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| **Assurance of Student Learning****2021-2022** |
| Ogden College of Science and Engineering | Chemistry Department |
| Chemistry MS (059) |

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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.** |
| **Student Learning Outcome 1:** Our graduates will have the ability to communicate effectively in written form. |
| **Instrument 1** | **Literature reviews written by the students in CHEM 516 (Chemical Literature Review)** |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 1.** | **Met** | **Not Met** |
| **Student Learning Outcome 2:** Our graduates will have the ability to communicate effectively in oral form. |
| **Instrument 1** | **Oral presentation of literature review in CHEM 598 (Graduate Seminar)** |
| **Instrument 2** | **Oral presentation of students’ research results in CHEM 598 (Graduate Seminar)** |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.** | **Met** | **Not Met** |
| **Student Learning Outcome 3:** Our graduates will have the ability to design and propose effective experiments. |
| **Instrument 1** | **Research proposals written by the students in CHEM 588 (Research Proposal)** |
| **Based on your results, circle or highlight 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. Evaluation of first draft vs. final report using the Written Communication Rubric (Outcome 1; Instrument 1 and Outcome 3; Instrument 1)
2. Evaluation of literature oral presentation vs. research presentation using the Oral Communication Rubric (Outcome 2; Instrument 1 and 2)
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| **Student Learning Outcome 1** |
| **Student Learning Outcome**  | Our graduates will have the ability to communicate effectively in written form. |
| **Measurement Instrument 1**  | Our graduates will have the ability to communicate effectively in written form.First drafts and final reports will be scored for students taking CHEM 516 Chemical Literature Review using a Written Communication Rubric. The instructors that taught this course will score their respective students.  |
| **Criteria for Student Success** | There should be an increase in rubric scores from the first paper drafts to the final paper. Students should score an average of 2.6 out of 4 on the final report.  |
| **Program Success Target for this Measurement** | 75% | **Percent of Program Achieving Target** | 100% |
| **Methods**  | All 6 students that took this course during the 2021-2022 AY were evaluated by their respective instructor of record. |
| **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.) |
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| Follow-Up (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| A modified AACU rubric that better coincides with the requirements for scientific writing in CHEM 516 has been completed. This rubric is provided to CHEM 516 students on the first meeting of this course. |

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| **Student Learning Outcome 2** |
| **Student Learning Outcome**  | Our graduates will have the ability to communicate effectively in oral form. |
| **Measurement Instrument 1** | **Oral presentation of literature review in CHEM 598 (Graduate Seminar)**Students taking CHEM 598 will be scored using an Oral Communication Rubric. The instructors that teach this course and audience faculty will score these students.  |
| **Criteria for Student Success** | Students will receive an average rubric number that will be compared to their research presentation rubric number from Instrument 2. |
| **Program Success Target for this Measurement**  |  75% | **Percent of Program Achieving Target** | 100% |
| **Methods**  | Five students presented literature seminars for this course during the 2021-2022 AY and were evaluated by faculty that attended the respective seminar presentation. |
| **Measurement Instrument 2** | **Oral presentation of students’ research results in CHEM 598 (Graduate Seminar)** |
| **Criteria for Student Success** | **There should be an increase in rubric scores from the** **literature review presentation compared to the research presentation. Students should score an average of 2.6 out of 4 on the research presentation.** |
| **Program Success Target for this Measurement** | **75%** | **Percent of Program Achieving Target** | **80%** |
| **Methods** | Five students presented research seminars for this course during the 2021-2022 AY and were evaluated by their respective instructor of record. |
| **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.) |
|   |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| A modified AACU rubric that better coincides with the requirements for CHEM 598 has been completed. This rubric is provided to CHEM 598 students on the first meeting of this course.  |

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| **Student Learning Outcome 3** |
| **Student Learning Outcome**  | Our graduates will have the ability to design and propose effective experiments. |
| **Measurement Instrument 1** | **Research proposals written by the students in CHEM 588 (Research Proposal)**Students will demonstrate though a written report and an oral research proposal defense their ability to formulate independent experimental plans based on their thesis topic.  |
| **Criteria for Student Success** | Students scoring and A or B in this class will be considered achieving this outcome.  |
| **Program Success Target for this Measurement** | 100% | **Percent of Program Achieving Target** | 100% |
| **Methods**  | Three students took this course during the 2021-2022 AY and grades were tabulated.  |
| **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 planned for program improvement. The actions should include a timeline.) |
|   |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| A modified AACU rubric that better coincides with the requirements for scientific writing in CHEM 588 has been completed. This rubric is provided to CHEM 588 students on the first meeting of this course. |

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| **CURRICULUM MAP TEMPLATE** |  |  |  |  |
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| **Program name:** | M.S. in Chemistry (Ref. 059) |   |  |  |  |
| **Department:** | Chemistry |   |   |  |  |  |
| **College:** | Ogden College of Science and Engineering |   |  |  |  |
| **Contact person:** | Kevin Williams |   |  |  |  |
| **Email:** | kevin.williams@wku.edu |   |  |  |  |
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| **KEY:** |  |  |  |  |  |  |
| **I = Introduced** |  |  |  |  |  |  |
| **R = Reinforced/Developed** |  |  |  |  |  |
| **M = Mastered** |  |  |  |  |  |  |
| **A = Assessed** |  |  |  |  |  |  |
|  |  |  | **Learning Outcomes** |
|  |  |  | **LO1:** | **LO2:** | **LO3:** | **LO4:** |
|   |  |  | Communicate scientific findings orally | Communicate scientific findings in written form | Complete an independent research project | Design and conduct research experiments to test a hypothesis |
| **Course Subject** | **Number** | **Course Title** |   |   |   |   |
| CHEM | 516 | Chemical Literature Review |   | I, A |   |   |
| CHEM  | 588 | Research Proposal |   | R, A | I | I, A |
| CHEM  | 598 | Graduate seminar (taken repeatedly) | I, R, A |   |   |   |
| CHEM | 599 | Thesis research/writing (taken repeatedly) | R | M | I, R, M, A | R, M |

CHEM 516 Literature Review Rubric

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|  | **Capstone**4 | **Milestones**3 | **Milestones**2 | **Benchmark**1 |
| **Context of and Purpose for Writing***Includes considerations of audience,**purpose, and the circumstances**surrounding the writing of a Chemistry Literature Review paper.* | Demonstrates a thorough understanding of context, audience, and purpose that is responsive todeveloping a current chemistry-topic Literature Review paper.  | Demonstrates adequate consideration of context, audience, and purpose and aclear focus on developing a current chemistry-topic Literature Review paper.  | Demonstrates awareness of context,audience, and purpose developing a current chemistry-topic Literature Review paper.  | Demonstrates minimal attention tocontext, audience, and purpose, developing a current chemistry-topic Literature Review paper  |
| **Content Development** | Throughout this paper (abstract, body, and conclusion) uses appropriate, relevant, and compelling content to illustrate mastery of the Literature Review subject area, conveying the writer's understanding and shaping the whole work. | Throughout this paper (abstract, body, and conclusion) uses appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work. | Throughout this paper (abstract, body, and conclusion) uses appropriate and relevant content to develop and explore ideas through most of the work. | Throughout this paper (abstract, body, and conclusion) uses appropriate and relevant content to develop simple ideas in some parts of the work. |
| **Genre and Disciplinary Conventions** | Demonstrates detailed attention to scientific writing that is clear and concise.  | Demonstrates consistent use ofscientific writing that is clear and concise. | Follows basic expectations for scientific writing that is clear and concise. | Attempts to use a consistent system forbasic scientific writing that is clear and concise. |
| **Sources and Evidence** | Demonstrates skillful use of high quality, credible, relevant sources todevelop ideas that are appropriate for the Literature Review. | Demonstrates consistent use of credible, relevant sources to support ideas that are situated within the Literature Review. | Demonstrates an attempt to use credible and/or relevant sources to support ideas that are appropriate for the Literature Review. | Demonstrates an attempt to use sourcesto support ideas in the Literature Review. |
| **Control of Syntax and Mechanics** | Uses graceful language that skillfullycommunicates meaning to readers withclarity and fluency, and is virtually error-free without wordiness or awkward sentences. | Uses straightforward language thatgenerally conveys meaning to readers.The language in the portfolio has fewerrors or could be edited to be more concise. | Uses language that generally conveysmeaning to readers with clarity, although writing may include some errors. | Uses language that sometimes impedesmeaning because of errors in usage. |

 CHEM 588 Research Proposal Rubric

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|  | **Capstone**4 | **Milestones**3 | **Milestones**2 | **Benchmark**1 |
| **Context of and Purpose for Writing***Includes considerations of audience,**purpose, and the circumstances**surrounding the writing of a research proposal.* | Demonstrates a thorough understanding of context, audience, and purpose that is responsive todeveloping a research proposal.  | Demonstrates adequate consideration of context, audience, and purpose and aclear focus on developing a research proposal. | Demonstrates awareness of context,audience, and purpose for developing a research proposal. | Demonstrates minimal attention tocontext, audience and purpose, for developing a research proposal. |
| **Content Development** | From Statement of the Problem and Significance of Proposed Research to Plan of Procedure uses appropriate, relevant, and compelling content to illustrate mastery of the research subject area, conveying the writer'sunderstanding, and shaping the wholework. | From Statement of the Problem and Significance of Proposed Research to Plan of Procedure uses appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work. | From Statement of the Problem and Significance of Proposed Research to Plan of Procedure uses appropriate and relevant content to develop and explore ideas through most of the work. | From Statement of the Problem and Significance of Proposed Research to Plan of Procedure uses appropriate and relevant content to develop simple ideas in some parts of the work. |
| **Genre and Disciplinary Conventions** | Demonstrates detailed attention to scientific writing that is clear and concise.  | Demonstrates consistent use ofscientific writing that is clear and concise. | Follows basic expectations for scientific writing that is clear and concise. | Attempts to use a consistent system forbasic scientific writing that is clear and concise. |
| **Sources and Evidence** | Demonstrates skillful use of high quality, credible, relevant sources todevelop ideas that are appropriate for the research proposal. | Demonstrates consistent use of credible, relevant sources to support ideas that are situated within the research proposal. | Demonstrates an attempt to use credible and/or relevant sources to support ideas that are appropriate for the research proposal. | Demonstrates an attempt to use sourcesto support ideas in the research proposal. |
| **Control of Syntax and Mechanics** | Uses graceful language that skillfullycommunicates meaning to readers withclarity and fluency, and is virtually error-free without wordiness or awkward sentences. | Uses straightforward language thatgenerally conveys meaning to readers.The language in the portfolio has fewerrors. | Uses language that generally conveysmeaning to readers with clarity, although writing may include some errors. | Uses language that sometimes impedesmeaning because of errors in usage. |

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| CHEM 598

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|   | **Capstone** 4  | **Milestones** 3  | **Milestones** 2  | **Benchmark** 1  | **Score** (1 – 4 for each row) These scores are used for assurance of student learning metrics only, not letter grades. |
| **Organization**  | Organizational pattern (specific introduction and conclusion, sequenced material within the body, transitions) clearly and consistently observable and is skillful and makes the content of the presentation cohesive.  | Organizational pattern (specific introduction and conclusion, sequenced material within the body, transitions) clearly and consistently observable within the presentation.  | Organizational pattern (specific introduction and conclusion, sequenced material within the body, transitions) intermittently observable within the presentation.  | Organizational pattern (specific introduction and conclusion, sequenced material within the body, transitions) not observable within the presentation.  |   |
| **Language**  | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience.  | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience.  | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience.  | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience.  |   |
| **Delivery**  | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident.  | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable.  | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative.  | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable.  |   |
| **Supporting Material**  | A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/authority on the topic.  | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/authority on the topic.  | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/authority on the topic.  | Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's credibility/authority on the topic.  |   |
| **Central Message**  | Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.)  | Central message is clear and consistent with the supporting material.  | Central message is basically understandable but is not often repeated and is not memorable.  | Central message can be deduced but is not explicitly stated in the presentation.  |   |

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