Assurance of Student Learning Reflection 2024-2025	
Ogden College of Science and Engineering	*Department of Biological Sciences*
Biology (525)	
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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 **Evaluation)**

Instructions: For the 2024-25 assessment, we are asking you to reflect on the last three-year cycle rather than collect data. It's important to take time to look over the results from the last assessment cycle and really focus on a data-informed direction going forward. In collaboration with your assessment team and program faculty, review each submitted template from 2021-2024 and consider the following for each Program Learning Outcome, add your narrative to the template, and submit the draft to your ASL Rep by May 15, 2025.

Program Student Learning Outcome 1	
Program Student Learning Outcome	Graduates will demonstrate a level of biological content knowledge appropriate to their degree level.
Evaluation	This Student Learning Outcome (SLO) remains relevant as it assesses students' content knowledge within the discipline. Students are not only expected to demonstrate foundational factual understanding, but also to apply and synthesize this knowledge as they advance through the program. This ensures they are well-prepared for entry into the workforce or for pursuing graduate and professional education upon graduation. The SLO is effectively measured by the Biology Assessment Exam, which is designed to assess both introductory and higher-order cognitive skills, aligned with Bloom's Taxonomy. The exam provides valuable insights into curricular and programmatic strengths and weaknesses, offering a data-driven foundation for informed improvements. The Biology Assessment Exam measures content knowledge associated with Student Learning Outcome 1 (SLO1) and serves as a valuable tool for informing future curricular revisions. To further strengthen the program's scaffolding, a closer analysis comparing the content emphasis in introductory courses with the content demands of 200- and 300-level courses could help identify potential gaps or misalignments. This analysis may also reveal whether revisions to the exam itself are warranted. For now, we plan to continue using the current version of the exam to collect additional data before making any changes.
Measurement Instruments	**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 14 vignettes, 2 each representing the six major areas of emphasis in our core curriculum (Cells, Metabolism, Genetics, Ecology, Evolution, Diversity); in 2022-23, the assessment exam was expanded to also include 2 vignettes addressing topics related to molecular biotechnology, immunology, and microbiology. 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, based on Bloom's Taxonomy. 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 & Targets	**Criterian for Student Success:** Students will score at least 50% or higher, with the score on Introductory-level items at least 60%. **Program Target**: At least 75% of students will attain the criterion level of success. The criterion for this SLO offered insight into student content knowledge at introductory and mastery levels, so it was successful. However,t the assessment instrument has been utilized through only 2 assessment cycles (and modified in-between in accordance with follow-up activities derived from analysis of the 2020-21 assessment results), and se we are reluctant to draw too many conclusions or implications from patterns in the scores within and among content areas or to change the current criteria or targets. We want to continue with our current exam and targets before drawing too many conclusions.
Results & Conclusions	There are small perceived differences in student responses to introductory level questions as compared to intermediate and higher level courses as categorized by Bloom's taxaonomy, however, the current data set remains limited in scope and sample size. We are reluctant to draw broad conclusions from this data at this time but believe that continuing to measure this SLO (SLO3) using the Assessment Exam remains relevant and valuable. We have revised the exam to better align with the content expectations of our program but we have not yet conducted an in-depth analysis to determine whether the assessment accurately reflects the core knowledge essential to our curriculum. Our three-year plan aims to examine how content is scaffolded across course levels and to identify any gaps in the curriculum. This process will help evaluate whether the Assessment Exam effectively measures the intended learning objectives.
****IMPORTANT - Plans for Next Assessment Cycle**:	While we intend to continue using the Biology Assessment Exam as the primary measure for this Student Learning Outcome (SLO), we also recognize the need to enhance our assessment practices to ensure they are both meaningful and effective. To that end, we have developed a three-year plan to improve the alignment between the assessment and the curriculum: 1. **Year 1** – Develop and present a proposal to the faculty that outlines a strategy for ensuring alignment between the curriculum at introductory, 200, and 300-level courses and exam content (See Year 2). 2. **Year 2** – If the plan is approved, implement the strategy. This may include self-evaluations by faculty to compare the content of introductory courses with the learning expectations of 200- and 300-level courses. 3. **Year 3** – Analyze the data collected during implementation and, based on the findings, recommend revisions to the curriculum, the assessment exam, or the overall program scaffolding as necessary.

Program Student Learning Outcome 2	
Program Student Learning Outcome	Graduates will demonstrate an understanding of research ethics and the responsible conduct of research.

Evaluation	This Student Learning Outcome (SLO) has been successfully met. The CITI Responsible Conduct of Research Course Modules are now embedded in both 100- and 200-level courses, ensuring that students are introduced to and assessed on ethical practices in scientific research (see results and conclusions below). Given this integration, the current SLO has fulfilled its purpose and is no longer necessary. Moving forward, we aim to develop a new SLO that focuses on fostering scientific perspectives within the program..
Measurement Instruments	**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 & Targets	**Student Criterian for 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 Taget for Measurement**: At least 75% of students will attain the criterion level of success. The established criteria and targets were met, effectively measuring student achievement of SLO 2.
Results & Conclusion	We are pleased with the results of this SLO assessment with 100% attainment of the target over three years. The integration of CITI training modules throughout the curriculum has proven effective, with student performance exceeding our target benchmark of 75%. Embedding these modules at multiple levels appears to reinforce key concepts in responsible research conduct, helping to instill these principles as a core part of our students' attitudes towards ethical practices in science. As this content is now a well-established and sustained element of our curriculum, continued measurement of this specific SLO is no longer necessary.
****IMPORTANT - Plans for Next Assessment Cycle**:	Since we plan to retire this SLO, we recognize the need to develop a new outcome focused on "perspectives in science" to take its place. Our proposed three-year plan includes the following steps: 1. **Year 1** – Present the proposed change to the faculty and develop a new SLO centered on student perspectives. Potential strategies could include a capstone-level evaluation of students' views on emerging scientific issues, ethical considerations, or reflections related to our new concentrations. This assessment could focus on determining whether ethical understanding and scientific awareness have been sustained throughout the program. 2. **Year 2** – Finalize and implement the new SLO across relevant courses. 3. **Year 3** – Collect and analyze data from the implementation to evaluate the effectiveness of the new SLO and inform any needed adjustments.

Program Student Learning Outcome 3	
Program Student Learning Outcome	Graduates will demonstrate the ability to apply scientific methodology and field/laboratory/analytical skills to a biological question.
Evaluation	SLO 3 remains both useful and relevant. Scientific process skills are foundational to our students' development. An SLO focused on these skills is essential to ensuring students are proficient in the methods and practices of scientific inquiry. The integration of process-based laboratory courses into the curriculum has institutionalized the expectation that our students engage in learning and applying the scientific process. While we offer a variety of courses and experiences that provide opportunities to practice these skills, the standardized assessment of this SLO through evaluation of a scientific artifact is a relatively new approach. The variability observed in the data may reflect differences in course design or the nature of the artifacts produced in different courses. Although faculty have been trained in both the expectations for the artifacts and the use of the AAC&U LEAP Inquiry and Analysis rubric, the assessment process is still being refined.It is reasonable to expect a delay between changes in expectations and their reflection in student submissions. This further underscores the need for additional time to effectively assess this SLO and its measurementAs we are in the early stages of using this assessment, we recommend retaining this SLO to continue improving consistency and effectiveness in measurement.
Measurement Instruments	**Representative Biology Process Artifact** All students in the program are required to successfully complete one of several approved process courses, which incorporate specific course SLOs related to application of the scientific process to address relevant questions in biology. In addition, many students undertake faculty-directed independent research. Both of these experiences yield artifacts – such as evidence and argument papers, research presentations or posters, Honors CE/T projects, or manuscripts – that allow for assessment of this SLO. As part of BIOL 489, students are required to submit the artifact from their process course(s) or independent research experience that they consider to be both representative of their best work as well as best aligned with the elements of the assessment rubric for this SLO. Artifacts are assessed by 2-person program faculty teams using the AAC&U LEAP Inquiry and Analysis rubric. Faculty teams independently assess each artifact they are assigned; when faculty ratings differ by more than 25% across all rubric elements, artifact ratings are reconciled either by a third reviewer or by discussion between team members. The Inquiry and Analysis rubric is attached to this report. We plan to continue using the current rubric and assessment process for this SLO over the next three years. Additional data collection and analysis are needed to determine whether curricular or programmatic adjustments are necessary to better support student development in this area.
Criteria & Targets	**Criterian for Student Success:** 75% attainment rate Students will receive an rating of 3.0 or higher across all rubric elements, with no rubric element below 3 (out of 4). **Program Success Target for the Measurement:** At least 75% of students will attain the criterion level of success. At this time, we are comfortable with the criteran for student success and the program success target measures.
Results & Conclusion	Over the past three years we have noted great variability in the scores of the process artifacts. The variability in the data may reflect the wide range of courses and experiences available to students, or it may indicate limitations of the artifact itself. To address this, we have conducted self-studies with faculty who teach designated "process courses" and provided training on the use of the AAC&U LEAP Inquiry and Analysis rubric. While many faculty have successfully integrated science process skills into both their courses and associated artifacts, others have been

	slower to adopt these practices. Ongoing dialogue and support for faculty as they implement these changes are essential to the continued success of this Student Learning Outcome (SLO). In addition, we recognize that there may be a time lag between expectations regarding artifacts and when they show in the work that students submit, further warranting the need to continue this SLO and process.
****IMPORTANT - Plans for Next Assessment Cycle**:	We plan to continue this Student Learning Outcome (SLO) in order to collect additional data and further refine both the development and assessment of the science process artifact within science process courses. Our three-year plan includes the following phases: 1) **Year 1** – Continue collecting and assessing science process artifacts. 2) **Year 2** – Conduct analyses of the collected data. 3) **Year 3** – Resume collection and assessment, and develop recommendations based on findings.

To add more outcomes, if needed, select the table above and copy & paste below.