SAINT LOUIS UNIVERSITY.

Program-Level Assessment: Annual Report

Program Name (no acronyms): BS Chemistry	Department: Chemistry
Degree or Certificate Level: Undergraduate	College/School: SSE
Date (Month/Year): September 2022	Assessment Contact: Brent Znosko

In what year was the data upon which this report is based collected? 2018-present

In what year was the program's assessment plan most recently reviewed/updated? 2022

Is this program accredited by an external program/disciplinary/specialized accrediting organization? Yes

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.)

Year 2 assessment focuses on components of lab courses that are used as a measure of student learning. The following program student learning outcomes were assessed in this annual assessment cycle (Year 2):

#2 – Demonstrate proficiency of basic (general, physical, and inorganic) laboratory techniques and advanced (organic and analytical) laboratory techniques and conduct laboratory experiments safely (a, c, e, g, and h in assessment plan).

#3 – Collect, interpret, and analyze quantitative data (c, e, and f in assessment plan).

#4 - Communicate scientific results effectively, especially through written reports and oral presentations (a, b, d, and f in assessment plan)

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.

Data collected includes:

Outcome #2 – Score on safety exam in General Chemistry 1&2, scoring rubric for Gen Chem 2 lab Boiling Point Elevation, semester score in Physical Chemistry Lab, score on safety exam in Orgo 1&2 Lab, scoring rubric (technique points section) for Orgo 2 lab (Lab 7: E1/E2 elimination), semester score in Analytical 1 Lab, and score on grading rubric in Inorganic Lab (ferrocene lab).

Outcome #3 – Semester score in Analytical 1 Lab, rubric (data analysis) for Analytical 2 Lab (spectroscopy lab), grading rubric for Inorganic Lab (report and computational work sections for ferrocene lab), and semester score for Physical Chemistry Lab.

Outcome #4 – Presentation in Orgo 1 Lab (rubric), overall score on rubric for Analytical 2 Lab (spectroscopy lab), semester score for Physical Chemistry Lab, and overall score on rubric in Inorganic Lab (ferrocene lab).

Data from Madrid was not collected. Only general chemistry and organic chemistry are offered in Madrid. Very few chemistry and biochemistry majors take these courses in Madrid.

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).

Raw scores were tabulated by the instructors of the courses and sent to the undergraduate program coordinator. Percentage scores were evaluated using the following criteria: >89% = exceeds, 80-89% = meets, 70-79% = approaching, and <70% does not meet.

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 #2 – Students' scores on a safety exam in General Chemistry 1 (64% exceeds, 23% meets, 2% approaching, 2% does not meet, n=44) and 2 (65% exceeds, 30% meets, 5% approaching, 0% does not meet, n=20), scoring rubric for Gen Chem 2 lab Boiling Point Elevation (33% exceeds, 46% meets, 13% approaching, 8% does not meet, n=24), semester score in Physical Chemistry Lab (14% exceeds, 62% meets, 17% approaching, 7% does not meet, n=29), score on safety exam in Orgo 1 (96% exceeds, 4% meets, 0% approaching, 0% does not meet, n=26) & 2 Lab (92% exceeds, 4% meets, 0% approaching, 4% does not meet, n=25), scoring rubric (technique points section) for Orgo 2 lab (Lab 7: E1/E2 elimination) (88% exceeds, 12% meets, 0% approaching, 0% does not meet, n=8), semester score in Analytical 1 Lab (55% exceeds, 45% meets, 0% approaching, 0% does not meet, n=20), and score on grading rubric in Inorganic Lab (ferrocene lab) (14% exceeds, 43% meets, 31% approaching, 11% does not meet, n=35) were collected.

Outcome #3 – Students' semester scores in Analytical 1 Lab (55% exceeds, 45% meets, 0% approaching, 0% does not meet, n=20), rubric (data analysis) for Analytical 2 Lab (spectroscopy lab) (52% exceeds, 17% meets, 9% approaching, 22% does not meet, n=23), grading rubric for Inorganic Lab (report and computational work sections for ferrocene lab) (17% exceeds, 37% meets, 37% approaching, 9% does not meet, n=35), and semester score for Physical Chemistry Lab (14% exceeds, 62% meets, 17% approaching, 7% does not meet, n=29) were collected.

Outcome #4 – Students' scores on a presentation in Orgo 1 Lab (rubric) (77% exceeds, 8% meets, 8% approaching, 8% does not meet, n=13), overall score on rubric for Analytical 2 Lab (spectroscopy lab) (26% exceeds, 39% meets, 26% approaching, 9% does not meet, n=23), semester score for Physical Chemistry Lab (14% exceeds, 62% meets, 17% approaching, 7% does not meet, n=29), and overall score on rubric in Inorganic Lab (ferrocene lab) (14% exceeds, 43% meets, 31% approaching, 11% does not meet, n=35) were collected.

5. Findings: Interpretations & Conclusions

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

We have learned the following:

1. 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 affects 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.
2. Overall, students are meeting the learning Outcome #2. On the General Chemistry Lab 1 safety exam, General Chemistry Lab 2 safety exam, General Chemistry Lab 2 Boiling Point Elevation, semester score in Physical Chemistry lab, Organic Lab 1 safety exam, Organic Lab 2 safety exam, technique points section on Lab 7: E1/E2 Elimination in Organic Lab 2, and the semester scores in Analytical 1 Lab, and grading rubric in Inorganic lab 87%, 95%, 79%, 76%, 100%, 96%, 100%, 100%, and 57% of the students have met the outcome.
3. Overall, students are meeting the learning Outcome #3. For the Analytical 1 Lab semester scores, Analytical 2 lab, Inorganic lab, and Physical Chemistry lab, 100%, 69%, 54%, and 76% of the students have met the outcome.
4. Overall, students are meeting the learning Outcome #4. On the presentation in Orgo 1 lab, Analytical 2 lab, Physical Chemistry lab, and Inorganic lab, 85%, 65%, 76%, and 57% of the students are meeting this outcome.

It should be noted that small sample sizes (sometimes as few as eight students) may be skewing the results. More meaningful results will likely require data from several years.

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 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. These instructors had an email discussion and shared ideas. The data will be shared with all faculty in the near future. It is likely that faculty will discuss the results reported here with their colleagues in their respective areas of expertise (general chemistry, organic, inorganic, analytical, physical, and biochem). Additional ideas may result from these discussions.

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.

It should be noted that students in this program are meeting learning Outcome #4 associated with the organic lab presentation, which was not the case for BA chemistry students. Due to poor performance by this group of students, the responsible parties for the course are still evaluating best steps forward; however, there are two pertinent actions that are being considered. (1) Evaluation of offering a no point penalty draft option. Students wishing to turn in a draft presentation will receive constructive feedback on how to improve their presentation so it can be incorporated into their final submission. (2) An example presentation could be provided to the class which would provide a template for them to utilize. These two modifications could benefit students who traditionally achieve lowers scores on this outcome, such as the BA chemistry students; however, any changes to the course will also affect all other majors. Final decisions on modifications to the course will be made after the submission of this report.

If no changes are being made, please explain why.

Due to the high percentage of students who are meeting the outcomes, it is likely that no changes will be made with Outcomes #2 and #3.

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 recently decided to change the assessment method for our analytical courses. For this program, we are no longer collecting data on technique-specific questions from the ACS analytical exam. The faculty felt that collecting the semester score in analytical 1 lab was sufficient to demonstrate proficiency of basic lab techniques. Also, we are no longer collecting data on quantitative questions from the ACS analytical exam. Instead, we are collecting students' semester scores in CHEM 2200.

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

These changes are reflected in our current assessment plan. We are no longer collecting data on technique-specific or quantitative questions from the ACS analytical exam. We have always collected the semester score in analytical 1 lab, so that will continue. We have begun collecting students' semester scores in CHEM 2200. That data is being assessed with all of our other program outcomes.

C. What were the findings of the assessment?

While the n is still small (n=11), so far, 100% of the students are meeting this program objective.

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

These changes will be reflected in our annual data collection process and our 3-year annual assessment cycle.

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.