8	0.3	0.3	8.0
9	Median	4	4	3	3	4	4	3	4	#NUM!	#NUM!			4	4	0	0	8

Assessment of Outcome 3a: These are all students in the third year of their PhD programs. 7 of 8 students received good and excellent overall scores, thereby meeting or exceeding our expectations. 1 of 8 students received Fair or Poor marks due to low research progress and tardiness on the written proposal.

- b) using a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent), the overall score on a rubric for the PhD Dissertation and Final Defense were used (Rows "Overall" and "Median", plus # in each category section in tables below).

PhD Dissertation (written)		Individual Students										# in each category					Total #	
Row	Rubric Component / Student #	1	2	3	4	5	6	7	8	9	10	Avg	Median	4 (Excellent)	3 (Good)	2 (Fair)		1 (poor)
1	Dissertation Format	4	3	4	4	3						3.6	4	3	2	0	0	5
2	Background Knowledge	4	3	4	4	3						3.6	4	3	2	0	0	5
3	Presentation of Independent Research	4	3	4	4	3						3.6	4	3	2	0	0	5
4	Written Communication	4	4	4	4	3						3.8	4	4	1	0	0	5
5	Overall (avg)	4.0	3.3	4.0	4.0	3.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	3.7	4.0	3.3	1.8	0.0	0.0	5.0
6	Median	4	3	4	4	3	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!			3	2	0	0	5

PhD Final Defense (oral)		Individual Students										# in each category					Total #	
Row	Rubric Component / Student #	1	2	3	4	5	6	7	8	9	10	Avg	Median	4 (Excellent)	3 (Good)	2 (Fair)		1 (poor)
1	Demonstrate advanced level knowledge in both (i) synthesis and materials chemistry and (ii) analytical and physical chemistry methods, with a higher level of knowledge expected in the student's area of focus	4	4	4	4	4						4.0	4	5	0	0	0	5
2	Acquire the basic tools, including chemical practices and theories, needed to conduct advanced chemical research. Students will become proficient in their specialized area of chemistry and complete an advanced, independent research project resulting in peer-reviewed publications.	4	4	4	4	4						4.0	4	5	0	0	0	5
3	Communicate scientific findings from literature and original findings from the student's own independent research.	4	4	4	4	4						4.0	4	5	0	0	0	5
4	Overall (avg)	4.0	4.0	4.0	4.0	4.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	4.0	4.0	5.0	0.0	0.0	0.0	5.0
5	Median	4	4	4	4	4	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!			5	0	0	0	5

Assessment of Outcome 3b: These are all students at the end of their PhD programs. All students received excellent scores, thereby exceeding our expectations.

For Outcome 4, using a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent), the overall score on a rubric for the PhD dissertation was used (Rows 5&6, plus # in each category section in Research Proposal table above).

Row	Research Proposal (written and oral)	Individual Students										# in each category					Total #	
		1	2	3	4	5	6	7	8	9	10	Avg	Median	4 (Excellent)	3 (Good)	2 (Fair)		1 (poor)
1	Research Proposal Format	4	4	4	4	4	4	3	3			3.8	4	6	2	0	0	8
2	Aims/Objectives	3	3	3	4	4	4	3	3			3.4	3	3	5	0	0	8
3	Background Knowledge	3	3	4	3	3	4	3	4			3.4	3	3	5	0	0	8
4	Experimental Approach	4	4	3	3	4	4	3	4			3.6	4	5	3	0	0	8
5	Research Progress	4	4	4	3	4	4	1	4			3.5	4	6	1	0	1	8
6	Written Communication	3	4	3	3	3	4	2	3			3.1	3	2	5	1	0	8
7	Oral Communication	3	4	3	3	3	3	3	4			3.3	3	2	6	0	0	8
8	Overall (avg)	3.4	3.7	3.4	3.3	3.6	3.9	2.6	3.6	#DIV/0!	#DIV/0!	3.4	3.4	3.8	3.8	0.3	0.3	8.0
9	Median	4	4	3	3	4	4	3	4	#NUM!	#NUM!			4	4	0	0	8

Assessment of Outcome 4: These are all students in the third year of their PhD programs. 7 of 8 students received good and excellent overall scores, thereby meeting or exceeding our expectations. 1 of 8 students received Fair or Poor marks due to low research progress and tardiness on the written proposal.

For Outcome 5, we devote a class period in CHEM-5000, our introductory research course, devoted to discussion of research ethics. Students are given real world examples as pre-reading, preparing them to participate in discussion. All students participated in this discussion.

5. Findings: Interpretations & Conclusions

What have you learned from these results? What does the data tell you?

Overall, our PhD students are meeting or exceeding expectations for the assessed outcomes. These findings indicate we are admitting students who are prepared to handle the challenges of our advanced coursework and conduct research in our labs. They are applying their knowledge to problems posed in their coursework and are doing so successfully. Based on our analysis, we would recommend graduate mentors to identify gaps in knowledge of their students and provide opportunities to fill these gaps as well as to provide opportunities to practice formal presentations in front of their groups and/or conference settings.

6. Closing the Loop: Dissemination and Use of Current Assessment Findings

A. When and how did your program faculty share and discuss these results and findings from this cycle of assessment?

The results and findings were communicated via the department's Microsoft Teams meeting portal and opened for discussion online and in the department faculty meeting.

B. How specifically have you decided to use these findings to improve teaching and learning in your program? For example, perhaps you've initiated one or more of the following:

Changes to the Curriculum or Pedagogies

- Course content
- Teaching techniques
- Improvements in technology
- Prerequisites
- Course sequence
- New courses
- Deletion of courses
- Changes in frequency or scheduling of course offerings

Changes to the Assessment Plan

- Student learning outcomes
- Artifacts of student learning
- Evaluation process
- Evaluation tools (e.g., rubrics)
- Data collection methods
- Frequency of data collection

Please describe the actions you are taking as a result of these findings.

Over the past year, we formed a Graduate Program Review Committee. Changes were needed due to the rapid growth of the department, greater percentage of PhD students, and desire to improve the overall experience for students and faculty by improving procedural inefficiencies and reducing grad student stress and build community. The committee made recommendations on changes to be program. Some changes

were simple things like forming a graduate student committee to invite 1-2 seminar speakers per year, have a student-led journal club and organize social outings. Others included changing our program start date from July 1 to August 1 to better align with other programs, give international students more time to arrive and settle in, and free up summer schedules. This necessitated a condensed TA training period in August, later selection of research mentors (after classes began), and moving our CHEM 5000 Intro to Chemical Research course to be spread throughout the fall, giving a more sure foundation that we had previously done by placing it in the first two weeks after arrival. We also adjusted required graduate coursework to be more flexible in course selection to allow better alignment with research interests. Finally, our written comprehensive exams for third year students were creating a lot of stress over their 2nd summer losing time for research while really only retesting students on knowledge they either should have had upon arrival in the program or had been previously tested on in their graduate coursework. We replaced this with “prelims” (standardized ACS subject exams) taken their first week upon arrival in order to identify any deficiencies early in their program so that we can give them opportunity to fill those gaps in knowledge right away (e.g., via auditing the appropriate course) rather than let them struggle for a couple of years. Some of these changes have already been approved by the SSE faculty council and others will be submitted, along with a revised graduate handbook this fall.

We will develop a quantitative assessment tool for Outcome 5 and incorporate it into our CHEM 5000 class.

If no changes are being made, please explain why.

N/A

7. Closing the Loop: Review of [Previous Assessment Findings and Changes](#)

A. What is at least one change your program has implemented in recent years as a result of assessment data?

We have not made any specific changes to our program as our assessment data consistently shows that our students are meeting and exceeding expectations on our outcomes. However, as noted above, we are making some changes to improve the overall student and faculty experience. Fall 2023 is the first year of those changes.

B. How has this change/have these changes been assessed?

N/A

C. What were the findings of the assessment?

N/A

D. How do you plan to (continue to) use this information moving forward?

We will continue to monitor the progress of our students and as areas of concern arise, we will made adjustments to address issues.

SLU Chemistry Department – Second Year Research Update Exam

	1 (Poor)	2 (Fair)	3 (Good)	4 (Excellent)	Score
Mastery of Chemical Concepts and Knowledge of Chemical Literature	<i>Demonstrates limited knowledge of chemical concepts. Does not appear familiar with relevant scientific literature</i>	<i>Demonstrates adequate knowledge of chemical concepts in primary area, but limited in other areas. Demonstrates some knowledge of the relevant scientific literature</i>	<i>Demonstrates in-dept knowledge of chemical concepts in primary area and some knowledge in other areas. Demonstrates knowledge of relevant scientific literature</i>	<i>Demonstrates knowledge of concepts in more than one area of chemistry. Demonstrates knowledge of relevant scientific literature</i>	
Experimental Approach	<i>The experimental approach is neither clearly defined nor logical. The expected outcomes are not discussed.</i>	<i>The experimental approach is clearly defined and logical, however the expected outcomes are either not discussed or are not plausible.</i>	<i>The experimental approach is clearly defined and logical. The expected outcomes are discussed and plausible. Alternative outcomes have not been sufficiently addressed.</i>	<i>The experimental approach is clearly defined and logical. The expected outcomes have been discussed and are plausible. Alternative outcomes have been sufficiently addressed.</i>	
Research Progress	<i>Limited progress has been made.</i>	<i>Some progress has been made.</i>	<i>Sufficient progress has been made.</i>	<i>Significant progress has been made.</i>	
Oral Communication	<i>Fails to clearly communicate results and conclusions.</i>	<i>Adequately communicates results and conclusions, however supporting information and explanations are missing.</i>	<i>Successfully communicates results and conclusions, supporting information and explanations are provided.</i>	<i>Results and conclusions are not only successfully summarized and supported, but are also analyzed in the context of the field.</i>	

Comments:

Please return to the Chemistry Graduate Program Coordinator

SLU Chemistry Department – Research Proposal (Written Proposal and Oral Defense)

	1 (Poor)	2 (Fair)	3 (Good)	4 (Excellent)	Score
Research Proposal Format	<i>The organization of the proposal is confusing and/or the length is not appropriate. More than one of the required sections is missing. The references may not be appropriately formatted.</i>	<i>The organization of the proposal is, in places, confusing and/or the length is not appropriate. References may not be appropriately formatted. One of the required sections is missing or more emphasis should be placed on several of the required sections.</i>	<i>The research proposal is well-organized and is of appropriate length. References are appropriately formatted. More emphasis should be placed on several of the required sections.</i>	<i>The research proposal is well-organized and is of appropriate length. All required sections (background, significance, related preliminary results (or examples from literature), broader impacts, and a concise summary) are included. References are appropriately formatted.</i>	
Aims/Objectives	<i>The proposal fails to adequately describe the aims/objectives and the rationale for the proposed project is unclear.</i>	<i>Aims/objectives are described, however, the rationale for the aims/objectives is unclear.</i>	<i>Aims/objectives are described. A rationale for the aims/objectives is included.</i>	<i>The proposal aims/objectives are clearly described and provide a logical framework to address a problem. A compelling rationale for the aims/objectives is included.</i>	
Background Knowledge	<i>Demonstrates limited knowledge of chemical principles and the current literature.</i>	<i>Demonstrates adequate knowledge of chemical principles and an awareness of the current literature, but does not identify unanswered questions in the field.</i>	<i>Demonstrates sufficient knowledge of the current literature and chemical principles. Correctly identifies and understands the importance of unanswered questions in the field.</i>	<i>Demonstrates the ability to apply fundamental concepts to advanced topics in chemistry and in-depth knowledge of the current literature. Correctly identifies and illustrates the importance of unanswered questions in the field and presents the proposal within the context of these questions.</i>	
Experimental Approach	<i>The experimental approach is neither clearly defined nor logical. The expected outcomes are not discussed.</i>	<i>The experimental approach is clearly defined and logical, however the expected outcomes are either not discussed or are not plausible.</i>	<i>The experimental approach is clearly defined and logical. The expected outcomes are discussed and plausible. Alternative outcomes have not been sufficiently addressed.</i>	<i>The experimental approach is clearly defined and logical. The expected outcomes have been discussed and are plausible. Alternative outcomes have been sufficiently addressed.</i>	
Research Progress	<i>Limited progress has been made.</i>	<i>Some progress has been made.</i>	<i>Sufficient progress has been made.</i>	<i>Significant progress has been made.</i>	

	1 (Poor)	2 (Fair)	3 (Good)	4 (Excellent)	Score
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Written Communication	<i>Fails to clearly communicate results and conclusions.</i>	<i>Adequately communicates results and conclusions, however supporting information and explanations are missing.</i>	<i>Successfully communicates results and conclusions, supporting information and explanations are provided.</i>	<i>Results and conclusions are not only successfully summarized and supported, but are also analyzed in the context of the field.</i>	
Oral Communication	<i>Fails to clearly communicate results and conclusions.</i>	<i>Adequately communicates results and conclusions, however supporting information and explanations are missing.</i>	<i>Successfully communicates results and conclusions, supporting information and explanations are provided.</i>	<i>Results and conclusions are not only successfully summarized and supported, but are also analyzed in the context of the field.</i>	

Comments:

SLU Chemistry Department – 4th Year Seminar for PhD students

	1 (Poor)	2 (Fair)	3 (Good)	4 (Excellent)	Score
Presentation skills	<i>Speaker was unprepared and significantly outside the time limits. Speaker did not look at the audience and read from slides. Many distracting habits. Slides were unorganized and poorly prepared.</i>	<i>Speaker was outside time limits by less than 4 min. A few instances of poor or distracting presentation skills.</i>	<i>Speaker was outside time limits by less than 2 min. Less polished, but still professional presentation.</i>	<i>Speaker was polished and within provided time limits. Speaker made eye contact with audience and did not read from slides. Speaker avoided distracting habits. Slides were visually appealing and organized.</i>	
Demonstrate advanced level knowledge in the student's area of research focus	<i>Student lacks basic knowledge in chemistry topics.</i>	<i>Student displays knowledge, but is weak in several key concepts.</i>	<i>Student displays knowledge, with minor weaknesses.</i>	<i>Student displays great knowledge chemistry topics.</i>	
Communicate chemical topics effectively	<i>Student unable to clearly communicate chemical topics.</i>	<i>Student can sometimes communicate chemical topics effectively.</i>	<i>Student can effectively communicate chemical topics.</i>	<i>Student can communicate chemical topics effectively and compellingly.</i>	

Comments:

SLU Chemistry Department – PhD Dissertation

	1 (Poor)	2 (Fair)	3 (Good)	4 (Excellent)	Score
Dissertation Format	<i>The organization of the dissertation is confusing and/or the length is not appropriate. The references may not be appropriately formatted.</i>	<i>The organization of the dissertation is, in places, confusing and/or the length is not appropriate. References may not be appropriately formatted. More emphasis should be placed on several of the sections.</i>	<i>The dissertation is well-organized and is of appropriate length. References are appropriately formatted. More emphasis should be placed on a few of the sections.</i>	<i>The dissertation is well-organized and is of appropriate length. Chapters are balanced appropriately. References are appropriately formatted.</i>	
Background Knowledge	<i>Demonstrates limited knowledge of chemical principles and the current literature.</i>	<i>Demonstrates adequate knowledge of chemical principles and an awareness of the current literature, but does not identify unanswered questions in the field.</i>	<i>Demonstrates sufficient knowledge of the current literature and chemical principles. Correctly identifies and understands the importance of unanswered questions in the field.</i>	<i>Demonstrates the ability to apply fundamental concepts to advanced topics in chemistry and in-depth knowledge of the current literature. Correctly identifies and illustrates the importance of unanswered questions in the field and presents his/her work within the context of these questions.</i>	
Presentation of Independent Research	<i>The aims/objectives and/or the rationale for the project are not adequately described. The experimental approach is neither clearly defined nor logical. Results and discussion are limited.</i>	<i>Aims/objectives are described, however, the rationale for the aims/objectives is unclear. The experimental approach is clearly defined and logical, however the results and discussion lack clarity.</i>	<i>Aims/objectives are described. A rationale for the aims/objectives is included. The experimental approach is clearly defined and logical. Results are presented and interpreted, but additional discussion should be provided.</i>	<i>The aims/objectives are clearly described and provide a logical framework to address a problem. A compelling rationale for the aims/objectives is included. The experimental approach is clearly defined and logical. Results and discussion are complete.</i>	
Written Communication	<i>Fails to clearly communicate results and conclusions.</i>	<i>Adequately communicates results and conclusions, however supporting information and explanations are missing.</i>	<i>Successfully communicates results and conclusions, supporting information and explanations are provided.</i>	<i>Results and conclusions are not only successfully summarized and supported, but are also analyzed in the context of the field.</i>	

Comments:

Please return to the Chemistry Graduate Program Coordinator

SLU Chemistry Department – Final Defense Rubric for PhD students

	1 (Poor)	2 (Fair)	3 (Good)	4 (Excellent)	Score
Demonstrate advanced level knowledge in both (i) synthesis and materials chemistry and (ii) analytical and physical chemistry methods, with a higher level of knowledge expected in the student's area of focus	<i>Student lacks basic knowledge in chemistry topics.</i>	<i>Student displays knowledge, but is weak in several key concepts.</i>	<i>Student displays knowledge, with minor weaknesses.</i>	<i>Student displays great knowledge chemistry topics.</i>	
Acquire the basic tools, including chemical practices and theories, needed to conduct advanced chemical research. Students will become proficient in their specialized area of chemistry and complete an advanced, independent research project resulting in peer-reviewed publications.	<i>Student has make limited progress on one or more aims of an advanced, independent research project.</i>	<i>Some progress has been made on one or more aims of an advanced, independent research project.</i>	<i>Sufficient progress has been made on one or more aims of an advanced, independent research project, resulting in a peer-reviewed publication.</i>	<i>Significant progress has been made on one or more aims of an advanced, independent research project, resulting in at least 1 peer-reviewed publication.</i>	
Communicate scientific findings from literature and original findings from the student's own independent research.	<i>Student unable to clearly communicate chemical topics.</i>	<i>Student can sometimes communicate chemical topics effectively.</i>	<i>Student can effectively communicate chemical topics.</i>	<i>Student can communicate chemical topics effectively and compellingly.</i>	

Comments:

Please return to the Chemistry Graduate Program Coordinator