

Assessment Plan for MS in Biology

Prepared by Dr. Claire Ramos, Graduate Program Director in consultation with Biology Faculty
claire.ramos@csupueblo.edu, 719-549-2509

Program Mission:

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.

All students graduating with a MS in biology will be proficient in all 5 SLOs.

In addition to the above SLOs, 80% of MS students will graduate within 3 years of starting the program. No more than 20% of students failing to complete the program will do so because they failed to write their thesis.

Curriculum:

The curriculum for graduate students varies widely depending on the area of research interests, however all graduate students are required to take BIOL 510, BIOL 593, and BIOL 589 (thesis) or BIOL 588 (non-thesis) as well as a graduate level statistics course. These courses along with the selected

coursework of interest prepare to students to master the 5 SLOs (Table 1). In addition to transcribed coursework, all graduate students are required to have a committee meeting with their graduate committee once per semester. This group of faculty (generally 3-4 CSM faculty) will evaluate the student's progression on each SLO at each committee meeting. In addition, all students will be evaluated in all SLOs during their thesis defense (BIOL 589) or internship seminar (BIOL 588).

Table 1: Course Map for MS in Biology

SLO	BIOL 510	BIOL 593	MATH 550	Core Course	Electives	BIOL 589 or BIOL 588
1. Mastery of Scientific Method	I	D	D			M
2. Dissemination of Scientific Products	I	D				M
3. Utilization of the Literature	I	D		D	D	M
4. Development of a Relevant Knowledge Base	I	D		D	D	M
5. Professionalism and Self Responsibility	I	D				M

I=introduction, D=development, M=mastery

Assessment:

As all SLOs in this program relate directly to the development of knowledge and skills related to the specific topic of research/interest, rather than assessing SLOs in courses, SLOs will be assessed in graduate committee meetings and during the thesis defense or internship seminar. All Biology MS students are required to have committee meetings at least once per semester. Graduate committees are composed of no fewer than 3 tenured or tenure-track faculty from CSU-Pueblo. As these faculty meet with the students on a regular basis, they are best suited to evaluate the students growth in the 5 SLOs. Evaluating SLOs at every meeting will allow for tracking of student progress through the program and will elucidate where additional training is necessary, either by the faculty advisor or through require coursework (e.g. BIOL 510, BIOL 593).

SLOs will be evaluated using a rubric developed by the biology department (Appendix A). Each SLO will be evaluated by each faculty on the graduate committee during each committee meeting. During Thesis Defense or Internship Seminar, all attending faculty will evaluate each student on each SLO. SLOs for students will be evaluated as "Excellent", "Proficient", "Developmental", or "Ineffective". Faculty who feel they do not have enough experience with a given student to assess a particular SLO may also use "Not Evaluated". The graduate director will collect evaluations from faculty and calculate an average score for each SLO for each student. Evaluations will be averaged by assigning a number to each category (Excellent=4, Proficient=3, Developmental=2, Ineffective=1) and taking the average from all completed faculty evaluations. We expect that all students defending theses or giving internship seminars will be proficient (average score ≥ 3.0) in all 5 SLOs.

Student completion times will be calculated for all graduating students. The reason for departure will be determined for all students leaving the program.

The graduate director will be responsible for collecting and tabulating all assessment results. Average assessment scores for each SLO will be presented to the department yearly at the convocation meeting. The biology department as a whole will decide on action based on assessment scores, such as adjustments to the MS curriculum, changes in content of required coursework, changes in policies in the graduate student handbook, etc.

Biology MS Program Assessment Plan Summary

Date Submitted: 6/2/24 For Academic Years:23/24

Student Learning Outcome	Measure description (direct or indirect?)	Timeline or cycle
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).	Assessment at Thesis Defense/Internship Seminar: Rubric (Appendix 1) will be used to evaluate students at completion of the program	Annually
	Assessment at Committee Meetings: Rubric (Appendix 1) will be used to evaluate students as they progress through the program	Annually
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.	Assessment at Thesis Defense/Internship Seminar: Rubric (Appendix 1) will be used to evaluate students at completion of the program	Annually
	Assessment at Committee Meetings: Rubric (Appendix 1) will be used to evaluate students as they progress through the program	Annually
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.	Assessment at Thesis Defense/Internship Seminar: Rubric (Appendix 1) will be used to evaluate students at completion of the program	Annually
	Assessment at Committee Meetings: Rubric (Appendix 1) will be used to evaluate students as they progress through the program	Annually
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.	Assessment at Thesis Defense/Internship Seminar: Rubric (Appendix 1) will be used to evaluate students at completion of the program	Annually
	Assessment at Committee Meetings: Rubric (Appendix 1) will be used to evaluate students as they progress through the program	Annually

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.	Assessment at Thesis Defense/Internship Seminar: Rubric (Appendix 1) will be used to evaluate students at completion of the program	Annually
	Assessment at Committee Meetings: Rubric (Appendix 1) will be used to evaluate students as they progress through the program	Annually
Time to graduation	Assessed for all graduating student	Annually
Reason for leaving program	Determined for all students failing to complete the program.	Annually
Expected level of student proficiency (definition and percentage)	100% of students will have an average score of proficient (i.e. ≥ 3.0) in all 5 SLOs by the completion of the program. Students will show improvement in SLOs from early committee meetings (year 1) to later committee meetings (year 2). 80% of students will finish the program in three years or less. No more than 20% of students will leave the program because they fail to complete their thesis.	

Assessment Plan Summary Page created June 2024.

Student Learning Outcomes Evaluation

Graduate Programs in Natural Sciences MS in Biology Program assessment rubric

	Excellent	Proficient	Developmental	Ineffective
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 	<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 	<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 statics 	<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

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	-Interpretations elucidate hypothesis and significance	-Methods include critical controls and adequate statistics -Interpretations elucidate hypothesis and touch on significance	-Interpretations relate to the hypothesis but not significance	-Interpretations do not relate the hypothesis or significance
Dissemination of Scientific Products	-Written work is clear and concise -Presentation is dynamic and confident. -Graphs are informative -Products follow correct format.	-Written work requires some editing -Presentation lacks flow -Graphs are unclear -Some incorrect formatting	-Written work is rambling or lacks detail -Presentation is unclear or disorganized. -Graphs are incorrect -Incorrect formatting prevalent	-Written work grammatically incorrect -Presentation is poor -Graphs are absent -Not in scientific format
Utilization of Literature	-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
Development of a Relevant Knowledge Base	-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 coaxing -Is somewhat familiar with the field -Is familiar with methods from field of interest, but does not fully understand them	-Cannot answer questions about research topic -Is unfamiliar with common methods in field of interest -Is not familiar with field
Professionalism and Self Responsibility	-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

Student Name: _____

Setting Evaluated: Committee Meeting / Thesis Defense

Semester/Year: _____

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).

 GPNS MS in Biology	Excellent	Proficient	Developmental	Ineffective	Not Evaluated
Scientific Method					
Scientific Products					
Literature					
Knowledge Base					
Responsibility					