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| **Assurance of Student Learning Report**  **2022-2023** | | |
| Ogden College of Science and Engineering | | Department of Chemistry and Department of Biology |
| Biochemistry, Ref. 519 | | |
| Kevin M. Williams, Chair, Department of Chemistry | | |
| ***Is this an online program***?  Yes  No | Please make sure the Program Learning Outcomes listed match those in CourseLeaf . Indicate verification here  Yes, they match! (If they don’t match, explain on this page under **Assessment Cycle)** | |

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| ***Use this page to list learning outcomes, measurements, and summarize results for your program. Detailed information must be completed in the subsequent pages. Add more Outcomes as needed.*** | | | |
| **Program Student Learning Outcome 1: Communicate Effectively in Written Form** | | | |
| **Instrument 1** | **Assessment of protein paper in CHEM 447 (Biochemistry laboratory)** | | |
| **Based on your results, check whether the program met the goal Student Learning Outcome 1.** | | **Met** | **Not Met** |
| **Program Student Learning Outcome 2: Interpret and Explain Data about Chemical Systems** | | | |
| **Instrument 1** | **American Chemical Society Exam in Analytical Chemistry** | | |
| **Based on your results, check whether the program met the goal Student Learning Outcome 2.** | | **Met** | **Not Met** |
| **Program Student Learning Outcome 3: Describe and discuss structure-property-function relationships for a variety of molecules** | | | |
| **Instrument 1** | **American Chemical Society Exam in Organic Chemistry** | | |
| **Based on your results, check whether the program met the goal Student Learning Outcome 3.** | | **Met** | **Not Met** |
| **Assessment Cycle Plan:** | | | |
| We plan to continue to assess the above program learning outcomes in the upcoming year in order to examine trends in student performance. Due to staffing changes in the program, we have new faculty teaching in key courses (330, 446, 447) and thus we wish to collect additional data with existing learning outcomes. | | | |

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| **Program Student Learning Outcome 1** | | | | | |
| **Program Student Learning Outcome** | 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, six biochemistry majors submitted papers and all 6 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** | 100% (6 out of 6) | |
| **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. The papers had averages that ranged from 2.8 to 3.2. | | | | |
| **Based on your results, highlight whether the program met the goal Student Learning Outcome 1.** | | | | **Met** | **Not Met** |
| **Results, Conclusion, and Plans for Next Assessment Cycle (Describe what worked, what didn’t, and plan going forward)** | | | | | |
| 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. Overall, the papers scored slightly above the target on the VALUE rubric. The rubric works well for this assessment and will likely be continue in the future. We plan to assess this outcome again in the upcoming year, when two faculty who have not taught the biochemistry lab in several years will be rotating into the biochemistry laboratory. We may broaden the assessment to include more students (would include some chemistry and/or biology majors). | | | | | |

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| **Program Student Learning Outcome 2** | | | | | |
| **Program Student Learning Outcome** | **Interpret and Explain Data about Chemical Systems** | | | | |
| **Measurement Instrument 1** | **American Chemical Society Exam in Analytical Chemistry**  This is a nationally-normed 50-question multiple choice exam given at the conclusion of the CHEM 330 (Quantitative Analysis) course (required of all majors and minors). | | | | |
| **Criteria for Student Success** | 50%-tile ranking or higher | | | | |
| **Program Success Target for this Measurement** | | 50% of students taking the exam | **Percent of Program Achieving Target** | 54% | |
| **Methods** | Assessments were given to all students in the course | | | | |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.** | | | | **Met** | **Not Met** |
| **Results, Conclusion, and Plans for Next Assessment Cycle (Describe what worked, what didn’t, and plan going forward)** | | | | | |
| It is proposed that the decrease in the percentage of students achieving the target percentile of content mastery (73% AY 20/21 to 54% AY 22/23) is a function of the student’s lack of mastery of content material from previous coursework; we note that this year’s percentage is nearly identical to last year’s (53%); since this is a sophomore/junior-level course, pandemic effects may be notable. Faculty have decided to include more review-type exercises at the beginning of the course so that students can identify their content weaknesses and review those areas early in the course. We will continue to assess this outcome again next year to look for any changes in trend as the time since the outset of the pandemic increases. | | | | | |

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| **Program Student Learning Outcome 3** | | | | | |
| **Program Student Learning Outcome** | **Describe and discuss structure-property-function relationships for a variety of molecules** | | | | |
| **Measurement Instrument 1** | **American Chemical Society Exam in Organic Chemistry**  This is a nationally-normed 50-question multiple choice exam given at the conclusion of the CHEM 342 (Organic Chemistry 2) course. | | | | |
| **Criteria for Student Success** | 50%-tile ranking of higher | | | | |
| **Program Success Target for this Measurement** | | 50% of students taking the exam | **Percent of Program Achieving Target** | 46% | |
| **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** |
| **Results, Conclusion, and Plans for Next Assessment Cycle (Describe what worked, what didn’t, and plan going forward)** | | | | | |
| It was previously proposed that the decrease in the percentage of students achieving the target percentile of content mastery (69% AY 20/21 to 39% AY 21/22) was a function of the student’s lack of mastery of content material from previous coursework. This year’s percentage (46%) is a slight improvement from last year and may be due to a return to more in-person learning over the past several semesters. Faculty have decided to include more review-type exercises at the beginning of the course so that students can identify their content weaknesses and review those areas early in the course. We will continue to assess this outcome next year to see if our results return closer to pre-pandemic levels. | | | | | |

**\*\*\* Please include Curriculum Map (below/next page) as part of this document**

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| **Program name:** | B.S. in Biochemistry (Ref. 519) | |  |  |  |  |  |
| **Department:** | Chemistry and Biology | |  |  |  |  |  |
| **College:** | Ogden College of Science and Engineering | |  |  |  |  |  |
| **Contact person:** | Kevin Williams | |  |  |  |  |  |
| **Email:** | [kevin.williams@wku.edu](mailto:kevin.williams@wku.edu) | |  |  |  |  |  |
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| **KEY:** |  |  |  |  |  |  |  |
| **I = Introduced** |  |  |  |  |  |  |  |
| **R = Reinforced/Developed** | |  |  |  |  |  |  |
| **M = Mastered** |  |  |  |  |  |  |  |
| **A = Assessed** |  |  |  |  |  |  |  |
|  |  |  | **Learning Outcomes** |  |  |  |  |
|  |  |  | **LO1:** | **LO2:** | **LO3:** | **LO4:** | **LO5** |
|  |  |  | Describe the relationships between structure and biological or chemical property | Read and interpret scientific data | Apply basic biological and chemical principles to key metabolic pathways | Apply fundamental principles to predict rate and spontaneity of key biochemical reactions | Effectively communicate findings through laboratory reports |
| **Course Subject** | **Number** | **Course Title** |  |  |  |  |  |
| BIOL | 120 | Biol Conc Cell Metab Genetics | I |  | I |  |  |
| BIOL | 121 | Biol Conc Cell Metab Genetics Lab |  | I | I |  | I |
| BIOL | 122 | Biol Conc Evol Div Ecol |  |  |  |  |  |
| BIOL | 123 | Biol Conc Evol Div Ecol Lab |  | I |  |  | I |
| CHEM | 120 | College Chemistry I | I |  | I | I |  |
| CHEM | 121 | College Chemistry Laboratory I | I | I |  |  | I |
| CHEM | 222 | College Chemistry II | R |  | I | R,A |  |
| CHEM | 223 | College Chemistry Laboratory II |  | I |  |  | I |
| BIOL | 319 | Intro to Molecular and Cell Biology | R |  | R |  |  |
| BIOL | 322 | Intro to Molecular and Cell Biology Lab | R | R | R |  |  |
| CHEM | 330 | Quantitative Analysis |  |  |  | R,A | R |
| CHEM | 340 | Organic Chemistry I | R |  | R | R |  |
| CHEM | 341 | Organic Chemistry Laboratory I | R | R |  |  | R |
| CHEM | 342 | Organic Chemistry II | R,A |  | R | R |  |
| CHEM | 343 | Organic Chemistry Laboratory II | R | R |  |  | R |
| BIOL | 411 | Cell Biology | R |  |  |  |  |
| BIOL/CHEM | 446 | Biochemistry I | M | R | R | R |  |
| BIOL/CHEM | 447 | Biochemistry Laboratory |  | R, A | R |  | M,A |
| BIOL/CHEM | 467 | Biochemistry II | M |  | M,A | R |  |