SAINT LOUIS UNIVERSITY.

Program-Level Assessment: Annual Report

Program Name (no acronyms): BA Chemistry	Department: Chemistry
Degree or Certificate Level: Undergraduate	College/School: A&S
Date (Month/Year): August 2021	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? 2021	

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 1 assessment focuses on lecture courses. The following program student learning outcomes were assessed in this annual assessment cycle (Year 1):

Outcome #1 – Demonstrate a foundational understanding of organic, inorganic, analytical, and physical chemistry.

Outcome #2 – Demonstrate proficiency of basic (general, organic, and analytical) laboratory techniques and conduct laboratory experiments safely.

Outcome #3 – Collect, interpret, and analyze quantitative data.

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 #1 – Students' overall percentiles on the ACS organic exam were collected for CHEM 2440. Students' overall percentages on the ACS inorganic exam were collected for CHEM 4500. Students' overall percentiles on the ACS analytical exam were collected for CHEM 2200. Students' overall percentages on the ACS physical exam were collected for CHEM 3330

Outcome #2 - Students' scores on technique-specific questions on the ACS organic exam were collected for CHEM 2440.

Outcome #3 - Students' semesters scores were collected for CHEM 2200. Students' scores on quantitative questions on the ACS organic exam were collected for CHEM 2440. Students' scores on quantitative questions on the ACS physical exam were collected for CHEM 3330.

All the relevant courses are typically offered in-person. Most data was not collected during COVID (ACS exams can only be taken in-person). Data from Madrid was not collected. Only general chemistry and organic chemistry are offered in Madrid, and these courses very rarely include majors.

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. Percentile scores were evaluated using the following criteria: >66 = exceeds, 45-66 = meets, 33-44 = approaching,

and <33 does not meet. 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 #1 – Students' overall percentiles on the ACS organic exam were collected for CHEM 2440 (57% exceeds, 14% meets, 14% approaching, 14% does not meet, n=7). Students' overall percentages on the ACS inorganic exam were collected for CHEM 4500 (17% meets, 83% does not meet, n=6). Students' overall percentiles on the ACS analytical exam were collected for CHEM 2200 (88% exceeds, 13% does not meet, n=8). Students' overall percentages on the ACS physical exam were collected for CHEM 3330 (14% exceeds, 21% meets, 14% approaching, 50% does not meet, n=14).

Outcome #2 - Students' scores on technique-specific questions on the ACS organic exam were collected for CHEM 2440 (14% exceeds, 14% meets, 14% approaching, 57% does not meet, n=7).

Outcome #3 - Students' semesters scores were collected for CHEM 2200 (50% meets, 50% approaching, n=2). Students' scores on quantitative questions on the ACS organic exam were collected for CHEM 2440 (43% exceeds, 14% meets, 14% approaching, 29% does not meet, n=7). Students' scores on quantitative questions on the ACS physical exam were collected for CHEM 3330 (17% exceeds 39% meets, 6% approaching, 28% does not meet, n=18).

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. Faculty in all disciplines agreed that ACS percentiles (versus ACS percentages or percentages on a final exam) were the best measure of these learning outcomes. The difficulty of final exams can vary each year and vary from instructor to instructor. The difficulty of the ACS exam also varies with each version. However, the ACS provides percentiles that take into account difficulty and allow us to compare our students' performances from year to year and against students across the nation. The use of ACS *percentages* is the likely reason why the physical chemistry outcomes do not look as positive as we would hope (see below).
3. The organic and physical faculty noted that using questions on an ACS exam may not be the best measure to evaluate quantitative and/or lab technique learning objectives. These objectives may be better measured by lab performance.
4. With that said, the organic faculty noted that they may need to devote more lecture time to quantitative problems.

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 data was shared with faculty via email on Tuesday, Aug. 3. The data was discussed at a faculty retreat on Monday, August 9. Faculty divided into their respective areas of expertise (general chemistry, organic, inorganic, analytical, physical, and biochem) to discuss their specific results. Faculty in their respective areas discussed the data in the weeks following the retreat.

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.

The department will be taking the following actions:

1. The organic chemistry lecture course is now being taught in a semi-flipped format that will devote significantly more time to in-class problem solving.
2. We will no longer use ACS physical chemistry exam questions to measure outcomes related to lab techniques.
3. We will use additional questions on the ACS physical chemistry exam to measure outcomes related to quantitative questions.
4. We will use a version of the ACS physical chemistry exam that has percentiles available. The ACS physical chemistry exam used in the past did not have percentiles available, so percentages were used, which makes it difficult to compare to older or newer version of the exam as difficulty changes and does not allow for comparison to national norms.
5. We will include additional inorganic data in the future as it was discovered that this year's analysis was missing a year of data.

If no changes are being made, please explain why.

No changes are being made to the analytical and biochemistry outcomes. We observed that, in aggregate, the students are meeting or exceeding the related learning objectives.

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?

Earlier this year, we 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 I 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 was assessed in this report.

C. What were the findings of the assessment?

The change was just made this year. Lab outcomes are a focus of next year's assessment cycle. The sample size for students' semester scores in CHEM 2200 (n=2) is too small to draw any conclusions.

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.