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| | 2022 Academic Program Assessment Report | Program current assessment plan here: | https://www.csupueblo.edu/assessment-and-student-learning/_doc/2019/report/biology-ms-assessment-plan-2019.pdf |
| | Biology MS | Program prior assessment report here: | https://www.csupueblo.edu/assessment-and-student-learning/_doc/2021/2021-assessment-reports/biology-ms-2021-assessment-report.pdf |
| Report Completed By: | Claire Ramos | | |
| Date Report Completed: | May 31, 2022 | | |
| Faculty members involved in this Assessment: | Bickford, Caprioglio, Gabaldon, Garcia Costas, Martinez, Sandmeier, Smith | | |

Please describe this year's assessment activities and follow-up for your program below. (Separate sheet for each undergraduate major, stand-alone minor, certificate, and graduate program in your department.) Please also submit any addenda such as rubrics which are not available in your assessment plan. The reports will be available to the Dean of your college/school and to the Executive Director for Assessment as well as faculty peer reviewers.

Brief Statement of Program Mission and Goals:

The Biology Program provides the biological component of the liberal arts education. We promote student understanding of biological concepts relevant to the individual and society, and foster an appreciation of scientific inquiry. Biology is an integral subject for other majors' requirements and the Biology department is committed to fulfilling these service courses and general education for other departments.

The graduate program leading to the degree of Master of Science in Biology prepares students to apply basic scientific principles to the practical biological problems encountered in business, industry, government, and education. Graduates from the program will be able to apply the techniques of scientific research to real-world biological problems. Our students obtain a broad education, covering a wide variety of biological disciplines. We focus on the student, facilitating hands-on experience, interactions with faculty, and opportunities for graduate research in topics of regional interest.

Upon completion of the MS in Biology, students will have achieved the following student learning outcomes as stated in the University Catalog:

SLO 1: **Mastery of the Scientific Method** – Independent development and mastery of problem solving skills including experimental design, execution, critical analysis, and interpretation of the results of original scientific experimentation (thesis) or experiential learning (internship).

SLO 2: **Dissemination of Scientific Products** – Persuasive communication and defense of significant results of original scientific investigation presented in both written and oral format at a graduate peer-professional level.

SLO 3: **Utilization of the Literature** - Critical evaluation of an independently accessed comprehensive body of scientific literature which is project relevant and foundational in supporting and explaining research findings in both written and oral format.

SLO 4: **Development of a Relevant Knowledge Base** - Development of intrinsically held fundamental field-specific knowledge which will be applied to explain and defend research findings at a level of mastery expected by peer-professionals.

SLO 5: **Professionalism and Self Responsibility** – Maintain a consistent professional work ethic of independently taking the initiative and motivation to produce tangible products of a quality commensurate with peer-standards in graduate or professional schools or in the career field being pursued.

I. Assessment of Student Learning Outcomes (SLOs) in this cycle. Including processes, results, and recommendations for improved student learning. Use Column H to describe improvements planned for the year based on the assessment process.

| A. Your program SLOs are pasted here verbatim from your assessment plan. Please enter info in columns B-H only for those assessed during this annual cycle. | B. When was this SLO last reported on prior to this cycle? (semester and year) | C. What method was used for assessing the SLO? Please include a copy of any rubrics used in the assessment process. | D. Who was assessed? Please fully describe the student group(s) and the number of students or artifacts involved (N). | E. What is the expected proficiency level and how many or what proportion of students should be at that level? | F. What were the results of the assessment? (Include the proportion of students meeting proficiency.) | G. What were the department's conclusions about student performance? | H. What changes/improvements to the program are planned based on this assessment? |
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| 1. Mastery of the Scientific Method – Independent development and mastery of problem solving skills including experimental design, execution, critical analysis, and interpretation of the results of original scientific experimentation (thesis) or experiential learning (internship). | Spring 21 | Rubric administered during thesis defense and at committee meetings. (Appendix 1) | We assessed students active in the program in the last three years since the beginning of our new assessment protocol in summer 19. 30 of 45 (87%) students were assessed at least once and 100% of 12 graduates were assessed at their thesis defense. 68 total committee meetings were evaluated and 12 defenses | It is expected that 100% of students are at least proficient at this SLO by thesis defense (i.e. average score is ≥ 3, where 1=ineffective, 2=developmental, 3=proficient, 4=excellent. (See assessment plan for scoring details) | We saw an increasing trend in performance as students moved through the program (see figure 1 following table). 100% (12 of 12) of students were scored proficient or better at their thesis defense. | By graduation students are performing at the expected level. Prior to graduation, some students are still developing skills. | No changes to the program at this time. We are meeting programmatic goals. We will continue to collect data as a large cohort of students are expected to graduate in the next year. |
| 2. Dissemination of Scientific Products – Persuasive communication and defense of significant results of original scientific investigation presented in both written and oral format at a graduate peer-professional level. | Spring 21 | Rubric administered during thesis defense and at committee meetings.(Appendix 1) | We assessed students active in the program in the last three years since the beginning of our new assessment protocol in summer 19. 30 of 45 (87%) students were assessed at least once and 100% of 12 graduates were assessed at their thesis defense. 68 total committee meetings were evaluated and 12 defenses | It is expected that 100% of students are at least proficient at this SLO by thesis defense (i.e. average score is ≥ 3, where 1=ineffective, 2=developmental, 3=proficient, 4=excellent. (See assessment plan for scoring details) | We saw an increasing trend in performance as students moved through the program (see figure 1 following table). 100% (12 of 12) of students were scored proficient or better at their thesis defense. | By graduation students are performing at the expected level. Prior to graduation, some students are still developing skills. | No changes to the program at this time. We are meeting programmatic goals. We will continue to collect data as a large cohort of students are expected to graduate in the next year. |
| 3. Utilization of the Literature - Critical evaluation of an independently accessed comprehensive body of scientific literature which is project relevant and foundational in supporting and explaining research findings in both written and oral format. | Spring 21 | Rubric administered during thesis defense and at committee meetings.(Appendix 1) | We assessed students active in the program in the last three years since the beginning of our new assessment protocol in summer 19. 30 of 45 (87%) students were assessed at least once and 100% of 12 graduates were assessed at their thesis defense. 68 total committee meetings were evaluated and 12 defenses | It is expected that 100% of students are at least proficient at this SLO by thesis defense (i.e. average score is ≥ 3, where 1=ineffective, 2=developmental, 3=proficient, 4=excellent. (See assessment plan for scoring details) | We saw an increasing trend in performance as students moved through the program (see figure 1 following table). 100% (12 of 12) of students were scored proficient or better at their thesis defense. | By graduation students are performing at the expected level. Prior to graduation, some students are still developing skills. | No changes to the program at this time. We are meeting programmatic goals. We will continue to collect data as a large cohort of students are expected to graduate in the next year. |
| 4. Development of a Relevant Knowledge Base - Development of intrinsically held fundamental field-specific knowledge which will be applied to explain and defend research findings at a level of mastery expected by peer-professionals. | Spring 21 | Rubric administered during thesis defense and at committee meetings.(Appendix 1) | We assessed students active in the program in the last three years since the beginning of our new assessment protocol in summer 19. 30 of 45 (87%) students were assessed at least once and 100% of 12 graduates were assessed at their thesis defense. 68 total committee meetings were evaluated and 12 defenses | It is expected that 100% of students are at least proficient at this SLO by thesis defense (i.e. average score is ≥ 3, where 1=ineffective, 2=developmental, 3=proficient, 4=excellent. (See assessment plan for scoring details) | We saw an increasing trend in performance as students moved through the program (see figure 1 following table). 100% (12 of 12) of students were scored proficient or better at their thesis defense. | By graduation students are performing at the expected level. Prior to graduation, some students are still developing skills. | No changes to the program at this time. We are meeting programmatic goals. We will continue to collect data as a large cohort of students are expected to graduate in the next year. |

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| 5. Professionalism and Self Responsibility – Maintain a consistent professional work ethic of independently taking the initiative and motivation to produce tangible products of a quality commensurate with peer-standards in graduate or professional schools or in the career field being pursued. | Spring 21 | Rubric administered during thesis defense and at committee meetings. (Appendix 1) | We assessed students active in the program in the last three years since the beginning of our new assessment protocol in summer 19. 39 of 45 (87%) students were assessed at least once and 100% of 12 graduates were assessed at their thesis defense. 68 total committee meetings were evaluated and 12 defenses | It is expected that 100% of students are at least proficient at this SLO by thesis defense (i.e. average score is ≥ 3 , where 1=ineffective, 2=developmental, 3=proficient, 4=excellent. (See assessment plan for scoring details) | We saw an increasing trend in performance as students moved through the program (see figure 1 following table). 100% (12 of 12) of students were scored proficient or better at their thesis defenses. | By graduation students are performing at the expected level. Prior to graduation, some students are still developing skills. | No changes to the program at this time. We are meeting programmatic goals. We will continue to collect data as a large cohort of students are expected to graduate in the next year. |
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Comments on part I:

This is our third year using our new rubric to evaluate all 5 SLO's at every committee meeting in addition to the thesis defense. Faculty participation in evaluations has been increasing from 8 evaluations in year 1, to 31 in year 2, and now 41 in year three. This year we have finally amassed enough data to do a meaningful analysis of student performance throughout the course of the program. Students have committee meetings every semester throughout the degree, so we can track student improvement as they progress through the program (Fig. 1). For all 5 SLO's there is a general upward trend as students progress through the program. All 12 of our graduating students in the last 3 years performed at the proficient level or above for all 5 SLO's at their thesis defenses. Based on the criteria set forward by our assessment plan, we are meeting our programmatic goals at this time. The sample size is still relatively small and we expect a large cohort of students to graduate in the next year. We intend to see if these patterns hold true with a larger sample. The department will discuss whether there are other metrics we would like to assess in the future. The 6 students who were active in the program but were not evaluated were in the writing phase of the thesis and did not hold a committee

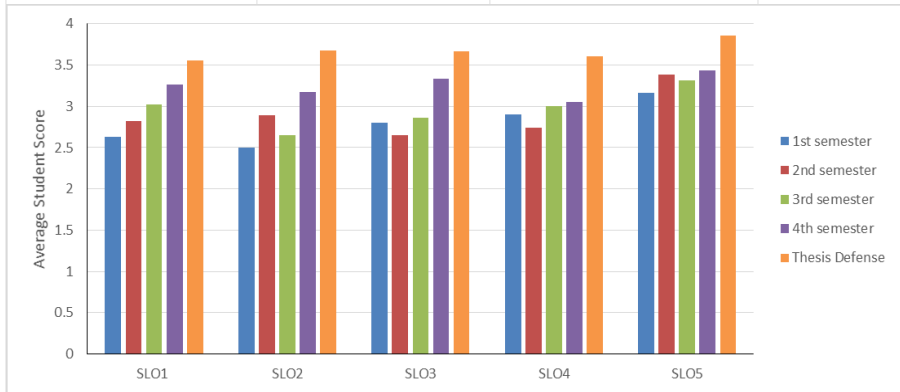


Fig 1: Average student scores for each SLO as students progress through the degree. 1=ineffective, 2=developmental, 3=proficient, 4=excellent.

II. Closing the Loop. Describe at least one data-informed change to your curriculum during the year cycle. These are those that were based on, or implemented to address, the results of assessment from previous cycles.

| A. What SLO(s) or other issues did you address in this cycle? Please include SLOs verbatim from the assessment plan, as above. | B. When was this SLO last assessed to generate the data which informed the change? Please indicate the semester and year. | C. What were the recommendations for change from the previous assessment column H and/or feedback? | D. How were the recommendations for change acted upon? | E. What were the results of the changes? If the changes were not effective, what are the next steps or the new recommendations? |
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| Small sample size | Spring 21 | Increase sample size | We increased sample size | We now have enough data to make informative conclusions about student progress. We appear to be meeting our programmatic goals. We intend to confirm with additional data. |

Comments on part II: Reviewers of previous assessment had no suggestions to incorporate into this assessment other than to continue data collection. Because we are meeting programmatic goals, there is not much to add here currently. The department will consider whether additional goals need to be added in the future.

APPENDIX 1:

Student Learning Outcomes Evaluation

Graduate Programs in Natural Sciences MS in Biology Program assessment rubric

| | Excellent | Proficient | Developmental | Ineffective |
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| Mastery of Scientific Method | <ul style="list-style-type: none"> -Significance compelling -Hypothesis testable and fully supported by background -Aims/predictions fully test hypothesis -Methods achieve aims/test predictions entirely -Methods include robust controls and statistics -Interpretations elucidate hypothesis and significance | <ul style="list-style-type: none"> -Significance clearly communicated -Hypothesis testable and mostly supported by background -Aims/predictions test the hypothesis -Methods achieve aims/test predictions -Methods include critical controls and adequate statistics -Interpretations elucidate hypothesis and touch on significance | <ul style="list-style-type: none"> -Significance partially communicated -Hypothesis testable -Aims/predictions test the hypothesis are not compelling -Methods not fully connected to aims/predictions -Methods missing controls or use incorrect statistics -Interpretations relate to the hypothesis but not significance | <ul style="list-style-type: none"> -Significance not clearly communicated -Hypothesis is trivial or untestable -Aims/predictions do not test hypothesis -Methods do not achieve aims/test predictions -Methods lack controls and statistics -Interpretations do not relate the hypothesis or significance |
| Dissemination of Scientific Products | <ul style="list-style-type: none"> -Written work is clear and concise -Presentation is dynamic and confident. -Graphs are informative -Products follow correct format. | <ul style="list-style-type: none"> -Written work requires some editing -Presentation lacks flow -Graphs are unclear -Some incorrect formatting | <ul style="list-style-type: none"> -Written work is rambling or lacks detail -Presentation is unclear or disorganized. -Graphs are incorrect -Incorrect formatting prevalent | <ul style="list-style-type: none"> -Written work grammatically incorrect -Presentation is poor -Graphs are absent -Not in scientific format |

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| <i>Utilization of Literature</i> | -Systematic review of literature -Can utilize and integrate multiple sources to answer questions | -Some important literature missing -Can give individual sources without integration | -Literature review is incomplete -Can give some but insufficient examples from the literature | -Literature review missing -Does not have a grasp of the literature | | | | |
| <i>Development of a Relevant Knowledge Base</i> | -Easily draws on knowledge base to answer questions -Understands and utilizes methods in field of interest -Is an expert in the field | -Can apply outside knowledge to answer questions -Understands common methods in field of interest -Is well versed in field | -Can apply outside knowledge with coaching -Is somewhat familiar with the field -Is familiar with methods from field of interest, but does not fully | -Cannot answer questions about research topic -Is unfamiliar with common methods in field of interest -Is not familiar with field | | | | |
| <i>Professionalism and Self Responsibility</i> | -Complete ownership -Conducts research independently -Schedules meetings without prompting from faculty -Makes and meets deadlines for products | -Partial ownership -Conducts research with some oversight from faculty -Schedules meetings on request -Meets deadlines for products | -Little ownership -Conducts research with faculty oversight -Fails to schedule meetings promptly -Does not meet deadlines for products | -No ownership -Relies on others to conduct research -Does not have regular meetings -Does not produce products | | | | |
| GPNS | <i>Excellent</i> | <i>Proficient</i> | <i>Developmental</i> | <i>Ineffective</i> | <i>Not Evaluated</i> | | | |
| <i>MS in Biology</i> | | | | | | | | |
| <i>Scientific Method</i> | | | | | | | | |
| <i>Scientific Products</i> | | | | | | | | |
| <i>Literature</i> | | | | | | | | |
| <i>Knowledge Base</i> | | | | | | | | |
| <i>Responsibility</i> | | | | | | | | |
| <i>Student Name:</i> | | | | | | | | |
| <i>Setting Evaluated: Committee Meeting / Thesis Defense</i> | | | | | | | | |
| <i>Semester/Year:</i> | | | | | | | | |
| <i>This form is to be completed by graduate committee at each committee meeting and by attending biology faculty at thesis defense or internship seminar. Data is to be compiled by the program director for programmatic assessment of student learning outcomes (SLOs).</i> | | | | | | | | |