|  |  |
| --- | --- |
| **Assurance of Student Learning Report**  **2020-2021** | |
| *Ogden College of Science and Engineering* | *Department of Biology* |
| *Molecular Biotechnology (738)* | |
| *Ajay Srivastava, Program Coordinator; Kerrie McDaniel, Doug McElroy, Assessment Coordinators* | |

|  |  |  |  |
| --- | --- | --- | --- |
| ***Use this page to list learning outcomes, measurements, and summarize results for your program. Detailed information must be completed in the subsequent pages.*** | | | |
| 1. **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** | **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.** | | **Met** | **Not Met** |
| 1. **Student Learning Outcome 3:**  Graduates will demonstrate the ability to apply scientific methodology and field/laboratory/analytical skills to a biological question. | | | |
| **Instrument 1** | Representative biology process artifact selected by the student from their required Biology Process Course or Biology Independent Research Experience | | |
| **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.)** | | | |
| During 2020-21, the Department of Biology Program Review/Assessment Committee (the ‘Committee’) developed and program faculty adopted substantially revised student learning outcomes and means of assessment for this and all other programs. This overhaul was driven by the recognition from prior assessments that the previous SLOs and/or their means of assermment were not in all cases direct measures of student learning and/or did not provide sufficient direct evidence to inform program improvement. In addition, recent adoption of a Biology Process Course requirement for 3 of 4 undergraduate programs necessitated significant modification to our means of assessment of the prior process-related SLO.  The specific action steps taken based on prior assessments were: (1) to develop and approve revised SLOs for all programs; (2) develop a new assessment instrument for SLO1 aligned with the curriculum core; (3) develop and adopt a means and protocol for assessing SLO2; (4) develop and adopt an AAC&U LEAP-based rubric for assessing SLO3; (5) develop a new five-year plan for program assessment; (6) generate a fully-developed curriculum map for all SLOs; and (7) collect baseline data for all SLOs.  Specific follow-up items for 2021-22 per our five-year assessment plan are to: (1) assess 2020-21 artifacts for all SLOs and analyze results from those assessments; (2) develop and approve recommendations for program improvements based on assessment findings; and (3) evaluate new assessments instruments and processes for collecting assessment data. | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 212 and BIOL 226/227) and 300-level (BIOL 319/322, 327/337, BIOL 350, BIOL 388, and BIOL 446/447). 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 Cells, Metabolism, and Genetics 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** | N/A – data to be assessed and reported in 2021-22 report | |
| **Methods** | All students in the capstone BIOL 489 course are intended to be assessed. This will generate a sample size of 10-15 each assessment year. In 2020-21, the sample size generated will be slightly less, as the assessment exam was not complete and so could not be administered in BIOL 489 during Fall 2020. This is also a relatively new program, so the projected number of graduates has not yet been fully realized. | | | | |
| **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.) | | | | | |
| 1. The Committee secured approval of this SLO and means of assessment from program faculty. (Fall 2020)  2. The Committee developed the new Biology Assessment Exam as the assessment instrument. (Fall 2020, Spring 2021)  3. The Committee worked in conjunction with BIOL 489 instructors to deliver the assessment exam. (Spring 2021)  4. The Committee evaluated the new assessment exam and its implementation. (Spring 2021)  5. The Committee generated a fully-developed curriculum map for this SLO. (Spring 2021). | | | | | |
| **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 analyze 2020-21 assessment results and develop recommendations for program improvement to bring to program faculty. (Fall 2021)  2. The Committee will move from an in-person to electronic delivery format for the assessment exam. This electronic delivery system will be 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 will review/revise and approve specific program improvement actions to be undertaken based on assessment findings. (Spring 2022). | | | | | |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) | | | | | |
| Baseline assessment results and recommendations for program improvement will be reported as part of the 2021-22 report. The SLO will then be assessed on an alternating year basis, with next (mid-cycle) results and recommendations included in the 2023/24 report. To allow for longitudinal comparison, the same assessment instrument will be used. Assessments will be delivered by BIOL 489 instructors and analyzed by the Department of Biology Program Review/Assessment Committee. | | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 froma 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** | N/A – data to be assessed and reported in 2021-22 report | |
| **Methods** | All students in the capstone BIOL 489 course are intended to be assessed. This will generate a sample size of 10-15 each assessment year. This is a relatively new program, so the projected number of graduates has not yet been fully realized. | | | | |
| **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.) | | | | | |
| 1. The Committee secured approval of this SLO and means of assessment from program faculty. (Fall 2020)  2. The Committee worked in conjunction with BIOL 489 instructors to collect process evidence of CITI certification and individual module scores from all graduating seniors. (Fall 2020, Spring 2021)  3. The Committee generated a fully-developed curriculum map for this SLO. (Spring 2021). | | | | | |
| **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 analyze 2020-21 assessment results and develop recommendations for program improvement to bring to program faculty. (Fall 2021)  2. Program faculty will review/revise and approve specific program improvement actions to be undertaken based on assessment findings. (Spring 2022). | | | | | |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) | | | | | |
| Baseline assessment results and recommendations for program improvement will be reported as part of the 2021-22 report. The SLO will then be assessed on an alternating year basis, with next (mid-cycle) results and recommendations included in the 2023/24 report. To allow for longitudinal comparison, the same assessment instrument will be used. Assessments will be collected by BIOL 489 instructors and analyzed by the Department of Biology Program Review/Assessment Committee. | | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Student Learning Outcome 3** | | | | | |
| **Student Learning Outcome** | **Graduates will demonstrate the ability to apply scientific methodology and field/laboratory/analytical skills to a biological question.** | | | | |
| **Measurement Instrument 1** | **Representative Biology Process Artifact**  All students in the program are required to successfully complete one of several approved biology processes 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 artifacts they are assigned; when faculty ratings differ by more than 25% across all rubric elements, artifacts ratings are reconciled either by a third reviewer or by discussion between team members. The Inquiry and Analysis rubric is attached to this report. | | | | |
| **Criteria for Student Success** | 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 this Measurement** | | At least 75% of students will attain the criterion level of success. | **Percent of Program Achieving Target** | N/A – data to be assessed and reported in 2021-22 report | |
| **Methods** | All students in BIOL 489 are intended to submit artifacts for assessment. This will generate a sample size of 10-15 each assessment year. This is also a relatively new program, so the projected number of graduates has not yet been fully realized. | | | | |
| **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.) | | | | | |
| 1. The Committee secured approval of this SLO and means of assessment from program faculty. (Fall 2020)  2. The Committee worked in conjunction with BIOL 489 instructors to collect process artifacts from all graduating seniors. (Fall 2020, Spring 2021)  3. The Committee generated a fully-developed curriculum map for this SLO. (Spring 2021). | | | | | |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) | | | | | |
| 1. Program faculty teams will assess artifacts using the AAC&U LEAP-based rubric and report results to the Committee. (Fall 2021)  2. The Committee will analyze 2020-21 assessment artifacts and develop recommendations for program improvement to bring to program faculty. (Spring 2022)  3. Program faculty will review/revise and approve specific program improvement actions to be undertaken based on assessment findings. (Spring 2022). | | | | | |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) | | | | | |
| Baseline assessment results and recommendations for program improvement will be reported as part of the 2021-22 report. The SLO will then be assessed on an alternating year basis, with next (mid-cycle) results and recommendations included in the 2023/24 report. To allow for longitudinal comparison, the same assessment rubric will be used. Artifacts will be collected by BIOL 489 instructors, which will subsequently each be assessed by 2-person program faculty teams. Assessment results will be analyzed by the Department of Biology Program Review/Assessment Committee. | | | | | |

**A picture containing text

Description automatically generatedINQUIRY AND ANALYSIS VALUE RUBRIC**

*for more information, please contact value@aacu.org*

**Definition**

Inquiry is a systematic process of exploring issues/' objects/works through the collection and analysis of evidence that result in informed conclusions/ judgments. Analysis is the process of breaking complex topics or issues into parts to gain a better understanding of them.

*Evaluators are encouraged to assign a zero to any work sample or selection of work that does not meet benchmark (cell one) level of performance.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Capstone**  **4** | **Milestones**  **3 2** | | **Benchmark**  **1** |
| **Topic selection** | Identifies a creative, focused, and manageable topic that addresses potentially significant yet previously less explored aspects of the topic. | Identifies a focused and manageable/doable topic that appropriately addresses relevant aspects of the topic. | Identifies a topic that while manageable/doable, is too narrowly focused and leaves out relevant aspects of the topic. | Identifies a topic that is far too general and wide-ranging as to be manageable and doable. |
| **Existing Knowledge, Research, and/or Views** | Synthesizes in-depth information from relevant sources representing various points of view/approaches. | Presents in-depth information from relevant sources representing various points of view/approaches. | Presents information from relevant sources representing limited points of view/approaches. | Presents information from irrelevant sources representing limited points of view/approaches. |
| **Design Process** | All elements of the methodology or theoretical framework are skillfully developed. Appropriate methodology or theoretical frameworks may be synthesized from across disciplines or from relevant subdisciplines. | Critical elements of the methodology or theoretical framework are appropriately developed; however, more subtle elements are ignored or unaccounted for. | Critical elements of the methodology or theoretical framework are missing, incorrectly developed, or unfocused. | Inquiry design demonstrates a misunderstanding of the methodology or theoretical framework. |
| **Analysis** | Organizes and synthesizes evidence to reveal insightful patterns, differences, or similarities related to focus. | Organizes evidence to important patterns, differences, or similarities related to focus. | Organizes evidence, but the organization is not effective in revealing important patterns, differences, or similarities. | Lists evidence, but it is not organized and/or is unrelated to focus. |
| **Conclusions** | States a conclusion that is a logical extrapolation from the inquiry findings. | States a conclusion focused solely on the inquiry findings. The conclusion arises specifically from and responds specifically to the inquiry findings. | States a general conclusion that, because it is so general, also applies beyond the scope of the inquiry findings. | States an illogical, or unsupportable conclusion from inquiry |
| **Limitations and Implications** | Insightfully discusses in detail relevant and supported limitations and implications. | Discusses relevant and supported limitations and implications. | Presents relevant and supported limitations and implications. | Presents limitations and implications, but they are possibly irrelevant and unsupported. |