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| **Assurance of Student Learning Report****2021-2022** |
| *Ogden College of Science and Engineering* | *Department of Biology* |
| *Medical Laboratory Science (5004)* |
| *Kerrie McDaniel, Program Coordinator; Kerrie McDaniel, Doug McElroy, Assessment Coordinators* |

***Is this an online program***? [ ]  Yes [x]  No

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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:** Graduates will demonstrate a level of biological content knowledge appropriate to their degree level. |
| **Instrument 1** | Biology Assessment Exam |
| **Based on your results, check whether the program met the goal Student Learning Outcome 1.** | **[ ]  Met** | **[x]  Not Met** |
| **Student Learning Outcome 2:**  Graduates will demonstrate an understanding of research ethics and the responsible conduct of research. |
| **Instrument 1** | CITI Responsible Conduct of Research Course modules |
| **Based on your results, check whether the program met the goal Student Learning Outcome 2.** | **[x]  Met** | **[ ]  Not Met** |
| **Program Summary (Briefly summarize the action and follow up items from your detailed responses on subsequent pages.)**  |
| During 2020-21 and consistent with it’s five-year assessment plan, the Department of Biology Program Review/Assessment Committee (the ‘Committee’) and faculty (1) assessed 2020-21 artifacts for all SLOs and analyzed results from those assessments; and (2) developed and approved recommendations for program improvements based on assessment findings. These follow-up actions will be undertaken during the 2022-23 academic year, and be fully implemented by Fall 2023. |

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| **Student Learning Outcome 1** |
| **Student Learning Outcome**  | **Graduates will demonstrate a level of biological content knowledge appropriate to their degree level.** |
| **Measurement Instrument 1**  | **Biology Assessment Exam**The Biology Assessment Exam is an instrument, newly developed in 2020-21, designed to assess content knowledge within the program discipline. The exam is constructed around 12 vignettes, 2 each representing the six major areas of emphasis in our core curriculum (Cells, Metabolism, Genetics, Ecology, Evolution, Diversity). These major areas are literally the elements introduced in our required introductory course sequence (BIOL 120/121 and BIOL 122-123), and reinforced in our restricted elective core choices at the 200-level (BIOL 222/223, 224/225, or 226/227) and 300-level (BIOL 319/322 or 327/337 and BIOL 315 or 316). Free elective courses at the 300- and 400-levels provide students the opportunity to further master these topics in more specific contexts aligned with their individual professional interests. Within each area of emphasis, there are 2 vignettes that are associated with 9 multiple-choice questions. Three (3) questions each test student content knowledge at the introductory, developing, and mastery level. In each area, several questions require interpretation of tables and/or figures, and assess students’ ability to apply the scientific process. This exam design allows for redundant assessment of knowledge by area of emphasis as well as mastery level; in addition, it provides the ability to carry out a meta-analysis of higher-order knowledge and skills such as correct interpretation of data and application of the scientific process.The exam is given either electronically or in-person as part of BIOL 489, our required program capstone course that is taken by students during their final semester at WKU prior to graduation.  |
| **Criteria for Student Success** | Students will score at least 50% or higher, with the score on Introductory-level items at least 60%. |
| **Program Success Target for this Measurement** | At least 75% of students will attain the criterion level of success. | **Percent of Program Achieving Target** | 55.6% of students attained the criterion level of success, with 33.3% meeting the sub-criterion. The sample size was 9. |
| **Methods**  | Given that the assessment instrument is newly-developed and implemented, the program considers the first round of assessment data to constitute baseline data; we are reluctant to draw too many conclusions or implications from patterns in the scores within and among content areas. Nevertheless, we can summarize the patterns based on this initial assessment. Across all mastery levels, students as a group performed best on questions related to cells (65.4% correct responses) and metabolism (6.05%), and worst on diversity (38.3%) and ecology (39.5%); performance on topics related to genetics (54.3%) and evolution (50.6%) were intermediate. This distribution of scores across content areas makes sense with respect to emphasis of students in theprogram. The 5004 is highly structured, with the majority of courses in the area of cell and molecular biology.Across all content areas, student performance on introductory-level questions was 52.5%, 56.2% on intermediate-level items, and 45.7% on mastery-level items. It became apparent from examination of assessment findings that coverage of content related to molecular biotechnology, immunology, microbiology, and clinical topics was underrepresented. The assessment findings indicate that the program should expand the assessment instrument to include better coverage of such topics so as to more fully align with the 5004 curriculum. |
| **Based on your results, highlight whether the program met the goal Student Learning Outcome 1.** | **[ ]  Met** | **[x]  Not Met** |
| **Actions** (Describe the decision-making process and actions for program improvement. The actions should include a timeline.) |
| 1. The Committee analyzed 2020-21 assessment results and develop recommendations for program improvement to bring to program faculty. (Fall 2021)2. The Committee moved from an in-person to electronic delivery format for the assessment exam. This electronic delivery system was piloted during the 2021-22 AY, in preparation for the collection of mid-cycle assessment data during 2022-23, for inclusion in the 2023/24 report.3. Program faculty reviewed and approved specific program improvement actions to be undertaken based on assessment findings. (Spring 2022). |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| 1. The Committee will develop and implement an additional 9-question module within the assessment exam to focus on topics related to molecular biotechnology, immunology and microbiology, and clinical applications; this module will address deficiencies in coverage identified during analysis of 2020-21 assessment data. (Fall 2022). |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) |
| 2022-23 academic year |

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| **Student Learning Outcome 2** |
| **Student Learning Outcome**  | **Graduates will demonstrate an understanding of research ethics and the responsible conduct of research.** |
| **Measurement Instrument 1** | **CITI Responsible Conduct of Research Course Modules**The Collaborative Institutional Training Initiative (CITI) is a web-based ethics training course for responsible conduct in research that has been adopted by the WKU IRB, IACUC, and IBS Committees as a prerequisite certification to be attained by any investigator seeking approval for a research project through one or more of these committees. All PIs, Co-PIs, and Faculty Sponsors are required to complete CITI RCR training and receive certification (based on a minimum score of 80%) across all course training modules. These module educate and evaluate researchers on up-to-date issues and standards of research ethics, research integrity, and researcher conduct.The Physical Science RCR Course used to assess this SLO consists of 7 individual modules: (1) Research Misconduct; (2) Data Management; (3) Authorship; (4) Peer Review; (5) Mentoring; (6) Conflicts of Interest; and (7) Collaborative Research. Within each module, participants review a multimedia presentation and several seminal articles related to the topic. At the end, participants demonstrate competency through a five-question multiple choice test, with test items randomly drawn from a larger question pool.Completion of CITI RCR training is required of all students enrolled in BIOL 489, our required program capstone course that is taken by students during their final semester at WKU prior to graduation. Students are required to submit (1) a Completion Certificate indicating that they have attained a minimum score of 80% across all course modules, and (2) individual module scores (percentage of questions answered correctly) from their first attempt. |
| **Criteria for Student Success** | Students will attain the required minimum score for certification, with at least 60% correct answers on each module from their first attempt. |
| **Program Success Target for this Measurement** | At least 75% of students will attain the criterion level of success. | **Percent of Program Achieving Target** | 100.0% of students attained the criterion level of success. The sample size was 6. |
| **Methods**  | Students performed well across all seven modules that make up the assessment instrument, demonstrating a solid understanding of research ethics gained through completion of the CITI training course. However, comments from students included such statements as ‘I had no idea that…’ and ‘I wish I had known thois earlier.’ These suggest that it would be beneficial for student learning and professional development to gain exposure to research ethics earlier in the curriculum. In so doing, the program could also enhance learning in this regard by scaffolding a series of increasingly-advanced levels of CITI training at various points thoughout the curriculum; this will both expand and deepn students’ exposure to research ethics issues. |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.** | **[x]  Met** | **[ ]  Not Met** |
| **Actions** (Describe the decision-making process and actions for program improvement. The actions should include a timeline.) |
| 1. The Committee analyzed 2020-21 assessment results and develop recommendations for program improvement to bring to program faculty. (Fall 2021)2. Program faculty reviewed and approved specific program improvement actions to be undertaken based on assessment findings. (Spring 2022). |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| 1. The program will integrate and require all students in BIOL 121 and 123 to complete the (1) Investigators, Staff, and Students Basic Course, and (2) Physical Sciences Responsible Conduct of Research Course. (Fall 2022)2. The program will integrate and require all students in BIOL 223, 225, and 227 to complete the Basic Biosafety Course. (Spring 2023)3. The program will integrate and require require all students in BIOL 322 and 337 to complete the NIH rDNA Guidelines Course or similar, appropriate CITI course. (Spring 2023) 4. The program will integrate and require students who did not complete all CITI courses previously (e.g., transfer students) to do so in BIOL 489/500. (Spring 2023) |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) |
| 2022-23 academic year |

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| **CURRICULUM MAP TEMPLATE** |  |  |
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| **Program name:** | 5004 Medical Laboratory Science |  |
| **Department:** | Biology |  |
| **College:** | Ogden |  |
| **Contact person:** | Kerrie McDaniel |  |
| **Email:** | Kerrie.mcdaniel@wku.edu |  |
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| **KEY:** |  |  |  |
| **I = Introduced** |  |  |  |
| **R = Reinforced/Developed** |  |  |  |
| **M = Mastered** |  |  |  |
| **A = Assessed** |  |  |  |
|  |  |  | **Learning Outcomes** |  |
|  |  |  | **LO1:** | **LO2:** |
|   |  |  | Graduates will demonstrate a degree of biological content knowledge appropriate to their degree level. | Graduates will demonstrate an understanding of research ethics and responsible conduct of research. |
| **Course Subject** | **Number** | **Course Title** |   |   |
| BIOL | 120/121 | Biological Concepts: Cells Metabolism and Genetics Lecture/Lab | I | I |
| BIOL | 122/123 | Biological Concepts: Evolution, Diversity, and Ecology Lecture/Lab | I | I |
| BIOL | 226/227 | Microbial Biology and Diversity Lecture/Lab | R | R |
| BIOL | 224/225 | Animal Biology and Diversity Lecture/Lab | R | R |
| BIOL | 319/322 | Introduction to Molecular and Cell Biology Lecture/Lab | R | M |
| BIOL | 327/337 | Genetics Lecture/Lab | R | M |
| BIOL | 328 | Immunology | R | A |
| CHEM | 120/121 | College Chemistry I Lecture/Lab |   |   |
| CHEM | 222/223 | College Chemistry II Lecture/Lab |   |   |
| CHEM | 340/341 | Organic Chemistry Lecture/Lab |   |   |
| MATH | 116/117 | College Algebra and Trigonometry |   |   |
| BIOL | 407 | Virology | M |   |
| BIOL | 411/412 | Cell Biology Lecture/Lab | M |   |
| BIOL | 446/447 | Biochemistry Lecture/Lab | M |   |
| BIOL | 470 | Pathogenic Microbiology | M |   |
| BIOL | 492 | Internship in Medical Lab Science | A |   |
| BiOL | 493 | Internship in Medical Lab Science | A |   |
| BIOL | 494 | Internship in Medical Lab Science | A |   |