



Program Assessment Report (PAR)

Biological Sciences (BIO) Masters Degree

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ACADEMIC YEAR COVERED BY THIS REPORT: 2020-2021

I. PROGRAM LEARNING OUTCOMES

Students completing a Master of Science in Biology will be able to Demonstrate how to formulate and critique arguments using accepted scientific theory and data. Apply norms of communication, including speaking and writing that are accepted in the field of biology. Read and synthesize primary literature within the field of biology. Demonstrate the ability to design, carry out, analyze and interpret results from experiments in biology. Demonstrate expertise within a particular field of biology Demonstrate how to identify and pursue a career in biology.

II. PROCEDURES USED FOR ASSESSMENT

A. Direct Assessment

To estimate the extent to which students met each of the six Program Learning Outcomes for the Biological Sciences MS program (Table 1), we utilized student grades from graduate courses from the Biological Sciences Department for which the specific learning outcomes were matched. Student grades were analyzed at the individual level. However, since student identifying information was not available for privacy reasons, this analysis does not account for the fact that students may be enrolled in multiple courses; hence an enrollee in a course matched to a particular learning outcome will be referred to as an “observation” in this report. Table 1. Summary of the six Program Learning Outcomes desired for the Biological Sciences MS, and selected courses aligned to these objectives which were offered in 2019 and 2020. Outcome Statement Courses Representing # Observations

O1 Demonstrate how to formulate and critique arguments using accepted scientific theory and data.

BIO6020,6060,6080,6200,6700,6720,7020,7990,8000 86 O2 Apply norms of communication, including speaking and writing that are accepted in the field of biology. BIO6060,6080,6200,7000,7020,7990,8000 84 O3 Read and synthesize primary literature within the field of biology.

BIO6020,6060,6080,6200,6700,6720,7020,7990,8000 86 O4 Demonstrate the ability to design, carry out, analyze and interpret results from experiments in biology. BIO6200,7020,8000,8990 66 O5 Demonstrate expertise within a particular field of biology BIO6040,6060,6420,6700,6720,6990,7020,7990,8990 53 O6 Demonstrate how to identify and pursue a career in biology. BIO7020,8990 45

B. Scoring of Student Work

The grade distributions in each course section were used to calculate a pass rate defined as the percentage of observations earning grades “A”, “B”, or “P” in each course. An aggregate percent achievement rate for each Program Learning Outcome was then calculated as the percentage of observations from the courses matched to each outcome which met this criterion. The motivation behind this approach was to obtain a measure of the extent to which our majors met the objective which was relatively independent of the nuances of a particular course. The aggregate “Percent Achievement Rate” score for each Program Learning Outcome is reported in Table 2.

C. Indirect Assessment

An exit questionnaire is being developed.

III. ASSESSMENT RESULTS/INFORMATION:

Aggregate percent achievement scores between 94% and 97% were reached for all of the Program Learning Outcomes (Table 2). Demonstration of expertise within a particular field of biology had the lowest percent achievement, at 94.3%. Demonstrating the ability to design, carry out, analyze, and interpret results from experiments in biology had the highest achievement rate, at 97%. It is promising that 95-96% of the students were able to demonstrate key practices in biology research including argumentation, communication, and synthesis of literature (Outcomes 1-3). Our data show that 95.6% of the students succeeded in coursework requiring them to demonstrate how to identify and pursue a career in biology.

Table 2. Summary of the six Program Learning Outcomes desired for Biological Sciences MS majors, and graduate level courses aligned to these objectives which were offered in 2019-2020. Outcome Statement % Achievement O1 Demonstrate how to formulate and critique arguments using accepted scientific theory and data. 95.3 O2 Apply norms of communication, including speaking and writing that are accepted in the field of biology. 96.4 O3 Read and synthesize primary literature within the field of biology. 95.3 O4 Demonstrate the ability to design, carry

out, analyze and interpret results from experiments in biology. 97.0 O5
Demonstrate expertise within a particular field of biology 94.3 O6 Demonstrate
how to identify and pursue a career in biology. 95.6

[Analysis]

IV. ACTIONS TO IMPROVE STUDENT LEARNING

Program learning outcome data will be shared with program faculty and staff at the department meetings. It will be shared with other stakeholders including faculty and staff in other departments and department sponsors upon request by these parties. Although the aggregate achievement measures are well over 90% for all learning outcomes, the data show that courses getting at specific disciplinary content have slightly lower achievement rates. At face value, aggregate achievement exceeding 94% may seem adequate. However, we would like for these values to approach 100% given that these are pragmatic for scientific practice. In particular, although some variation in communication and argumentation ability may be expected, we would like for all students to come out of our program understanding how to take the next step in pursuing a career in biology. We are aware of the limitations of using course grades as a proxy for the extent to which the students in our program meet its learning outcomes. Another option we are considering is conducting an indirect assessment of our graduates using an exit survey which asks the extent to which they feel an outcome has been met and/or relative comfort pursuing work after graduation that aligns with a specific outcome. We acknowledge that reported achievement does not necessarily align with actual achievement. However, this approach could be more useful from a marketing perspective since responses would align better with how graduates are likely to communicate with others about the quality of the Biological Sciences program and their satisfaction with the program.

V. SUPPORTING DOCUMENTS

Additional documentation, when provided, is stored in the internal Academic Program Assessment of Student Learning SharePoint site.