SAINT LOUIS UNIVERSITY.

Program-Level Assessment: Annual Report

Program Name (no acronyms): Biomedical Engineering	Department: Engineering
Degree or Certificate Level: B.S.	College/School: Parks College
Date (Month/Year): 04/23	Assessment Contact: Scott Sell
In what year was the data upon which this report is based collected? AY 2021-2022	
In what year was the program's assessment plan most recently reviewed/updated? 2023	
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.)

In this annual cycle, we assessed all five of our stated HLC student learning outcomes. Because ABET accreditation cycle requires outcomes to be assigned to courses, each year of a 3-year cycle (2 cycles per ABET review) we look at a different set of courses. This year, the courses that were common to both the ABET and University assessment processes were BME 1000, BME 3200, BME 4400, BME 4950, BME 1010, BME 3400, and BME 4200.
The assessed student learning outcomes were as follows:
Outcome 1: Graduates will demonstrate an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (ABET 1).
Outcome 2: Graduates will demonstrate an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. (ABET 5)
Outcome 3: Graduates will demonstrate an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. (ABET 4).
Outcome 4: Graduates will demonstrate communicate effectively with a range of audiences. (ABET 3)
Outcome 5: Graduates will be able to solve bio/biomedical engineering problems, including those associated with the interaction between living and non-living systems. (ABET BME B).

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.

BME artifacts include specific homework, quiz and exam questions, specific sections of reports from projects, oral presentations, poster presentations and prototypes of student's designs. We also have extensive student survey data, but survey data is not included in this report. For AY 2020 - 2021 we collected artifacts from the following courses: BME 1000, BME 3200, BME 4400, BME 4950, BME 1010, BME 3400, and BME 4200.

None of the artifacts were collected from the Madrid campus, or other off-campus locations. None of the courses were delivered in an online / hybrid format.

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).

The evaluation occurs in three phases. In phase one, faculty teaching the course identify and perform quantitative analysis of each artifact type corresponding to each outcome. This analysis results with the artifacts being assigned the letters A, B, and C, where an A corresponds to greater than 80% of the artifacts received a passing score (>70%), B corresponds to greater than 60% of the artifacts received a passing score, and C corresponds to less than 60% of the artifacts received a passing score. This evaluation is documented in the Form 3_5 under 'Phase 1 assessment.'

In phase two, faculty fill out ABET outcome evaluation rubrics for each artifact, reflecting the degree to which each artifact corresponds to the desired response. These evaluations are converted to the letters A, B and C, where an A corresponds to greater than 80% of the artifacts fall within the 'satisfactory' or 'exemplary' categories, B corresponds to greater than 60% of the artifacts falling within the 'satisfactory' or 'exemplary' categories, and C corresponds to less than 60% of the artifacts falling within the 'satisfactory' or 'exemplary' categories. This evaluation is documented in the Form 3_5 under 'Phase 2 Assessment.' In phase three, the entire BME faculty meet to discuss and evaluate the forms and the outcome rubrics.

The 3_5 form and the learning outcome rubrics are included with this report.

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: Graduates will demonstrate an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. This outcome was assessed through artifact collection in courses across sophomore, junior, and senior level courses. In each of these courses the outcome was assessed to be at Level-A achievement (>80% of the artifacts received passing scores).

Outcome 2: Graduates will demonstrate an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. This outcome was assessed through artifact collection in courses representing sophomore, junior, and senior levels. In each of these courses the outcome was assessed to be at Level-A achievement (>80% of the artifacts received passing scores).

Outcome 3: Graduates will demonstrate an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. This outcome was assessed through artifact collection in three courses representing junior and senior levels. In each of these courses the outcome was assessed to be at Level-A achievement (>80% of the artifacts received passing scores).

Outcome 4: Graduates will demonstrate communicate effectively with a range of audiences. This outcome was assessed through artifact collection in three courses representing junior, and senior levels. In each of these courses the outcome was assessed to be at Level-A achievement (>80% of the artifacts received passing scores).

Outcome 5: Graduates will be able to solve bio/biomedical engineering problems, including those associated with the interaction between living and non-living systems. This outcome was assessed through artifact collection in three courses representing junior, and senior levels. In each of these courses the outcome was assessed to be at Level-A achievement (>80% of the artifacts received passing scores).

5. Findings: Interpretations & Conclusions

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

Our data suggests that the students are achieving the desired level of performance with respect to each of our assessed outcomes.

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?

> Our faculty keep a Google folder of all our assessments and artifacts. We have a program meeting each semester to view and discuss the assessments of our courses (exemplar artifacts viewed as needed). This allows all faculty to observe assessment techniques and opportunities while providing feedback and allowing for continuous improvement.

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.

> Based upon high student achievement of outcomes (with all being achieved at Level A) we are not planning for changes to curriculum or the assessment plan.

If no changes are being made, please explain why.

> Based on our assessment, students obtained a high level of achievement in the outlined outcomes in all courses evaluated this academic year. Previously, we have generated performance indicators and official scoring rubrics for each outcome and associated areas of focus. We have also changed outcomes in alignment with a change implemented by ABET. See below for the discussion of these changes and our findings.

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 created performance indicators and official scoring rubrics for all student outcomes and started using them for data assessment and analysis in the Fall '21.

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

> Each faculty filled out the Form 3_5 for each course scheduled for assessment. The entire BME faculty met to review, discuss, and evaluate the assessment forms and the outcome rubrics.

C. What were the findings of the assessment?

> The use of performance indicators and rubric outcomes allows us to decouple student outcomes from student grades. Our analysis appears to validate this assessment method. We observed that students achieved passing grades while also obtaining a high level of achievement in the student learning outcomes.

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

> We continue to focus on student generated content, but less so on grades. This will put more emphasis on the performance indicators and scoring rubrics rather than just assignment grades for determining outcome achievement.