

## **BS Biochemistry Annual Assessment Report 2015-16**

### **1. What learning outcome(s) did you assess this year?**

Assessment activities from 2015-16 and 2016-17 have been switched to align the B.S. Biochemistry assessment activities with the B.A. and B.S. Chemistry SOAP.

**SLO 2.** Students will apply their understanding of chemical and biochemical terminology, concepts, theories, and skills to conduct experimental laboratory work of high quality.

### **2. What instruments did you use to assess them?**

The SOAP calls for the use of ‘Method B’ to assess the learning outcome. However, with the re-alignment of the SOAP with that of our other degrees, we chose to use the two rubrics developed for our B.A. and B.S. Chemistry student outcomes assessment (appended to this report).

**Laboratory Notebook Rubric.** From the B.A./B.S. Chemistry SOAP: *“Instructor Evaluation Rubric – This rubric will be applied primarily in laboratory courses as a check on the quality and ethics of student laboratory work along with their ability to function in teamwork and collaborative assignments. When used for program assessment, a minimum of 15% of the class or four students (whichever is less) are scored by two or more faculty members to ensure consistent application of the rubric. Each student passing the course is expected to earn an average of 1.5 of 3 with no more than one poor (0) score.”*

Laboratory notebooks were collected in the Spring 2016 CHEM 156 course (Biochemical Laboratory Techniques, a senior level lab course taken by B.A. Chemistry and B.S. Biochemistry majors). Seven notebooks were evaluated by two course instructors according to the rubric.

**Instructor Evaluation Rubrics.** From the SOAP: *“Instructor Evaluation Rubric – This rubric will be applied primarily in laboratory courses as a check on the quality and ethics of student laboratory work along with their ability to function in teamwork and collaborative assignments. When used for program assessment, a minimum of 15% of the class or four students (whichever is less) are scored by two or more faculty members to ensure consistent application of the rubric. Each student passing the course is expected to earn an average of 1.5 of 3 with no more than one poor (0) score.”*

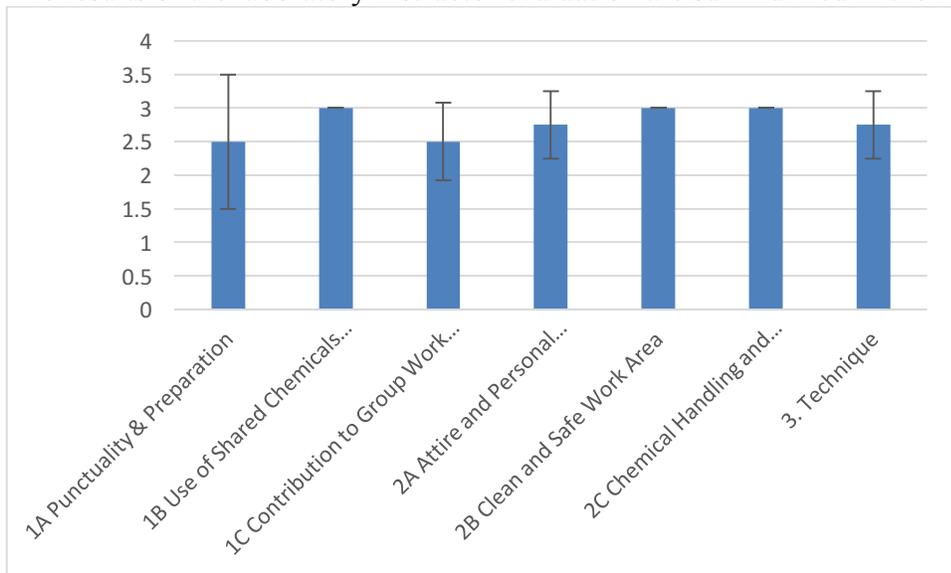
For the B.S. Biochemistry program, the rubric was used by the instructors in the Spring 2016 CHEM 156 course.

**Indirect Measure H – Faculty Feedback on Laboratory Performance.** From the SOAP: *“The department will periodically collect feedback from faculty and instructors on their perceptions of student strengths and weaknesses.”*

Results from assessments were shared with department faculty and the topic was discussed at a department meeting in August 2016.

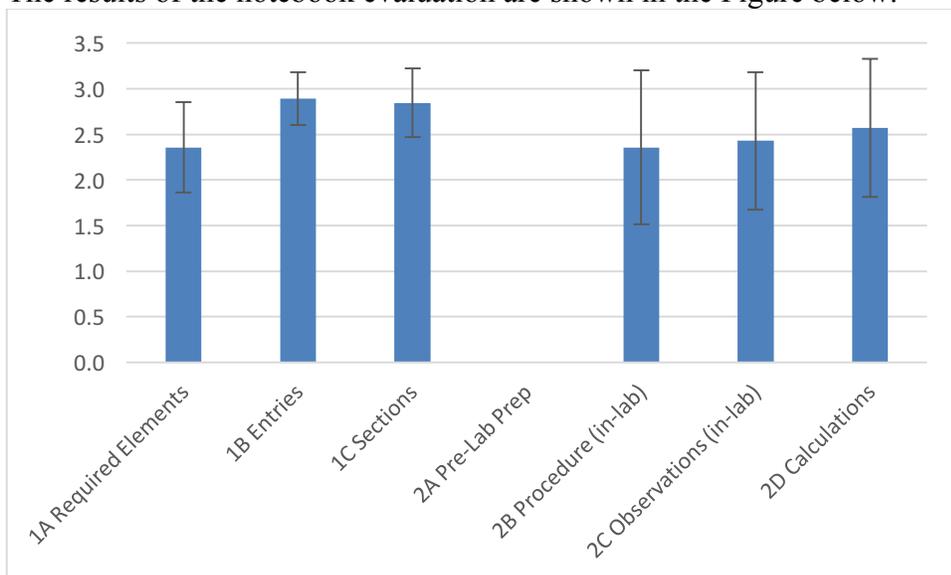
### 3. What did you discover from these data?

The results of the laboratory instructor evaluation are summarized in the Figure below.



Average scores in all categories were well above expectations. The lowest student average for the rubric was 2.6, and no student scored below 1 in any category. The data indicate that the B.S. Biochemistry program is successful developing all of the required laboratory skills and habits.

The results of the notebook evaluation are shown in the Figure below.



Average scores in all categories were above the expected average of 1.5, with scores in the range 2.0 to 2.9, and with no students scoring below 1 in any category. Average scores in each category ranged from 2.4 to 2.9. Scores were not assigned to the Pre-lab and Preparation category since this is not relevant to the structure of the course assessed.

## Faculty Feedback

### 4. What changes did you make as a result of the findings?

Overall the assessment demonstrates that our students are developing the expected skills in the B.S. Biochemistry degree, indicating that no substantive changes are needed. During the assessment activity, faculty noted that standards and expectations are not entirely consistent across all of the laboratory courses in the program. For example, not all courses currently require students to date each page in their lab notebooks. The department will therefore work to develop a set of minimum standards that are the same across all lab courses in the B.S. Biochemistry, B.A. and B.S. Chemistry programs.

Similar to the discussion of the B.A., B.S. chemistry program, the faculty agreed that chemical safety, handling, and disposal with respect to biochemistry applications, should be included in the safety training for the faculty, staff, teaching associates, and students.

### 5. What assessment activities will you be conducting in the 2016-17 academic year?

Review of SLO1 – Problem Solving & Data Interpretation using data from methods A,C,F.

**SLO1.** Students will apply their understanding of chemical and biochemical terminology, concepts, theories, and skills to solve problems and evaluate the significance of data.

#### Direct Measures

A. Biochemistry Exam (SLO1) – This exam will consist of validated multiple choice questions taken from biochemistry test banks. It will be administered to students in CHEM 155B near the end of the course. It is expected that students passing the course will score above 50% correct responses on the exam.

C. Final Group Written Report Rubric (SLO1, SLO3, SLO4) – Students will write a group report on a culminating independent experiment conducted during CHEM156. Student reports will be scored on the ability to accurately report data as compared to notebook data, including a thorough materials and methods section, and including content, integration and critical analysis of their own work in the context of other groups' results. A rubric will be used to score the work. It is expected that students passing the course will score above 70% on the assignment. The rubric is calibrated by all biochemistry faculty evaluating ~3-5 works on the protocol assignment, comparing the scores anytime the assignment or rubrics are updated.

#### Indirect Measures

F. Graduating Students Feedback – The department will ask for feedback from graduating students using surveys or focus groups to evaluate their perception of whether the degree has adequately prepared them for their chosen career. This may include job placement and graduate/professional school admission rates.

**6. What progress have you made on items from your last program review action plan?**

This is a new program launched in Fall 14, and therefore has not yet been through the program review process.

## Laboratory Notebook Rubric

### 1. Organization

#### 1A. Required Elements

Excellent (3 pt.):	Every page contains an appropriate title, date, student name, consecutive page numbers, and a signature at the bottom of the page.
Good (2 pt.):	Most pages include the required elements listed under 'excellent'.
Average (1 pt.):	Missing elements make finding and identifying key information difficult.
Poor (0 pt.):	Required elements are consistently missing.

#### 1B. Entries

Excellent (3 pt.):	All entries are in ink, made at the time work was conducted (not transcribed), and errors are corrected using single line strikeouts rather than erasure, whiteout, or obliteration.
Good (2 pt.):	Many of the entries meet the criteria required for 'excellent'.
Average (1 pt.):	Many key entries are missing or illegible.
Poor (0 pt.):	Most entries are missing or illegible.

#### 1C. Sections

Excellent (3 pt.):	Each laboratory entry is divided clearly into titled pre-, in-, and post-lab sections with appropriate subsections as required in the course lab policies or the laboratory instructions. The table of contents includes entries for the laboratory and these sections.
Good (2 pt.):	Most entries are divided into sections that meet the criteria for 'excellent'.
Average (1 pt.):	Many entries are not divided into appropriate sections/subsections. The table of contents is missing or incomplete.
Poor (0 pt.):	Laboratory entries are not divided into sections as required in course lab policies. The table of contents is missing.

## 2. Content

### 2A. Pre-Laboratory Preparation

- Excellent (3 pt.): The pre-lab is well written, organized, and neat. It contains all required elements: title, introduction, chemicals table, equations/reactions, and anticipated procedure. Appropriate references including MSDS, CRC, and other sources have been used and cited for chemical and safety information.
- Good (2 pt.): The pre-lab is well written but is missing some elements/information.
- Average (1 pt.): The pre-lab is missing key elements that are needed for the successful completion of the lab. Appropriate references are missing.
- Poor (0 pt.): No pre-lab has been completed.

### 2B. Procedure (In-Lab)

- Excellent (3 pt.): The in-lab section contains a thorough and clear procedure that describes the actual experience in the laboratory. Deviations, modifications, and errors are recorded in a chronological sequence of events. Any in-laboratory calculations, such as adjustments to the amount or reagents to use are shown clearly.
- Good (2 pt.): The procedure is clearly described, but deviations and modifications made to the original protocol are missing.
- Average (1 pt.): The procedure is not described clearly enough to be repeated without reference to other documents.
- Poor (0 pt.): The experimental procedure is not described.

### 2C. Observations (In-Lab)

- Excellent (3 pt.): Observations are plentiful and clearly noted for each experiment with details including color changes, precipitation, temp., etc. Data is recorded directly into the laboratory notebook and is both organized and clearly labeled.
- Good (2 pt.): Most key observations are clearly recorded.
- Average (1 pt.): Some key observations are recorded.
- Poor (0 pt.): Observations are not recorded.

## 2D. Calculations and Conclusions

- Excellent (3 pt.): All required calculations are complete and correct including the evaluation of experimental error or uncertainty. A written conclusion is present that shows a thorough and accurate analysis of the data and its significance. This includes evaluation of the question or hypothesis tested in the experiment. This conclusion includes answers to any post-lab questions.
- Good (2 pt.): Calculations have completed and include error/uncertainty analysis. An analysis of the data and its significance has been written.
- Average (1 pt.): Calculations have been performed but are not complete/correct. An analysis of the data and its significance is missing or incorrect.
- Poor (0 pt.): Calculations have not been completed.

## Laboratory Instructor Evaluation

### 1. Citizenship

#### 1A. Punctuality & Preparation

- Excellent (3 pt.): The student consistently arrives for the laboratory on-time and prepared for work and then stays until their work and preliminary calculations are complete.
- Good (2 pt.): The student arrives for the lab on time and is prepared for work.
- Average (1 pt.): The student is not prepared to work at the start of the lab and is not able to complete the work in the allotted time.
- Poor (0 pt.): The student is consistently late, unprepared, and/or leaves before their work and preliminary calculations are completed.

#### 1B. Use of Shared Chemicals and Equipment

- Excellent (3 pt.): The student is a good citizen in the use of shared materials by avoiding taking excess of the materials, returning containers to their proper location, refilling reagents as needed, emptying waste as needed, leaving shared equipment clean and orderly, and leaving their work area clear and clean at the end of the laboratory period.
- Good (2 pt.): The student is generally a good citizen, and rarely needs reminding/prompting to return/refill shared chemicals, empty full waste containers or clean up the work area.
- Average (1 pt.): The student periodically behaves in a way that inconveniences others in the lab, which may include failure to return shared chemicals to the appropriate location, refill reagents, empty waste bottles when filled or leave equipment and work areas clean at the end of the lab.
- Poor (0 pt.): The student consistently behaves in a way that inconveniences others in the lab, which may include failure to return shared chemicals to the appropriate location, refill reagents, empty waste bottles when filled or leave equipment and work areas clean at the end of the lab.

#### 1C. Contribution to Group Work and Problem Solving

- Excellent (3 pt.): The student is supportive of the instructor and other students. They work effectively with other students on group work and tasks by both contributing and allowing others to contribute to the project. They participate meaningfully in helping address problems that arise during the laboratory period.

- Good (2 pt.): The student works collaboratively with others and makes contributions to group projects.
- Average (1 pt.): The student works within the group but contributions to completion of the assignment are somewhat limited.
- Poor (0 pt.): The student is disruptive or does not participate in group work.

## 2. Chemical Knowledge and Safety

### 2A. Attire and Personal Protective Equipment (PPE)

- Excellent (3 pt.): The student consistently dresses appropriately for lab work and wears the required PPE, particularly safety glasses, at all times.
- Good (2 pt.): The student consistently dresses appropriately for lab work and usually wears the required PPE, particularly safety glasses, without prompting.
- Average (1 pt.): The student consistently dresses appropriately for lab work and but needs reminders to wear the required PPE, particularly safety glasses.
- Poor (0 pt.): The student dresses in a way that would pose a safety hazard if not addressed by the instructor. This includes failure to dress appropriately for lab work and/or wear the required PPE.

### 2B. Clean and Safe Work Area

- Excellent (3 pt.): The student keeps their work area free of chemical spills and hazards such as undue clutter, properly secured reaction setups, appropriate labeling of chemicals, and prompt disposal of waste.
- Good (2 pt.): The student mostly keeps the work area clean and uncluttered.
- Average (1 pt.): The student's work area is not clean and uncluttered at times.
- Poor (0 pt.): The student's work area is not clean. The student must be prompted to address potential safety concerns such as chemical spills and poorly secured reaction setups.

### 2C. Chemical Handling and Waste Disposal

- Excellent (3 pt.): The student demonstrates an understanding of the chemicals they are using through their handling of the chemicals and the proper disposal of chemicals and reaction waste.
- Good (2 pt.): The student generally handles and disposes of chemicals and waste in an appropriate manner.

Average (1 pt.): The student needs prompting or assistance to correctly handle chemicals and dispose of chemical waste.

Poor (0 pt.): The student does not handle or dispose of chemicals and waste in an appropriate manner.

### 3. Laboratory Technique

#### 3A. Technique

Excellent (3 pt.): The student develops and demonstrates excellent laboratory technique including the efficient and effective use of laboratory glassware and instrumentation.

Good (2 pt.): The student develops and demonstrates good laboratory technique including appropriate use of laboratory glassware and instrumentation.

Average (1 pt.): The student develops and demonstrates acceptable laboratory technique.

Poor (0 pt.): The student consistently uses poor laboratory technique that will lead to low quality data and/or could damage equipment or instrumentation.