MS in Biology Graduate Degree Program Annual Assessment Report AY20-21

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Mission Statement

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.

No changes since last report.

PLOs

Learning outcomes	Assessment strategies
PLO1. Describe, synthesize, & apply concepts and techniques in the current literature within a specific research area.	• Directed Reading (BIOL 695) • Graduate Seminar (BIOL 600) • Graduate course electives
PLO2. Develop mastery of content through direct instruction of basic biological concepts.	• Teaching evaluations • Supervisor evaluations
PLO3. Conduct original research, evaluate data, & demonstrate research skills within a specified research area.	• 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.	• Thesis writing (BIOL 699) • Thesis outline assessment • Final thesis evaluation • Assessment of committee members

No changes to PLOs since last report.

Curricular Map

Program Learning Outcomes X Courses	PLO1 Describe, synthesize, & apply concepts and techniques in the current literature within a specific research area.	PLO2 Develop mastery of content through direct instruction of basic biological concepts	PLO3 Conduct original research, evaluate data, & demonstrate research skills within a specified research area	PLO4 Communicate results of independent scientific inquiry through both oral & written discourse
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	
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		

No changes since the last report.

Your assessment schedule between APRs

- 2015-2016: PLO4
- 2016-2017: PLO3
- 2017-2018: PLO2
- 2018-2019: PLO4
- 2019-2020: Alternate assessment due to COVID
- 2020-2021: PLO1
- 2021-2022: APR

Description of the methodology including rubrics or other instruments for the required and/or alternative assessment process.

All students in the MS biology program are required to take a seminar course once per year that they are in the program. In this course, students view presentations from guest speakers presenting their work and then are required to write an abstract summarizing this work using proper scientific writing form. These abstracts are then evaluated by faculty following the attached 10-point rubric.

For the AY 2020-2021 evaluation period, we had 12 graduate students in the program across all cohorts. 11 of these 12 students were in seminar either in the Fall or the Spring semesters, and so their ability to *Describe and synthesize concepts and techniques in the current literature within a specific research area* (PLO1) were directly assessed. Note that this evaluation does not specially address the *application* of concepts and techniques; this has been evaluated via other metrics for the other PLOs since the last APR.

Description of your results noting any significant findings from the data or assessment process.

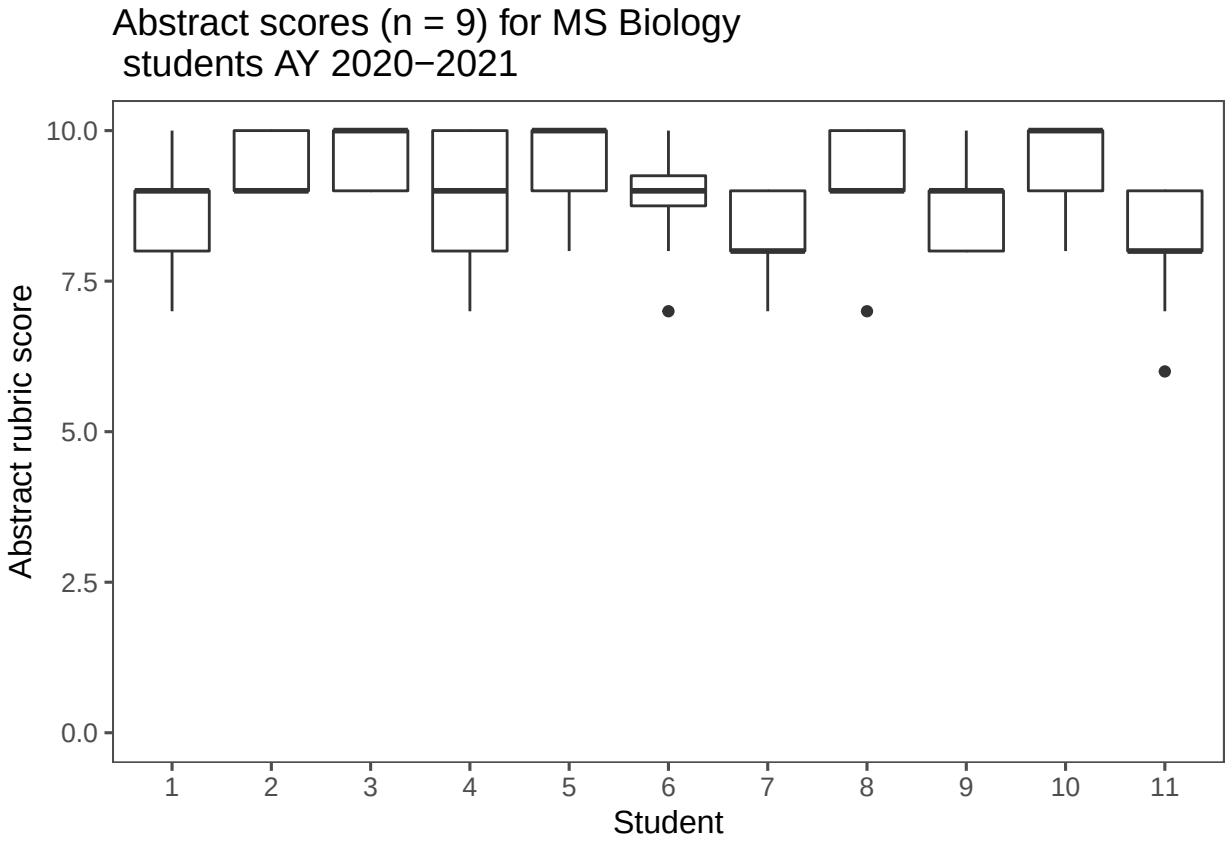

Figure 1: MS student scores are generally high on the rubric scale, indicating that they are meeting or exceeding the expectations for PLO1.

In assessing these metrics of students' abilities to "Describe, synthesize, & apply concepts and techniques in the current literature within a specific research area (PLO1)", we found that our students are generally scoring quite high on the rubric metrics for abstract writing and organization (Figure 1), which indicate a high level of ability to interpret, synthesize, and describe modern and cutting-edge techniques within specific research areas. Despite this overall relatively high level of ability for students coming into the program and the class, there is also a significant improvement in rubric scores over the course of the semester (Figure 2), which provides evidence that this element of our curriculum is being effective at improving students' skills in this area.

In many cases, the areas on the rubric where the students lost points most frequently were the ability to tightly and logically structure the flow of ideas in their abstract writing and to evaluate which pieces of information from a long talk are important enough to include in a 200-300 word abstract. These are both higher-level synthesis and writing skills that we work with them to build.

Sharing of results and future plans for followup

These results were shared with the department and the graduate program committee, as well as the rotating set of faculty that teach the seminar course each semester.

In response to this observation that the points being lost are frequently those higher-level organizational skills, we have added some additional skills-building days into the seminar course, where students are given

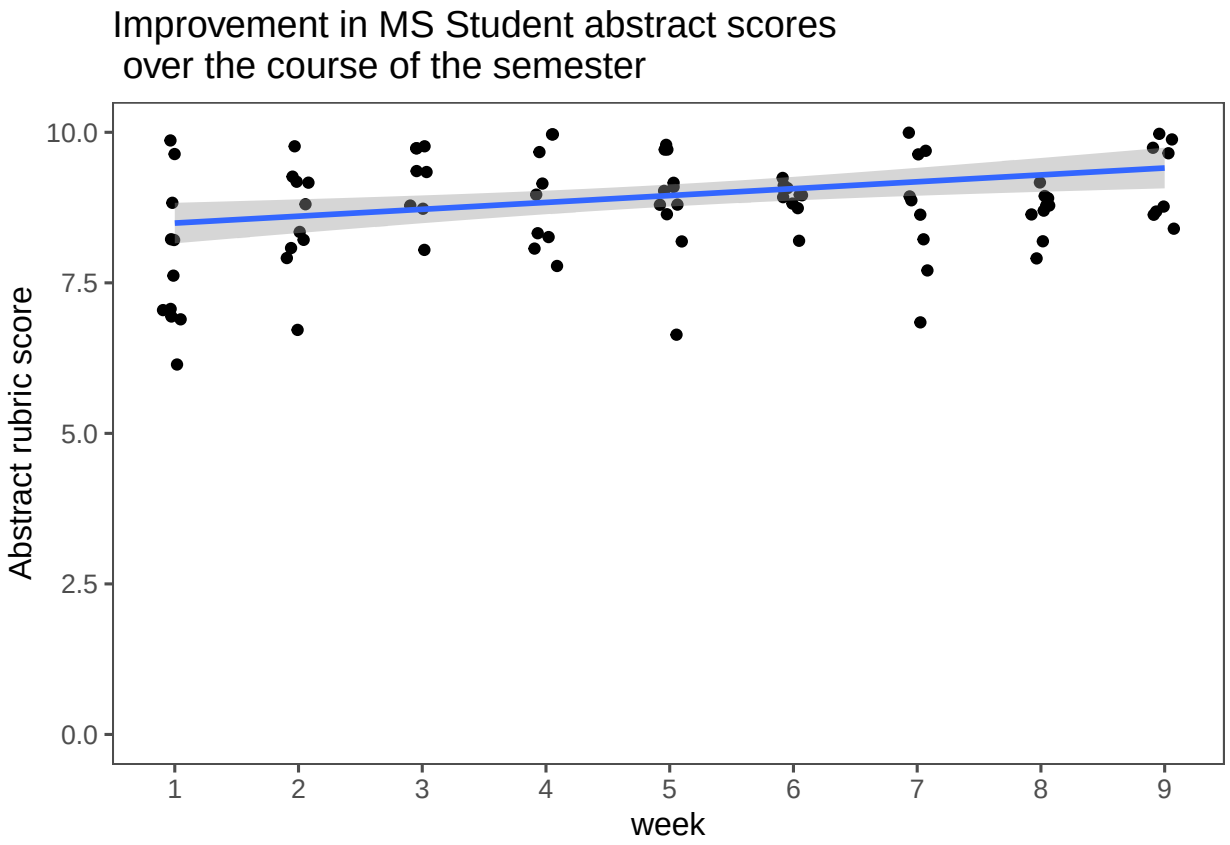

Figure 2: Students showed significant ($p < 0.01$) improvement in abstract scores over the course of a semester in the seminar course.

instructions and exercises to help build their ability to organize complex information in a concise and logical way. This has anecdotally seemed to improve both student ability and student morale, and future assessments will be able to discern whether this change had a significant impact on student skill improvement over the course of a semester.

Significant feedback from your previous year's report

No significant feedback noted.

	0	1	2	3	4	5	Points given:
Content (main questions, approaches, results, implications): 0-5	Abstract is on a different subject entirely, or is for incorrect talk	Abstract is missing more than two major areas of content: background, questions/hypotheses, methods, conclusions, implications	Abstract is missing two major components: background, questions/hypotheses, methods, conclusions, implications	Abstract omits one or more major method or conclusion	Abstract covers most of the content, but is missing mention of some key details	Abstract succintly and logically covers the background/motivation, primary questions, methodological approaches, major findings, and take-home implications of the talk	
Style (logical flow, sentence structure, scientific style): 0-2	Abstract is not well organized or difficult to understand.	Abstract is coherant, but there are several major logical gaps or deficiencies in structure or flow.	Abstract has a clear and logical flow, starting with broader picture, working through primary questions, methodological approaches, conclusions, and finally back to the bigger picture.				
Grammar (logical flow, proper grammar, punctuation, sentence structure, scientific style): 0-1	Many proofreading and/or grammatical errors	No more than 1-2 minor grammatical or proofreading errors, consistent use of scientific writing style and sentence structure					
Proper title and speaker name: 0-1	Speaker name or talk title is missing or incorrect	Speaker name and talk title are present and correct					
Proper length: 0-1	Abstract body text is less than 200 or more than 300 words	Abstract body text is between 200 and 300 words					
						Sum of points (10 possible):	