

Master of Science in Biology

ASSESSMENT REPORT ACADEMIC YEAR 2018 – 2019

Some useful contacts:

1. Prof. Alexandra Amati, FDCD, Arts – adamati@usfca.edu
2. Prof. John Lendvay, FDCD, Sciences – lendvay@usfca.edu
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Academic Effectiveness Annual Assessment Resource Page:

<https://myusf.usfca.edu/arts-sciences/faculty-resources/academic-effectiveness/assessment>

I. LOGISTICS

1. Please indicate the name and email of the program contact person to whom feedback should be sent (usually Chair, Program Director, or Faculty Assessment Coordinator).

John Paul (jrpaul@usfca.edu) – Program Director

Naupaka Zimmermann (nzimmerman@usfca.edu) – Assistant Program Director

2. Please indicate if you are submitting report for (a) a Major, (b) a Minor, (c) an aggregate report for a Major & Minor (in which case, each should be explained in a separate paragraph as in this template), (d) a Graduate or (e) a Certificate Program

Graduate program – Master of Science in Biology.

3. Please note that a Curricular Map should accompany every assessment report. Has there been any revisions to the Curricular Map?

No. See Curricular Map at the end of report.

II. MISSION STATEMENT & PROGRAM LEARNING OUTCOMES

1. Were any changes made to the program mission statement since the last assessment cycle in October 2018? Kindly state “Yes” or “No.” Please provide the current mission statement below. If you are submitting an aggregate report, please provide the current mission statements of both the major and the minor program

Mission Statement (Major/Graduate/Certificate):

The MS graduate program in biology offers a research-intensive experience for post-baccalaureate students in a focused field of biology. The program seeks to prepare students for further postgraduate work or a technical research profession by developing proficiency in scientific research through critical thinking, inquiry, analysis, teaching, and communication.

2. Were any changes made to the program learning outcomes (PLOs) since the last assessment cycle in October 2017? Kindly state “Yes” or “No.” Please provide the current PLOs below. If you are submitting an aggregate report, please provide the current PLOs for both the major and the minor programs.

No

PLOs (Major/Graduate/Certificate):

Learning outcomes	Assessment strategies
PLO1. Describe, synthesize, & apply concepts and techniques in the current literature within a specific research area.	<ul style="list-style-type: none"> • Directed Reading (BIOL 695) • Graduate Seminar (BIOL 600) • Graduate course electives
PLO2. Develop mastery of content through direct instruction of basic biological concepts.	<ul style="list-style-type: none"> • Teaching evaluations • Supervisor evaluations
PLO3. Conduct original research, evaluate data, & demonstrate research skills within a specified research area.	<ul style="list-style-type: none"> • Biannual progress reports of research performance • Directed Research (BIOL 698) • Assessment of committee members
PLO4. Communicate results of independent scientific inquiry through oral & written discourse.	<ul style="list-style-type: none"> • Thesis writing (BIOL 699) • Thesis outline assessment • Final thesis evaluation • Assessment of committee members

3. State the particular Program Learning Outcome(s) you assessed for the academic year 2018-2019. PLO(s) being assessed (Major/Graduate/Certificate):

PLO4. Communicate results of independent scientific inquiry through oral & written discourse.

III. METHODOLOGY

Describe the methodology that you used to assess the PLO(s).

Important: *Please attach, at the end of this report, a copy of the rubric used for assessment.*

Methodology used (Major/Graduate/Certificate):

The MS in Biology program is small. Typically, there are about 7-11 students enrolled in a given semester. The program is thesis-based and research intensive. Given the small size of the program, few student products are available for assessment in a given cycle. Accordingly, this assessment cycle we have opted to develop a formal assessment rubric for our Program's PLO4 (Communicate results of independent scientific inquiry through oral & written discourse). This rubric is designed to assess PLO4 of our learning outcomes, specifically communicating results of independent scientific inquiry **orally** through public research talks. The MS in Biology 2016-2017 Assessment Report included the 'Thesis Assessment Rubric' for assessing PLO3 (Conduct original research, evaluate data, and demonstrate research skills within a specified research area). This rubric specifically assesses the major written component of a Biology Masters student's research, the thesis. This rubric also effectively addresses the written component of PLO4: communicating results of independent scientific inquiry in **written** format. Hence, the rubric presented here in our 2018-2019 Assessment Report is designed to assess the oral component of PLO4. With the combined use of the Thesis Assessment Rubric and the Oral Presentation Assessment Rubric, both PLO3 and PLO4 of our program learning outcomes can be fully assessed.

We developed our 'Oral Presentation Assessment Rubric' to focus on assessment of 'communicating results of an independent scientific inquiry' by developing questions that assess critical components of any scientific presentation of research: i) importance of the research to the scientific discipline (context), and how it builds on previous research (background); ii) conceptual basis for the key questions (background) and the specific hypotheses and predictions being tested (original research), iii) methods used; iv)

presentation of results using of graphical tools (communicating results); v) interpretation of results providing significance to the scientific discipline, implications of the study, and limitations of the study; and vi) potential directions for future research. We did not include questions assessing the speaker's oral presentation skills *per se*, such as speaking with confidence, looking at the audience, projection of voice, etc. While these are all valuable aspects of giving any presentation and the graduate students would likely be critiqued on these factors by their major professor, we confined our assessment questions to directly address the PLOs language of orally 'communicating *results of independent scientific inquiry*'. As such, our question focus is in the content, rather than the style of the presentation.

Please see 'Closing the loop' below, where we lay out our plan for using this oral presentation assessment rubric in the future.

IV. RESULTS & MAJOR FINDINGS

What are the major takeaways from your assessment exercise?

Results (Major/Graduate/Certificate):

We will begin using the assessment rubric (with modifications suggested by faculty and the FDCD) in Spring 2020 when four students will present their research in the Biology Seminar Series (see 'Closing the Loop', below).

V. CLOSING THE LOOP

1. Based on your results, what changes/modifications are you planning in order to achieve the desired level of mastery in the assessed learning outcome? This section could also address more long-term planning that your department/program is considering and does not require that any changes need to be implemented in the next academic year itself.

Closing the Loop (Major/Graduate/Certificate):

Plan for future assessment of oral presentations:

Biology Masters students have two primary oral presentations that are formally part of their graduate training. First, all MS in Biology students must present once in the Biology Seminar Series during their 2nd year as a graduate student. These talks are typically ~15 minutes long (2-3 students present within a 50-minute time block) and in some cases may include partial results, as their research and analysis is ongoing. Second, all students give an 'exit seminar' as part of Master's defense. These talks are typically 30 – 60 minutes and cover the entirety of a student's Masters project. Many students give additional talks at USF's Creative Activity and Research Day (CARD) or at scientific conferences. In theory, our rubric could be applied to any of these kinds of talks. For our assessment plan, we will use the required Biology Seminar Series talks, since all students give a talk in the same format, with the same general time limitations, and in the same year of the program. In addition, the Seminar Series is captured each semester using the Echo360 platform. We have approximately the past 2 years of graduate seminar talks to combine with four that will be presented in Spring 2020, and an additional seven in Fall 2020 - Spring 2021. We hope to have > 15 talks to use for formal assessment, so the 2021-2022 assessment cycle may be an appropriate time to submit the results of this assessment. We plan to have at least three Biology faculty (which are not the student's major advisor) assess each research talk. We will tally the results and interpret the areas in which students were found to be inadequate, adequate, or excellent for each assessment question.

2. What were the most important suggestions/feedback from the FDCD on your last assessment report (for academic year 2017-2018, submitted in October 2018)? How did you incorporate or address the suggestion(s) in this report?

Suggestions (Major/Graduate/Certificate):

That assessment report used indirect means to assess PLO2 on student teaching. The FDCD suggested we use direct means for assessment in the future if possible. We are working to address this critique regarding assessing teaching PLO2, but also took this to heart for our other PLO assessments. This is why we worked to develop an explicit rubric for oral presentations that will allow direct assessment of PLO4.

ADDITIONAL MATERIALS

Biology Oral Presentation Assessment Rubric:

PL04. Communicate results of independent scientific inquiry through oral and written discourse.

	Inadequate	Adequate	Excellent
Does the speaker provide context to their research within the discipline of biology?	The speaker does not clearly indicate how and/or where their research fits within the discipline of biology. The research is not placed within a broader context.	The speaker provides some context to indicate how and/or where their research fits within the discipline of biology.	The speaker clearly indicates how and/or where their research fits within the discipline of biology.
Does the speaker provide sufficient background information for a general biology audience?	The speaker does not provide sufficient background information for a general biology audience to have an adequate understanding of their research topic and its key conceptual components. The background information is too general to build understanding in a general biology audience, OR the background information is overly detailed or uses too much discipline specific jargon, making understanding of the key conceptual components difficult or inaccessible to a general biology audience.	The speaker provides sufficient background information for a general biology audience to have an adequate understanding of their research topic and its key conceptual components. The background information is general enough to build understanding in a general biology audience, OR the background information is not overly detailed or does not use too much discipline specific jargon.	The speaker provides sufficiently detailed background information for a general biology audience to have an excellent understanding of their research topic and its key conceptual components.
Does the speaker clearly state the central questions, hypotheses, and predictions of their research?	The speaker does not clearly articulate the key questions, hypotheses and/or predictions of their research. They do not highlight key questions and/or hypotheses and/or predictions.	The speaker articulates the key questions, hypotheses and/or predictions of their research, but they are presented in an indirect or difficult to follow manner.	The speaker clearly articulates the key questions, hypotheses and/or predictions of their research.

<p>Does the speaker describe their methods in sufficient detail for a general biology audience?</p>	<p>The speaker does not provide sufficient methodological detail for a general biology audience to have an adequate understanding of their research methods. The methods lack sufficient detail to allow understanding, OR methods are overly detailed or use too much discipline specific jargon, making understanding of the methods difficult or inaccessible to a general biology audience.</p>	<p>The speaker provides sufficient methodological detail for a general biology audience to have an adequate understanding of their research methods. Most of the methods have sufficient detail to allow understanding, OR most of the methods are not overly detailed or using too much discipline specific jargon.</p>	<p>The speaker provides sufficient methodological detail for a general biology audience to have an excellent understanding of their research methods.</p>
<p>Does the speaker provide an overview of their results using informative figures, tables, and illustrations?</p>	<p>The speaker does not provide an overview of their results using informative figures, tables, and illustrations. The results either lack informative figures, tables, and/or illustrations OR included figures, tables, and/or illustrations are difficult to interpret, lack key elements (e.g., legends, axis labels), or are not informative to the key hypotheses and predictions.</p>	<p>The speaker provides an adequate overview of their results using figures, tables, and/or illustrations that are mostly readable, relatively easy to interpret, and mostly informative to the key hypotheses or predictions.</p>	<p>The speaker provides an excellent overview of their results using informative figures, tables, and illustrations that are easy to read and interpret, and are informative to the key hypotheses or predictions.</p>
<p>Does the speaker discuss the significance, implications, and limitations of the study?</p>	<p>The speaker does not provide an adequate discussion of their results. The discussion does not highlight the general significance to biology and/or, the implications for future research, and/or the limitations of the study.</p>	<p>The speaker provides an adequate discussion of their results, highlighting the general significance to biology, the implications for future research, and the limitations of the study.</p>	<p>The speaker provides an excellent discussion of their results, highlighting the general significance to biology, the implications for future research, and the limitations of the study.</p>
<p>Does the speaker provide suggestions for future research directions based on the results of their study?</p>	<p>The speaker does not adequately articulate future research directions. Does not provide connections to the results of their study.</p>	<p>The speaker adequately articulates some future research directions, but the connection to the results of their study may be indirect.</p>	<p>The speaker clearly articulates future research directions suggested by the results of their study.</p>

Rationale for assessment measures:

1. Does the speaker provide context to their research within the discipline of biology?

Rationale: Biology is a broad and diverse discipline. Research presentations should draw in an audience from any discipline of biology by providing the context of their work within the big picture.

2. Does the speaker provide sufficient background information for a general biology audience?

Rationale: In order for the audience to follow and understand a research talk, the speaker must provide background information that provides the conceptual foundation for the research and its motivating questions. There should be sufficient background information, but not too much, to provide an overview of concepts and empirical evidence that motivate the key questions, hypotheses, and predictions of the study.

3. Does the speaker clearly state the central questions, hypotheses, and predictions of their research?

Rationale: A critical component of a research presentation is clearly articulating the key, motivating questions that your study hopes to address, often packaged as a set of testable hypotheses and associated predictions.

4. Does the speaker describe their methods in sufficient detail for a general biology audience?

Rationale: The methods tell your audience what tools you used to test your predictions, so it is important to describe what you did. However, there is a great deal of technical detail and jargon associated with many scientific methods and approaches, so it is important for the speaker to distill this information in a digestible form for a diverse audience. Either too little or too many methodological details can hinder understanding of the tools used for data collection and analyses.

5. Does the speaker provide an overview of their results using informative figures, tables, and illustrations?

Rationale: Presenting research results through data summaries in tables or graphical forms like figures, illustrations, etc., is standard and commonplace in most scientific disciplines. Especially in oral presentations, having easy to read and interpret figure can be critical for quickly and clearly conveying key research results.

6. Does the speaker discuss the significance, implications, and limitations of the study?

Rationale: The discussion and interpretation of results must clearly articulate the significance of the research, the implications of the results, and any limitations to consider when weighing the results.

7. Does the speaker provide suggestions for future research directions based on the results of their study?

Rationale: A novel and important research project should provide results that lay the foundation for future research. The speaker should highlight future directions they could envision for their general research questions, based on what has been discovered thus far.

Curriculum Maps:

	PLO1	PLO2	PLO3	PLO4
Institutional Learning Outcomes X Program Learning Outcomes	Critically evaluate concepts and techniques in the current literature in a specific research area	Develop effective pedagogical strategies to teach concepts in the biological sciences	Conduct original research within a specified research area	Effectively communicate scientific data and conclusions
Institutional Learning Outcomes				
1. Students reflect on and analyze their attitudes, beliefs, values, and assumptions about diverse communities and cultures and contribute to the common good.	x	x		
2. Students explain and apply disciplinary concepts, practices, and ethics of their chosen academic discipline in diverse communities.	x	x	x	x
3. Students construct, interpret, analyze, and evaluate information and ideas derived from a multitude of sources.	x		x	x
4. Students communicate effectively in written and oral forms to interact within their personal and professional communities.				x
5. Students use technology to access and communicate information in their personal and professional lives.		x	x	x
6. Students use multiple methods of inquiry and research processes to answer questions and solve problems.		x	x	
7. Students describe, analyze, and evaluate global interconnectedness in social, economic, environmental and political systems that shape diverse groups within the San Francisco Bay Area and the world.	x			x

	PLO1	PLO2	PLO3	PLO4
Program Learning Outcomes X Courses	Critically evaluate concepts and techniques in the current literature in a specific research area	Develop effective pedagogical strategies to teach concepts in the biological sciences	Conduct original research within a specified research area	Effectively communicate scientific data and conclusions
Courses or Program Requirement				
Directed Reading (BIOL 695)				
CLO1--Develop critical abilities to read primary literature & interpret figures and conclusions.	X			
CLO2--Evaluate current understanding of the chosen field of biological research while determining areas of the discipline that remain understudied.	X		X	X
CLO3--Gain skills in critical analysis of primary literature and oral communication.	X			X
Graduate Seminar (BIOL 600)				
CLO1--Evaluate methodologies, data, and conclusions from novel biological research.			X	
CLO2--Critically assess scientific research in a range of biological disciplines.	X		X	
CLO3--Evaluate the role of scientific ethics in how research is conducted and communicated.	X		X	
CLO4--Develop skills in presenting results of scientific inquiry through seminar presentations.				X
Directed Research (BIOL 698)				
CLO1--Complete independent research projects under the direction of a research professor			X	
CLO2--Develop skills in laboratory techniques that allow for the successful completion of research.	X		X	
Writing & Research Methods (BIOL 697)				
CLO1--Develop critical ability to read primary literature and develop research projects based on current knowledge in the field	X			
CLO2--Gain skills in critical analysis of the literature and oral communication	X			X
CLO3--Develop skills in written discourse through abstract, poster, and proposal preparation		X		X
Thesis Writing (BIOL 699)				
CLO1--Communicate results of independent laboratory research by completing a formal written thesis.				X
CLO2--Communicate results of independent laboratory research by orally presenting data and conclusions.				X
Teaching Assistant Requirement				
LO1--Develop efficient strategies to instruct students in an academic laboratory environment.		X		X
LO1--Develop mastery of basic biological concepts taught in lower division biology courses.		X		