

## Program-Level Assessment: Annual Report

Program Name (no acronyms): Chemical Biology & Pharmacology

Department: Chemistry

Degree or Certificate Level: BS

College/School: College of Arts & Sciences

Date (Month/Year): August 2021

Assessment Contact: Marvin Meyers

In what year was the data upon which this report is based collected? 2020-2021

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

### 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.)

SLU graduates with a BS degree in Chemical Biology & Pharmacology will be able to:

1. Explain major principles in organic chemistry, biochemistry, and pharmacology
2. Conduct laboratory techniques and experiments safely
- 3. Analyze quantitative data**
- 4. Apply chemistry principles to biology**
5. Articulate scientific results in both oral and written forms

Learning outcomes highlighted in **BOLD font** were assessed in this annual cycle.

This is the second year for the program. In Year 1, learning outcomes 1 and 2 were evaluated. In Year 2, outcomes 3 and 4 are evaluated. In Year 3, outcome 5 will be evaluated.

### 2. Assessment Methods: Artifacts of Student Learning

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

#### Outcome 3:

1. ACS standardized analytical exams are normally used to quantify student mastery (CHEM 2200/2205). Data was collected for Fall and Spring semesters.
2. For undergraduate research, a rubric is used in which the faculty mentor reports on a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent) the student's ability to "analyze quantitative data" (Row 2 of the rubric) (CHEB-3970). Data was not analyzed for students in their first semester of research (as students are just getting oriented in lab so this would not represent their most advanced work) or for students registered in CHEM-3970. The rubric can be found at <https://forms.gle/xMxxdpRfdookgBy38>.

#### Outcome 4:

1. The average exam scores in medicinal chemistry (CHEM-4470) are used to gauge student mastery.
2. For undergraduate research, a rubric is used in which the faculty mentor reports on a scale of 1 to 4 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent) the student's ability to "apply chemistry principles to biology. E.g., How well has the student applied what they have learned in chemistry coursework to biological problems in research." (Row 3 of the rubric) (CHEB-3970). The rubric can be found at <https://forms.gle/xMxxdpRfdookgBy38>.

Madrid does not have a program in Chemical Biology.

No courses in this assessment were offered online or off-campus. The exception to this was CHEM-4470 and CHEM-220 which were offered as hybrid courses (synchronous in-person/Zoom-cast) so some students attended in person and others online or both.

### 3. Assessment Methods: Evaluation Process

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

Data was collected and submitted by course instructors and is summarized on the attached spreadsheet. The undergraduate research rubric completed by mentors can be found at <https://forms.gle/xMxxdpRfdookgBy38>.

Data was analyzed by the Chemical Biology Program Coordinator and reported to department faculty for feedback.

### 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)?

#### Outcome 3:

1. Due to limitations from COVID-19, the ACS exams were not given in 2020, therefore data was only available from the Spring semester of 2021. During this semester, only 4 students in the major took the course and exam. 3 of 4 students met or exceeded expectations with 1 of 4 students not meeting expectations. The sole student not meeting expectations was a transfer student in their first semester on campus.
2. For undergraduate research, 7 of 8 students met or exceeded expectations with 1 student approaching expectations.

#### Outcome 4:

1. No majors were enrolled in CHEM-4470 this past spring, so data from Spring 2020 was used. 4 of 4 students met or exceeded expectations. Half of the course was taught in person and the second half online due to COVID-19.
2. For undergraduate research, 7 of 8 students met or exceeded expectations with 1 student not meeting expectations.

### 5. Findings: Interpretations & Conclusions

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

Based on our analysis, our BS students are generally exceeding expectations, although we were limited to some extent by lingering impact of COVID-19 affecting learning modalities and relatively low numbers of students in certain results due to the fact that the program is only in year 2. As the program develops, we will have more data from more students taking the more advanced coursework required for our learning assessments.

### 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 of the assessment were shared with the full faculty during our annual department retreat in August 2021.

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.

This is our first year assessing these outcomes using these metrics. No changes are being made with respect to these two outcomes.

If no changes are being made, please explain why.

Generally speaking, there are no major concerns given the small sample size where 75-88% of our students are meeting or exceeding expectations.

## 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?

No specific changes to the program have been made as this is only the second year of the program and last year's assessment was significantly affected by the COVID-19 pandemic.

The original Program Assessment Plan was approved as part of the approval of the major in 2018 without development of the specific rubrics needed for assessment. In the past year, specific rubrics were developed to assess Outcomes 2-5 so that we can continuously collect data for relevant portions of these outcomes on an annual basis. The revised Assessment Plan (attached) has been further updated to reflect these more specific modes of data collection.

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?

Rubrics on will be used to collect data annually so that we can assess larger sample sizes (3 year's worth of data) in the coming years when the outcome(s) are scheduled for review.

**IMPORTANT: Please submit any assessment tools (e.g., rubrics) with this report as separate attachments or copied and pasted into this Word document. Please do not just refer to the assessment plan; the report should serve as a stand-alone document.**

Course Performance - BS Students  
Academic Year 2020-2021  
Program Year 2

Assessment Cycle: Year 2

Year 1: Learning outcomes 1 and 2

Year 2: Learning outcomes 3 and 4

Year 3: Learning outcome 5

Outcome 1: Explain major principles in organic chemistry, biochemistry, and pharmacology								
Data Source	>90% - Exceeds Expectations	70 - 89% - Meets Expectations	65 - 69% - Approaching Expectations	<65% - Not meeting expectations	Total	Assesment	Notes	
CHEM 2440 Organic Chem					0			
CHEM 4620 Biochemistry					0			
CHEM 4470 Med Chem					0			
PPY 4410 Molec Pharm					0			

Outcome 2: Conduct laboratory techniques and experiments safely								
Data Source	>90% - Exceeds Expectations	70 - 89% - Meets Expectations	65 - 69% - Approaching Expectations	<65% - Not meeting expectations	Total		Notes	
CHEM 2445 Org Chem 2 Lab					0			
CHEM 4625 Biochem 2 Lab					0			
CHEB 3970 Undergrad Research					0			

Outcome 3: Analyze quantitative data								
Data Source	>90% - Exceeds Expectations (Rubric 4 = Excellent)	70 - 89% - Meets Expectations (Rubric 3 = Good)	65 - 69% - Approaching Expectations (Rubric 2 = Fair)	<65% - Not meeting expectations (Rubric 1 = Poor)	Total		Notes	
CHEM 2200 Anal Chem	2	1		1	4	3 of 4 students met or exceeded expectations with 1 of 4 students not meeting expectations. The sole student not meeting expectations was a transfer student in their first semester on campus.	ACS standardized exam; 66th percentile exceeds, 45-66 meets, 33-44 approaching, <33 does not meet. Due to COVID-19, the ACS Exams were not given in 2020; Data collected only for Spring 2021	
CHEM 3970 Undergrad Research: Rubric Q2 completed by research mentor.	4	3	1		8	7 of 8 students met or exceeded expectations with 1 student approaching expectations	Data was not analyzed for students in their first semester of research or for students registered in CHEM-3970; Rubric was first established in Spring 2021, so only includes data for the spring 2021 semester. The rubric can be found at <a href="https://forms.gle/xMxxdpRfdookgBy38">https://forms.gle/xMxxdpRfdookgBy38</a>	

Outcome 4: Apply chemistry principles to biology								
Data Source	>90% - Exceeds Expectations (Rubric 4 = Excellent)	70 - 89% - Meets Expectations (Rubric 3 = Good)	65 - 69% - Approaching Expectations (Rubric 2 = Fair)	<65% - Not meeting expectations (Rubric 1 = Poor)	Total		Notes	
CHEM 4470 Med Chem: Avg. score on exams	3	1			4	4 of 4 students met or exceeded expectations.	Since no ChemBioPharm BS students were enrolled in CHEM-4470 in the spring of 2021, data was used from the course in the spring of 2020	
CHEM 3970 Undergrad Research: Rubric Q3 completed by research mentor.	4	3		1	8	7 of 8 students met or exceeded expectations with 1 student not meeting expectations	Data was not analyzed for students in their first semester of research or for students registered in CHEM-3970; Rubric was first established in Spring 2021, so only includes data for the spring 2021 semester. The rubric can be found at <a href="https://forms.gle/xMxxdpRfdookgBy38">https://forms.gle/xMxxdpRfdookgBy38</a> .	

Outcome 5: Articulate scientific results in both oral and written forms.								
Data Source	>90% - Exceeds Expectations	70 - 89% - Meets Expectations	65 - 69% - Approaching Expectations	<65% - Not meeting expectations	Total		Notes	
CHEM 3100 Chem Lit					0			
CHEM 3970 Undergrad Research					0			
Senior Thesis					0			
Senior Poster					0			

## Program Assessment Plan

**Program:** BS in Chemical Biology  
**Department:** Chemistry  
**College/School:** College of Arts & Sciences  
**Date:** Revised August 2021  
**Primary Assessment Contact:** Marvin Meyers

**Note:** Each cell in the table below will expand as needed to accommodate your responses.

#	Program Learning Outcomes	Assessment Mapping	Assessment Methods	Use of Assessment Data
	<p>What do the program faculty expect all students to know, or be able to do, as a result of completing this program?</p> <ul style="list-style-type: none"> <li>Note: These should be measurable, and manageable in number (typically 4-6 are sufficient).</li> </ul>	<p>From what specific courses (or other educational/professional experiences) will artifacts of student learning be analyzed to demonstrate achievement of the outcome? Include courses taught at the Madrid campus and/or online as applicable.</p>	<p>What specific artifacts of student learning will be analyzed? How, and by whom, will they be analyzed?</p> <ul style="list-style-type: none"> <li>Note: the majority should provide direct, rather than indirect, evidence of achievement.</li> </ul> <p>Please note if a rubric is used and, if so, include it as an appendix to this plan.</p>	<p>How and when will analyzed data be used by faculty to make changes in pedagogy, curriculum design, and/or assessment work?</p> <p>How and when will the program evaluate the impact of assessment-informed changes <i>made in previous years</i>?</p>
1	<p>Explain major principles in organic chemistry, biochemistry, and pharmacology.</p>	<p>CHEM-2440 (organic chemistry)            CHEM-4620 (biochemistry)            CHEM-4470 (medicinal)            PPY-4410 (molecular pharmacology)</p>	<p>ACS standardized exams for organic chemistry (CHEM-2440) and biochemistry (CHEM-4620) will be used to quantify student comprehension.</p> <p>Average exam scores in CHEM-4470 and PPY-4410 will be used to gauge student mastery of this learning outcome (Spring).</p>	<p>The data will be analyzed by the Chemical Biology Program Coordinator and a small team of faculty.</p> <p>Assessment data will be collected on a 3-year rotating basis. A summary of the results will be shared with the faculty annually and adjustments to the curriculum and/or assessment process will be made as needed.</p>
2	<p>Conduct laboratory techniques and experiments safely.</p>	<p>CHEM-2445 (organic chem 2 lab)            CHEM-4625 (biochemistry 2 lab)            CHEB-3970/CHEM-3970/BIOL-4980 (undergrad research)</p>	<p>A rubric will be used to collect student learning data from instructor/mentor evaluations for CHEM-2445 (organic chem 2 lab), CHEM-4625 (biochemistry 2 lab), and CHEB-3970/CHEM-3970/BIOL-4980 (undergrad research).</p>	<p>The data will be analyzed by the Chemical Biology Program Coordinator and a small team of faculty.</p> <p>Assessment data will be collected on a 3-year rotating basis. A summary of the results will be shared with the</p>

			<p>The rubric for undergraduate research can be found at <a href="https://forms.gle/xMxxdpRfdookgBy38">https://forms.gle/xMxxdpRfdookgBy38</a>.</p> <p>The rubric will be completed by the course instructors and research mentors as they assess student mastery (Fall and Spring).</p>	<p>faculty annually and adjustments to the curriculum and/or assessment process will be made as needed.</p>
3	Analyze quantitative data.	<p>CHEM-2200 (analytical chemistry)            CHEM-2205 (analytical chemistry lab)            CHEB-3970/CHEM-3970/BIOL-4980 (undergrad research)</p>	<p>ACS standardized exam for analytical chemistry will be used to quantify student mastery (CHEM-2200/2205) (Fall and Spring).</p> <p>A rubric will be used to collect student learning data from CHEB-3970 mentor evaluations of student performance (Fall and Spring; excludes student in their first semester of research). The rubric for undergraduate research can be found at <a href="https://forms.gle/xMxxdpRfdookgBy38">https://forms.gle/xMxxdpRfdookgBy38</a>.</p>	<p>The data will be analyzed by the Chemical Biology Program Coordinator and a small team of faculty.</p> <p>Assessment data will be collected on a 3-year rotating basis. A summary of the results will be shared with the faculty annually and adjustments to the curriculum and/or assessment process will be made as needed.</p>
4	Apply chemistry principles to biology.	<p>CHEM-4470 (medicinal chemistry)            CHEB-3970/CHEM-3970/BIOL-4980 (undergrad research)</p>	<p>Average exam scores in CHEM-4470 will be used to gauge student mastery of this learning outcome (Spring).</p> <p>A rubric will be used to collect student learning data from CHEB-3970 mentor evaluations of student performance. The rubric will be completed by the course instructors and research mentors as they assess student mastery (Fall and Spring; excludes student in their first semester of research). The rubric for undergraduate research can be found at <a href="https://forms.gle/xMxxdpRfdookgBy38">https://forms.gle/xMxxdpRfdookgBy38</a>.</p>	<p>The data will be analyzed by the Chemical Biology Program Coordinator and a small team of faculty.</p> <p>Assessment data will be collected on a 3-year rotating basis. A summary of the results will be shared with the faculty annually and adjustments to the curriculum and/or assessment process will be made as needed.</p>
5	Articulate scientific results in both oral and written forms.	<p>CHEM-3100 (chemical literature)            CHEB-3970/CHEM-3970/BIOL-4980 (undergrad research)            Senior Thesis            Senior Poster Session</p>	<p>Score from oral literature presentation in CHEM-3100 will be used to gauge student mastery of oral (Fall).</p> <p>A rubric will be used to collect student learning data from CHEB-3970, the senior thesis and poster presentation (Spring).</p>	<p>The data will be analyzed by the Chemical Biology Program Coordinator and a small team of faculty.</p> <p>Assessment data will be collected on a 3-year rotating basis. A summary of the results will be shared with the faculty annually and adjustments to</p>

			<p>The rubric will be completed by the research mentor as they evaluate the senior thesis for written mastery. The rubric for the senior thesis can be found at <a href="https://forms.gle/dvN4QDzWgsf8WFp87">https://forms.gle/dvN4QDzWgsf8WFp87</a>.</p> <p>The senior posters will be judged as part of the Sigma Xi poster session. Average scores from all the judges will be used.</p>	<p>the curriculum and/or assessment process will be made as needed.</p>
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### Additional Questions

1. On what schedule/cycle will faculty assess each of the above-noted program learning outcomes? (*It is not recommended to try to assess every outcome every year.*)

In year 1, learning outcomes 1 and 2 will be assessed. In year 2, learning outcomes 3 and 4 will be assessed. In year 3, learning outcome 5 will be assessed.

2. Describe how, and the extent to which, program faculty contributed to the development of this plan.

The chemical biology program director revised the plan, distributed and discussed with faculty at the annual faculty retreat in August 2021.

3. On what schedule/cycle will faculty review and, if needed, modify this assessment plan?

Every 3 years, the faculty will review the assessment plan and modify if needed.

**IMPORTANT:** Please remember to submit any assessment rubrics (as noted above) along with this report.