SAINT LOUIS UNIVERSITY.

# Program-Level Assessment: Annual Report

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| Program Name (no acronyms): Chemical Biology & Pharmacology | Department: Chemistry |
| Degree or Certificate Level: BS | College/School: College of Arts & Sciences |
| Date (Month/Year): August 2022 | Assessment Contact: Chris Arnatt |
| In what year was the data upon which this report is based collected? 2021-2022 | |
| 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 third year for the program. In Year 1, learning outcomes 1 and 2 were evaluated. In Year 2, outcomes 3 and 4 were evaluated. In Year 3, outcome 5 was 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 5:**

1. For CHEM3100 Chem Lit, final grades were used to classify the students into >90% - Exceeds Expectations, 70 - 89% - Meets Expectations, 65 - 69% - Approaching Expectations, and <65% - Not meeting expectations.

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 "articulate scientific results in both oral and written forms." (Row 4 of the rubric) (CHEB-3970). The rubric can be found at https://forms.gle/xMxxdpRfdookgBy38.

3. For Senior thesis, a grading rubric was used, this document is attached.

4. For senior poster, students present their work at the spring Sigma Xi conference at SLU. Posters are judged and scored.

Madrid does not have a program in Chemical Biology.
No courses in this assessment were offered online or off-campus.

## 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** (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 5:**

1.  10 out of 10 students met expectations with articulating scientific results in CHEM3100.

2.  Based upon responses, 20 out of 20 students met expectations with articulating their scientific results in Undergraduate Research.

3.  3 out of 3 students met expectations with their senior thesis. This number is low due to the low number of graduating seniors in this year of the program.

4.  3 out of 3 students exceeded expectations with their poster presentations. This number is low due to the low number of graduating seniors in this year of the program.

## 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 extend by lingering impact of COVID-19 affecting poster presentations and relatively low numbers of students in certain results due the fact that the program is only in year3. As the program develops, we will have more data from more students taking the more advanced coursework required for our learning assessments.

The University's policy of submitting this assessment report based on individual program may not be best suited for chemistry. The faculty decided that assessment based on the aggregated results from all programs is a better method of assessment. Most courses are enrolled by students from different programs, so changes to a course affect students in different programs. Also, separating based on program does not provide a sufficient amount of data to make meaningful conclusions (notice the very small n values above). In the aggregate, our students are meeting or exceeding the outcomes.

## 6. Closing the Loop: Dissemination and Use of <u>Current</u> 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 via email. The collection and analysis of the data was completed just prior to finalizing this report. The data and the first draft of this report was shared with the instructors of the courses related to the above outcomes.

**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 third year of the program.

   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.**

|  | Mastery (3) | Meets Expectations (2) | Needs Development (1) | Score |
|---|---|---|---|---|
| Arrangement of thesis | Information and text are arranged in a format that is typical of a publication in the field: Title, Introduction, Procedure, Results, Discussion, Conclusion, and References. | Information and text are arranged in a format that is typical of a publication in the field with only one section out of order or not included. | Information and text are not arranged in a format that is typical of a publication in the field. |  |
| Arrangement of text | Text is arranged in a coherent, logical manner that is appropriate for the topic. Paragraphs are put together well with a coherent "flow." They are persuasive and connect to surrounding material. | Text is arranged in a logical manner appropriate for the topic. Paragraphs are put together well, but some lack a coherent "flow". Some are persuasive and connect to surrounding material. | Text is not arranged in a logical manner. Paragraphs lack a coherent "flow." They are not persuasive and do not connect to the surrounding material. |  |
| Title | The title clearly identifies the **topic** and the **main point** of the thesis. | The title identifies the topic and gives a general idea of the main point. | The title does not identify the topic, or there is no title. |  |
| Research Problem | The research problem meets the following criteria: is testable, is predictive, is specific, and looks at a particular question or theory. | The research problem meets all but one of the defined criteria. | The research problem does not meet two or more of the defined criteria. |  |
| Introduction | Information relevant to the given topic is provided. The significance of the topic is clear to the reader. | Information relevant to the given topic is provided, but the significance of the topic is not clear to the reader. | Information provided is not relevant to the given topic. The significance of the topic is not clear to the reader. |  |
| Materials and methods | The procedure is written in paragraph form and can reliably be repeated by another scientist. All materials/methods used in the laboratory are clearly indicated. | The procedure is written in paragraph form and can usually be repeated by another scientist. Most materials/methods used in the laboratory are clearly indicated. | The procedure is not written in paragraph form. Details are missing, and the procedure cannot be repeated by another scientist. Some materials/methods used in the laboratory are clearly indicated. |  |
| Results | The results section describes all quantitative and qualitative observations from the laboratory. The data is tabulated and/or graphed in a way that is easy to comprehend. All tables and graphs are numbered, titled, and referenced. | The results section describes some quantitative and qualitative observations from the laboratory. The data is tabulated and/or graphed in a way that is potentially confusing. Tables and graphs are titled and referenced. Graphs are not always provided where applicable. | Significant quantitative and qualitative observations from the laboratory are missing. The data is tabulated and/or graphed in a way that is not easily comprehendible. Graphs of the given data are not provided where applicable. |  |
| Discussion | All results and outside evidence are properly introduced and thoroughly discussed. Clear connections are built between all important pieces of information. | All results and some outside evidence are presented, but the discussion is not completely convincing. Some connections are built between important pieces of information. | Results and outside evidence are mentioned but not thoroughly discussed. No connections are built between important pieces of information. |  |
| Conclusion | The conclusion is strong and well summarized. It leaves the reader with a clear and thorough understanding. | The conclusion is well summarized. It leaves the reader with a general understanding. | The conclusion is present but not well summarized. It leaves the reader without an understanding. |  |
| Grammar/Spelling Error | The thesis is free from spelling and grammar errors; 0-5 errors can be identified. | The thesis is generally free from spelling and grammar errors; 6-10 errors can be identified. | The thesis has many spelling and grammar errors. |  |

Loosely adapted from a rubric in Rachel M. Coon's "A Compilation of Rubrics to be Used in Chemistry to Emphasize Argumentative Writing in the Science Classroom." This blank rubric was designed for program assessment. Completed rubrics will not be returned to students nor will they be used to determine semester grades for CHEM 3970.

**Course Performance - BS Students**
**Academic Year 2021-2022**
**Program Year 3**

**Assessment Cycle:  Year 3**
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 | Assessement | 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 | | | | | | | |
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| 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 | | | | | | | 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. | | | | | | | 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 https://forms.gle/xMxxdpRfdookgBy38 . |

| 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 | | | | | | | 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. | | | | | | | 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 https://forms.gle/xMxxdpRfdookgBy38. |

| 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 | 9 | 1 | | | 10 | | |
| CHEM 3970 Undergrad Research | 16 | 4 | | | 20 | | |
| Senior Thesis | 2 | 1 | | | 3 | | |
| Senior Poster | 3 | | | | 3 | | |