



Program Assessment Report (PAR)

Biochem + Molecular Biology (BMB) Baccalaureate Degree

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ACADEMIC YEAR COVERED BY THIS REPORT: 2021-2022

I. PROGRAM LEARNING OUTCOMES

Graduates will be able to... demonstrate mastery in the content-based foundational concepts listed in the ASBMB accreditation program as follows 1. Explain and apply core concepts of matter and energy transformation, including thermodynamics, catalysis, the coupling of exergonic and endergonic processes, and the nature of biological energy. 2. Explain and apply core concepts of macromolecular structure and function, including the nature of biological macromolecules, their interaction with water, the relationship between structure and function, and frequently encountered mechanisms for regulating their function. 3. Explain and apply core concepts of biological information, including the genome, the manner in which the information it contains is encoded and translated, and the mechanisms by which it is transmitted and maintained across generations. 4. Explain and apply the process of science, including hypothesis generation, experimental design, quantitative analysis, and data interpretation. demonstrate the ability to 5. Communicate effectively orally and in writing. 6. Work effectively in teams.

II. PROCEDURES USED FOR ASSESSMENT

A. Direct Assessment

To analyze whether students demonstrate mastery in the content-based foundational concepts listed in the ASBMB accreditation program We track student grades in BMB 3850 Biochemistry Lab, BMB 4210 Biochemistry and Molecular Biology I and BMB 4230 Biochemistry and Molecular Biology II. These three courses contain content and activities that encompass all of the program learning outcomes suggested by ASBMB (American Society for Biochemistry and Molecular Biology) and the course grades will give a direct measure of their understanding of those concepts. We use standardized assessments given in their freshman and senior years as a part of their learner centered portfolio to evaluate content mastery. One of these assessment (Biochemistry threshold concepts) was the basis

for the ASBMB foundational concepts. We analyze student self-reporting of learning through our majors exit survey given in their senior year. We analyze student self-reporting of mastery of the foundational concepts through our majors exit survey given in their senior year. To analyze if our students can communicate clearly in the sciences We track student grades in our integrated writing courses in the major (BMB 3850 Biochemistry Lab, BMB 3900 Scientific Communication and BMB 4100 Senior Reflection). We track grades on student assignments that exemplify written or oral communication. In BMB 3850 Biochemistry Lab students must generate a final written and oral presentation on the laboratory final research project. In BMB 3900 Scientific Communications students must generate a written scientific article as a final project. In BMB 4100 Senior Reflection student must rewrite an old assignment using their improved writing skills and provide a final oral presentation of their work in the major. We track Pass/Fail grades for students in our research seminars (BMB 4000) where they must evaluate the presentation style of the invited speakers. We track the success of our Honors program students who are required to submit a final thesis and give an oral presentation We track student self-report of improved writing ability in our integrated writing courses. To analyze whether students can work successfully as a team member We track students throughout our courses as they work in small groups, as lab partners and generally as a member of a team. Any interventions that are needed with our students to assist in their teamwork is logged. Finally, in our exit interview students are given the opportunity to evaluate each of the program learning outcomes and indicate whher they feel the program has met those goals.

B. Scoring of Student Work

For the majority of the assessment data it was scored by the professor instructing the course. Exams, papers and presentations are all examples of items that were assessed. For presentations and papers, rubrics are used to evaluate student success and provide feedback. Exams format can vary over the coursework as so there is no standard for these. Some standardized assessment are used as tools to observe student content mastery. While these are scored by the program director, the answer keys and questions were generated by a third party and only verified by the program director.

C. Indirect Assessment

Students are given an exit interview in their senior year as an evaluation of the program and its courses. Observations are made of students and their relationships with one another in small group activities and lab settings. An alumni survey will be generated to further evaluate the program several years out from graduation (we do not yet have students more than 2 years out.)

III. ASSESSMENT RESULTS/INFORMATION:

1. To measure our majors content mastery of foundational concepts in BMB A. We have reviewed their grades in BMB 3850, 4210 and 4230. B. We have reviewed student scores on the CCI, IMCA and Biochem assessments C. We evaluated students self-reporting of learning in our courses on our exit interview 2. To measure our majors' communication in the sciences A. We analyze their writing grades in BMB 3850 B. We analyze the final project grade in BMB 3900 C. We analyze grades of final projects and writing assignments in BMB 4100 D. We analyze grades in BMB 4000 E. We analyze our honors students' ability to communicate orally and in written form as a part of graduating with honors. F. We analyze the exit survey to see if students felt their writing improved in our integrated writing courses in the major. 3. To measure our majors' abilities to work as a team member A. We reviewed teamwork intervention events over BMB 2100, 3850, 4210 and 4230 4. To measure if students feel we are meeting our program learning objectives A. We analyze the results of the exit survey to see if students feel we are meeting our program objectives using a likert style survey question

1A In BMB 3850 of 5 majors, all passed with 2Cs, and 3As In BMB 4210 of 7 majors, all but 1 passed with 1F, 2Cs, 2Bs and 2As In BMB 4230 of 6 majors, all but 1 passed with 1F, 2Cs, 1B, and 2As 1B Of 8 students which took the assessments both pre and post, we saw an average increase of 13% (post AVG 77%) on the CCI, an increase of 52% (post AVG 81%) on the Biochem assessment and increase of 13% (post AVG 75%) on the IMCA. 1C All student indicated that they learned in all of our content-based courses. The value below indicates average agreement with learning 1 is no learning, 5 is learning BMB 2100 = 4.71 n=7 BMB 3850 = 4.44 n=9 BMB 4210 = 4.56 n=9 BMB 4230 = 4.44 n=9 2A Of the 5 majors in the course there were 4 Bs and 1 A on the final oral presentations Of the 8 majors in the course there were 2 Bs and 6As on the final written papers 2B Of the 8 majors in the course there were 1C, 2 Bs and 5As on their final written papers. 2C Of the 9 majors in the course there were 9 As on the final project oral presentations 2D Of the 14 students in the course in Fall 2020 all passed Of the 10 students in the course in Spring 2021 all passed 2E No honors students graduated this year 2F Of the 9 students, all felt their writing had improved in BMB 3850, BMB 3900 and BMB 4100 (our integrated writing courses). The value below indicates average agreement with learning 0 is no learning, 5 is learning BMB 3850 = 4.67 n=9 BMB 3900 = 4.71 n=7 BMB 4100 = 4.11 n=9 3A There were no recorded interventions for the year 4A For each of the program learning objectives students scored their agreement with the statement that "Upon graduation they will be able to" Of the 9 students all felt we were meeting our program objectives. The value below indicates average agreement with learning 0 is strongly disagree, 5 is strongly agree. Explain and apply core concepts of matter and energy transformation, including thermodynamics, catalysis, the coupling of exergonic and endergonic processes, and the nature of biological energy. – Mean = 4.44 Explain and apply core concepts of macromolecular structure and function, including the nature of biological macromolecules, their interaction with water, the relationship between structure and function, and frequently encountered mechanisms for regulating their function. – Mean = 4.44 Explain and apply core concepts of biological information, including the genome,

the manner in which the information it contains is encoded and translated, and the mechanisms by which it is transmitted and maintained across generations. – Mean = 4.22 Explain and apply the process of science, including hypothesis generation, experimental design, quantitative analysis, and data interpretation. – Mean = 4.44 Communicate effectively orally and in writing. – Mean = 4.56 Work effectively in teams. – Mean = 4.67

We feel that we can demonstrate ample learning of the major foundational concept areas in Biochemistry and Molecular biology based on student grades, standardized assessment scores and their own self evaluations. We feel that students display scientific communication through the various written and oral projects that are incorporated into our integrated writing courses. Additionally, students were given the opportunity to view firsthand how professionals communicate in both the oral and written format. Moreover, our honors program emphasize the importance of communicating scientific work. Finally, student self-report that they feel like their writing has improved. We feel that our students are able to move forward in their science careers as they are prepared to do so throughout the major. Our job/school placement is currently 100%, though we have only just started as a program. We feel that students are given ample opportunity to develop and work as a team member throughout the program including in a lab setting. As no interventions were needed this year, students are performing satisfactorily.

IV. ACTIONS TO IMPROVE STUDENT LEARNING

This information was shared with the Undergraduate Oversight Committee which consists of the department chair and both Vice chairs in the department. The overview of the oversight committee meeting data and comments are reviewed at the Annual faculty retreat in the Fall. Further, any suggestions for modification are taken to the Departmental Curriculum committee for evaluation. Detailed proposed changes are taken to the departmental faculty meetings for discussion. Thus far the program has only had 4 graduating classes. Based on the findings of our assessments and statistical analysis some modifications have been made to our curriculum. They are as follows: Major modifications to the program curriculum were made in the 2020-2021 academic year (increased freshman seminar course credits, addition of SM 1010, dropping the requirement for Calculus I and II) which applied to the Freshman class in 2021-2022. With only one year of data (and only for the changes made to our Freshman year) there is currently not enough power to support any corrections or modifications to the program beyond those already made. An evaluation of the added content to our Freshman courses will be available next year as we evaluate the retention data from Freshman to Sophomore year for at least 2 years As per the suggestions made by ASBMB (third party accreditation) we have also introduced more faculty into the Freshman seminar series or courses. Additionally, we have slightly modified the Lab course (BMB 3850) content to align better with the requirements of the program (specifically we are adding western blotting into the course) One student who continually struggled in our major was met with and a transfer plan was coordinated between the BMB and BIO departments as it was felt that this

would be her best path toward graduation.

V. SUPPORTING DOCUMENTS

Additional documentation, when provided, is stored in the internal Academic Program Assessment of Student Learning SharePoint site.