|  |  |
| --- | --- |
| **Assurance of Student Learning Report**  **2020-2021** | |
| Ogden College of Science and Engineering | Department of Chemistry and Department of Biology |
| Biochemistry, Ref. 519 | |
| Kevin M. Williams, Chair, Department of Chemistry | |

|  |  |  |  |
| --- | --- | --- | --- |
| ***Use this page to list learning outcomes, measurements, and summarize results for your program. Detailed information must be completed in the subsequent pages.*** | | | |
| **Student Learning Outcome 1: Students will be able to analyze relevant biochemistry research literature** | | | |
| **Instrument 1** | **Written answers to analytical questions** | | |
| **Based on your results, check whether the program met the goal Student Learning Outcome 1.** | | **Met** | **Not Met** |
| **Student Learning Outcome 2:**  Students will be able to communicate effectively in written form | | | |
| **Instrument 1** | **Assessment of protein paper** | | |
| **Based on your results, check whether the program met the goal Student Learning Outcome 2.** | | **Met** | **Not Met** |
| **Student Learning Outcome 3:** Students will have an understanding of structure/function relationships | | | |
| **Instrument 1** | **Assessment of specific structure/function questions throughout course** | | |
| **Based on your results, check whether the program met the goal Student Learning Outcome 3.** | | **Met** | **Not Met** |
| **Program Summary (Briefly summarize the action and follow up items from your detailed responses on subsequent pages.)** | | | |
| 1. Reading rubric will be refined to more accurately assess ability to understand a scientific paper. 2. Feedback was provided on a draft of the written assessment in order to improve student performance. 3. A question analysis was performed on the national ACS exams for the Organic Chemistry sequence. Based on the content analysis, individual questions were developed by faculty and used to assess student understanding over the duration of the semester. This is opposed to the end-of-the-semester national exam assessment. An increase in student performance was observed for the course. | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Student Learning Outcome 1** | | | | | |
| **Student Learning Outcome** | Students will be able to read and understand scientific literature. | | | | |
| **Measurement Instrument 1** | **Written answers to analytical questions**  Pairs of students chose a recent peer-reviewed article related to metabolism as part of the second semester biochemistry lecture course, which focuses primarily on metabolic pathways. The students were asked to carefully read the article and answer a series of nine questions about the article. The questions were adapted from “The thinker’s guide to analytic thinking” from The Foundation for Critical Thinking. Each project was evaluated using the Reading VALUE Rubric from the Association of American Colleges and Universities, focusing on the Comprehension, Relationship to Text, and Analysis metrics. A total of 9 papers were submitted, and each of the papers had at least one biochemistry major contributing; thus, all 9 papers were evaluated. Because many students had little familiarity with the scientific literature, particularly in the area of metabolism, a value of 2 on the rubric scale of 1 to 4 was considered acceptable. | | | | |
| **Criteria for Student Success** | The papers should score an average of at least 2.0 in the Comprehension, Relationship to Text, and Analysis ratings | | | | |
| **Program Success Target for this Measurement** | | At least 60% of the submitted papers will achieve the average of 2.0 | **Percent of Program Achieving Target** | 67% of the papers (6 out of 9) | |
| **Methods** | The papers were evaluated using the Reading VALUE rubric by Dr. Kevin Williams. A score of 1 (benchmark) to 4 (capstone) was assigned for each category and the values were averaged. | | | | |
| **Based on your results, highlight whether the program met the goal Student Learning Outcome 1.** | | | | **Met** | **Not Met** |
| **Actions** (Describe the decision-making process and actions for program improvement. The actions should include a timeline.) | | | | | |
| The project utilizes several analytical questions about purpose, assumptions, conclusions, and inferences about a scientific paper. The project is designed to require a careful reading and thoughtful consideration of the paper while generating answers to the questions that are relatively short and easy to assess. This project has been used in previous years as a supplemental project for graduate students as an augmentation of the undergraduate course. This year, the project was assigned to all students, though the students were placed in pairs since such a project is new to most students. | | | | | |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) | | | | | |
| The Reading VALUE rubric was adequate for assessment, but it was not ideal as the rubric was somewhat generic and not specific for analysis of reading and comprehension of scientific literature. Given the complexity of the primary scientific literature and student’s relative inexperience, a more tailored rubric would allow a better assessment of reading and comprehension skills for this assignment. | | | | | |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) | | | | | |
| Due to recent staffing changes in the biochemistry major due to retirement, we will consider whether this project or a related project will be used to assess student’s ability to read and understand primary literature. We intend to assess this outcome again next year, though perhaps in a different course or with a different assignment. | | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Student Learning Outcome 2** | | | | | |
| **Student Learning Outcome** | Students will be able to communicate effectively in written form | | | | |
| **Measurement Instrument 1** | **Assessment of protein paper**  In biochemistry laboratory, students chose a protein and investigated the structural details and the function of the protein in the scientific literature. Each student then wrote a paper explaining how the structure of the protein contributes directly to its function. The papers were scored on a scale of 1 to 4 using the AACU Written Communication rubric using the 5 categories of the rubric. In the fall, eight biochemistry majors submitted papers and all 8 were assessed by the rubric. | | | | |
| **Criteria for Student Success** | The papers should score an average of 2.6 on the 4-point scale of the Written Communication Rubric | | | | |
| **Program Success Target for this Measurement** | | At least 75% of the papers will score at least an average of 2.6. | **Percent of Program Achieving Target** | 88% (7 out of 8) | |
| **Methods** | The papers were evaluated using the Written Communication VALUE rubric by Dr. Kevin Williams. A score of 1 (benchmark) to 4 (capstone) was assigned for each category and the values were averaged. | | | | |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.** | | | | **Met** | **Not Met** |
| **Actions** (Describe the decision-making process and actions planned for program improvement. The actions should include a timeline.) | | | | | |
| The written assignment is described in the syllabus and discussed at the beginning of the semester. Students are required to get approval of their protein choice and are expected to submit a draft of their paper (or at least an outline) a few weeks before the end of the semester in order to get feedback about the quality of their work. | | | | | |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) | | | | | |
| The rubric will continue to be evaluated for appropriateness. | | | | | |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) | | | | | |
| We plan to assess this outcome in the upcoming year. | | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Student Learning Outcome 3** | | | | | |
| **Student Learning Outcome** | Students will have an understanding of structure/function relationships | | | | |
| **Measurement Instrument 1** | Specific questions were utilized throughout the course to parallel the content normally assessed via the American Chemical Society Organic Chemistry exam. This course is required for all biochemistry majors; we opted to evaluate this course holistically with all students taking the course considered together. | | | | |
| **Criteria for Student Success** | Overall student score of 50th percentile or higher | | | | |
| **Program Success Target for this Measurement** | | 50% of students will score 50th percentile or higher | **Percent of Program Achieving Target** | 69% | |
| **Methods** | Assessments were taken by all students in the course. | | | | |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 3.** | | | | **Met** | **Not Met** |
| **Actions** (Describe the decision-making process and actions for program improvement. The actions should include a timeline.) | | | | | |
| Course content is being evaluated in the context of exam topics. This exam is made available in an updated version approximately every two years. This update cycle allows the exam to reflect the current topical content recommended by the exam committee.  Due to exam-security restrictions put in place by the American Chemical Society for the administration of the national exam, the Department was not able to give the ACS exam for the 20-21 AY. To maintain continuity with the designated SLO, faculty teaching the CHEM 340 and 342 courses identified topic areas on the national exam and write questions focused on the identified topic areas for inclusion on assessments given in the course.  A question level analysis was completed for the Fall 2020 semester and content specific questions were developed to assess the content areas on the national exam. Specific content areas identified and assessed were acid/base chemistry of organic molecules, sterochemistry, electrophilic substitution reactions, reactions of alcohols, ethers and carboxylic acids. | | | | | |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) | | | | | |
| The increase in the percentage of students achieving the target percentile of content mastery are a function of two changes in the course. First, students were provided a content review opportunity before each assessment. And second, content areas were assessed over the extent of the semester with multiple assessment tools as opposed to an end-of-the-semester single assessment. Both of these types of assessment (during the term vs end of term) are useful in providing insight into student learning in the selected content areas. During-the-term assessments give faculty a chance to respond in student misconceptions and deficiencies in real time. While end-of-the-term assessments allow faculty to collect data on the students’ ability to retain and apply concepts in the long term. | | | | | |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) | | | | | |
| We plan to assess this outcome again in the upcoming year. | | | | | |