II-B. SUMMARY OF ASSESSMENT – GRADUATE PROGRAM

A. Program Learning Outcomes (PLO)

Students graduating with a M.S. in Biological Sciences from Cal State East Bay will be able to:

1. *Demonstrate a broad and sophisticated understanding that contributes to biological concepts and principles across all levels of biological organization, from ions to ecosystems (ILO 1,2,6);*
2. *demonstrate expertise in a specific area of biological science (ILO 6);*
3. *independently apply the scientific method to formulate testable biological hypotheses, analyze empirical data, and synthesize the results of the analysis (ILO 1,2,6);*
4. *clearly communicate the design and results of an observational or experimental analysis in a variety of formats, including the graduate thesis, scientific paper, scientific poster, and oral presentation (ILO 1,2,6);*
5. *gather and evaluate primary scientific literature and judge the value of the information presented in relation to particular biological questions (ILO 1,6).*

B. Program Learning Outcome(s) Assessed

Instrument: For the M.S. program we used the "Inquiry and Analysis Rubric" and the "Oral Communication Rubric" to assess the oral defense, a capstone event in partial fulfillment of the Master of Science Degree. A copy of this rubric is included in the Appendix (Fig. A10). Our rubric is based on the VALUE rubrics developed by teams of faculty experts representing colleges and universities across the United States. The Value Rubric Development Project was sponsored by the Association of American Colleges and Universities.

Data Collection: For the M.S. program, all three committee members (including the thesis advisor) are tasked to complete a combined "Inquiry and Analysis" and "Oral Communication" rubric just after the completion of the oral defense by the student. This rubric is accessible as a Google Form and can be reviewed here: (Link: https://docs.google.com/forms/d/e/1FAIpQLScK-3JmxzQKct2i2TLc-zrJoirCol6LoRW19tJjIIv59qLSRg/viewform?usp=sf_link). Then for assessment purposes, the Graduate Coordinator downloads the raw data in excel format.

Sampling Procedure: The combined "Inquiry and Analysis" and "Oral Communication" rubric was applied to all 12 M.S. students that scheduled an oral defense during AY 2024-25. The oral defense is one of the last requirements our M.S. students complete. By the time a student schedules the oral defense, the University Thesis has been written and submitted for initial format review and is nearly ready for final format review. Most students were assessed by three faculty members. Where that failed, at least two faculty members submitted an assessment. Each data point is calculated by averaging the scores given by each individual faculty member on the committee submitting an assessment.

Data Analysis: For the M.S. program, the results are shown as a box plot in C (Summary of Assessment Results). They include all individual data points (filled gray circles). The light blue boxes represent the first and third quartile, the vertical lines represent the minimum and maximum values, and the thicker black horizontal line represents the median. Figures C1

through C3 below include the data for all 12 students evaluated in AY 2024-25.

C. Summary of Assessment Process

Main Findings: For the M.S. program, we aim for all of our students to score a 3 (proficient) or above for all PLOs assessed. By looking at the data for individual students assessed (Figure C3), you can see that on we are mostly meeting our goal. Only two students scored between 2 and 3 (where 2= basic) for a single criteria that assessed PLO2 (*demonstrate expertise in a specific area of biological science*) and PLO3 (*independently apply the scientific method to formulate testable biological hypotheses, analyze empirical data, and synthesize the results of the analysis*). No students scored below 2 for any of the PLOs assessed. Figure C2 displays the scores earned for individual assessment criteria reviewed by our rubric. This data also demonstrates that on average, we are meeting our goal of 3 or above. That said, the average score for **background knowledge** (*Synthesizes relevant information from reliable sources. Answers questions accurately*) was at 3 and continues to be the lowest among all the criteria assessed. Figure C1 displays the data organized by PLO. Our students are scoring above 3 on average for every PLO assessed. Our lowest scores are for PLO2 (demonstrate expertise in a specific area of biological science) which is not surprising given that the lowest scores are given for the question about background knowledge on the rubric. In summary, while we can always make improvements for individual students and individual categories (i.e. background knowledge. See "Next Step(s) for Closing the Loop" we are happy with the results this year.

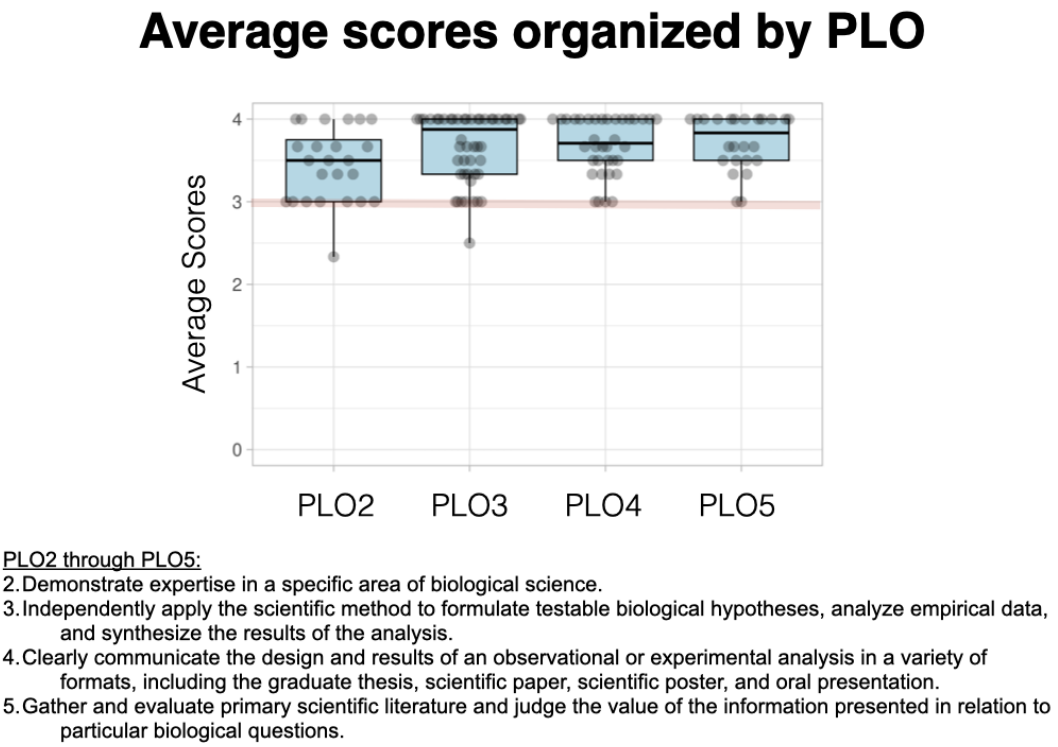

Figure C1. Average student scores organized by each PLO evaluated. Individual PLOs were evaluated by more than one criterion (see rubric in Appendix and the list of individual criteria in Figure C2). The red line marks the position of minimally proficient.

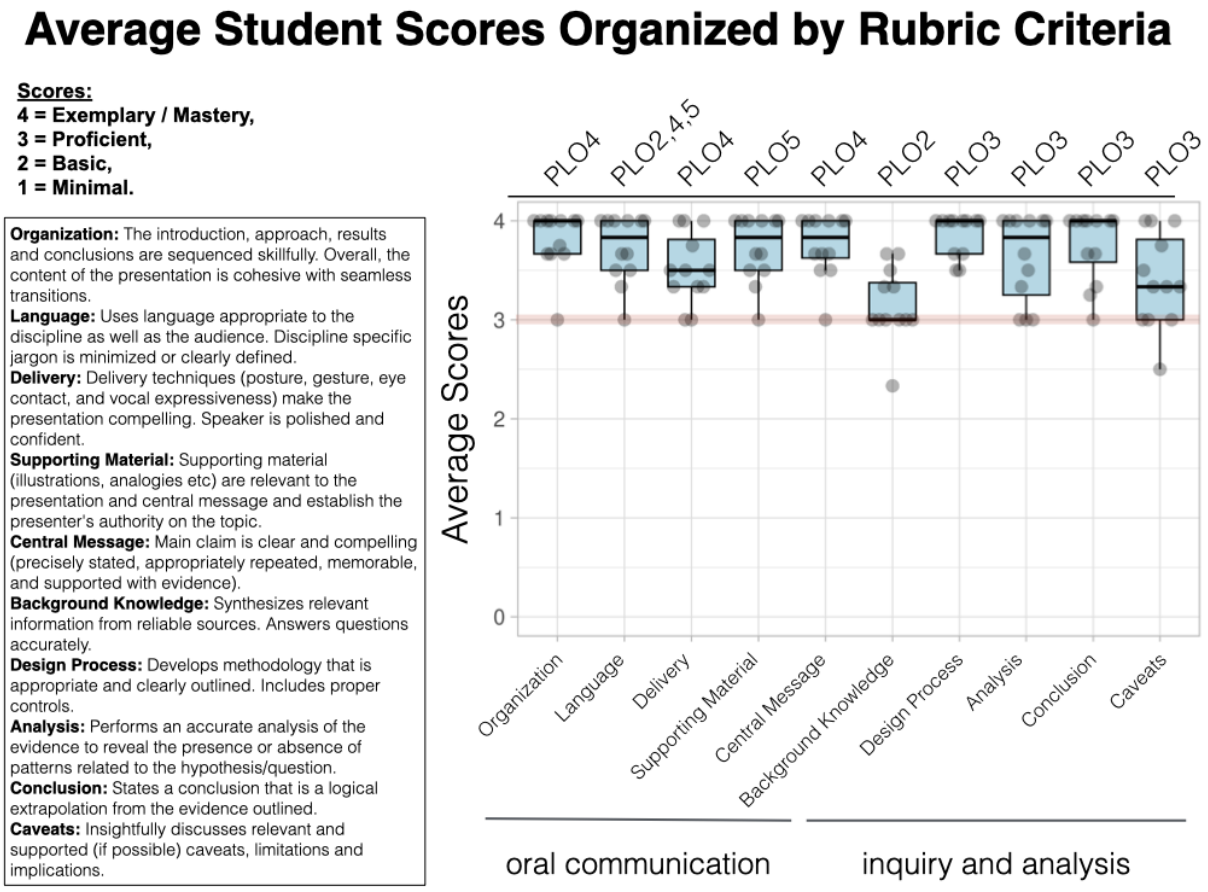

Figure C2. Student scores for each criteria evaluated is shown in the box plot at right. A description of each criterion is listed on the left. The red line marks the position of minimally proficient.

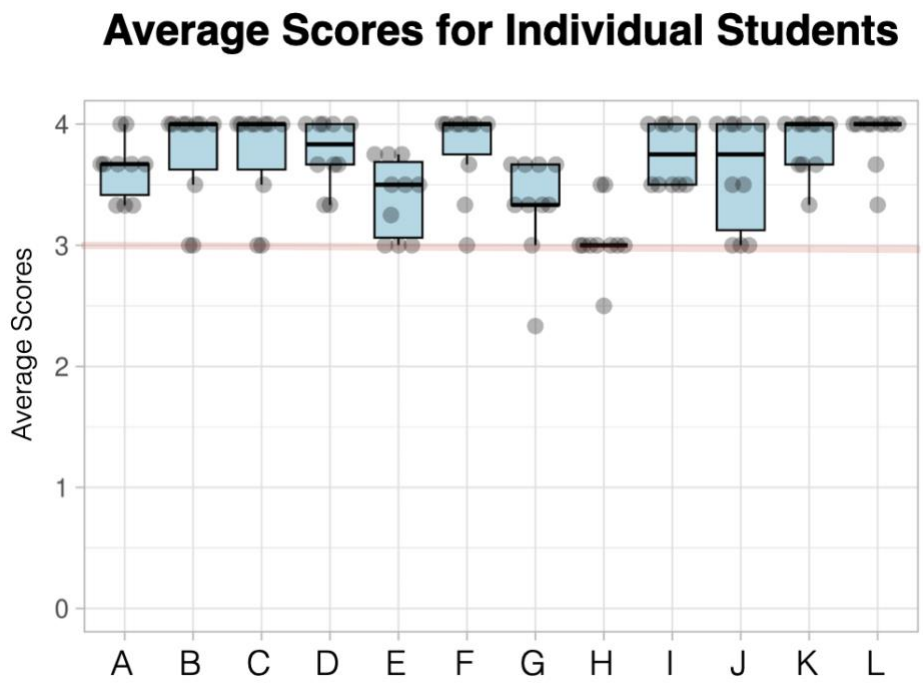

Figure C3. Scores organized by student numbered A-L. The red line marks the position of minimally proficient.

D. Summary of Assessment Results

Recommendations for Program Improvement (Closing the Loop): Our students continue to score the lowest for PLO2 (*Demonstrate expertise in a specific area of biological science)* and they take too long to submit the research proposal and ultimately complete the program. Faculty have discussed the possibility of instituting a departmental requirement that students meet with committee members once a semester to demonstrate a clear understanding of their research and are making progress towards completion of their degree. Unfortunately, we have yet to agree on making this a requirement. Instead, it is remains, "strongly encouraged". Most faculty cite a lack of time. Below we detail steps we plan to take to improve student outcomes in other ways.

Changes to Introductory Curriculum: We continue to adjust BIOL 601A and BIOL 601B, the two one-unit courses that *all* incoming master's student take during their first year. First**, we changed the classification of BIOL 601A and BIOL 601B from a lecture course to an activity.** This allowed us to increase the amount of time we have with the graduate students each week from 50 minutes to 1 hour and 40 minutes without changing the number of units earned. The increase in the amount of time we have with the students has provided more time to discuss important topics including building a digital library, maintain a digital lab notebook, write a proposal, create an oral presentation etc. We now have two years of data to evaluate the effectiveness of this ongoing change. The data looks promising. 11 MS students enrolled in BIOL 601B in the Spring of 2023. At this time the course was only 50 minutes in length. Of these 11

students, 3 (28%) submitted an advisor-approved proposal by the following Fall semester (our goal is 100%). By contrast, 18 MS students enrolled in BIOL 601B since the transition to the longer meeting time. Of the 18, 8 (44%) submitted an advisor-approved proposal the following Fall. We still have room for improvement and will continue to keep track of this data. In addition to increasing the amount of time students spend in the classroom for BIOL 601A and 601B, we are also considering modifying the curriculum to emphasize building a habit of reading and writing to learn and think critically. These modifications may include how to incorporate Artificial Intelligence (AI) to enhance and accelerate the learning process.

Expansion of the MS program: We have successfully launched two new pathways to earn an MS degree in the Department of Biological Sciences: 1) a project-based Masters (non-thesis track) and 2) a blended Master's program for students that do their undergraduate degree at CSUEB. The latter is designed to shorten the time needed to earn an MS degree and is now known as the Falcon Accelerated Success Track Program 4+1 (FAST). Students that choose to pursue the FAST program will take fewer courses overall (since 11 units will count toward the Bachelor of Science *and* the Master of Science degrees). We are in the process of admitting our first cohort of FAST students and we have our first project-based Master's student aiming to complete their degree in Spring 2026.

Students pursuing the project-based Masters are not required to complete a thesis or stand for an oral defense, a dramatic change. Instead of enrolling in five University Thesis units, students enroll in two Capstone Project units, making up for the loss by enrolling in one additional elective. Thus, as a department we need to define what an acceptable project looks like. We need to work out the details related to the Capstone Project approval process. And finally, we need to decide how to assess the students that complete this track. Toward this goal, we are holding monthly graduate committee meetings to work out these and other policy details. Once these details are worked out and approved by the entire department, we will update the CSUEB websites.

Implementation of an End-of-Semester Poster Presentation Event: Our current plan is to have the MS students in the non-thesis track orally present their Capstone Projects in Poster Format. Given that the number of project-based Master's students may start out small, we have decided to host (in collaboration with the College of Science) a poster session at the end of every Fall and Spring semester. This "End-of-Semester" poster presentation will be open to both undergraduate and graduate students enrolled in Special Registration courses in Biology (i.e. Independent Study, Research, Thesis or Capstone Project units). The faculty advisor and committee members of the MS student presenting a Capstone Project will be required to attend for evaluation purposes. It will also be open to both undergraduate and graduate students enrolled in Special Registration courses in Biology (i.e. Independent Study, Research, Thesis or Capstone Project units). Our hope is that this event wil "kill multiple birds with one stone" (so to speak). First, the student presenting a Capstone Project can be part of a bigger event. That student would not only have the opportunity to discuss their project with the faculty in attendance but also with other students from all levels. Second, this event might inspire undergraduates to apply to the MS degree program when they graduate. And finally,

graduate students in the thesis track can get feedback from both faculty and students while their project is ongoing.

Other Reflections: We will continue to monitor the impact that modifications we make to our year-long course (BIOL 601A and BIOL 601B) have on the success of our M.S. students. We also anticipate the policies we enact for the Project-based Masters and FAST program will increase the number of students able to complete the program in a reasonable amount of time. We will continue to keep track of how much time it takes our students to progress through the program.

Assessment Plans for Next Year: In general, the faculty continue to value the rubric as an effective measure for assessing if our students are meeting our program learning outcomes. Thus, we plan to continue to use this same rubric to assess our MS students during the oral defense. By using the same rubric year after year, we will increase our statistical power and be able to evaluate if any of our programmatic changes make a difference in student outcomes.