

Biology Major and Minor

ASSESSMENT REPORT ACADEMIC YEAR 2017 – 2018

I. LOGISTICS & PROGRAM LEARNING OUTCOMES

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).

Biology Assessment Coordinator

Scott Nunes (nunes@usfca.edu)

Biology Assessment Committee

Leslie Bach (lbach@usfca.edu)

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2. Were any changes made to the program mission statement since the last assessment cycle in October 2017? Kindly state “Yes” or “No.” 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.

The mission statement is the same for both the Biology major and minor, and was last reviewed and revised in spring 2017.

Mission Statement: The core mission of the University of San Francisco is to educate students in the knowledge and skills required to succeed as professionals and as persons, while also teaching the sensitivity and values necessary to participate in a world shared by all people. The Department of Biology particularly emphasizes the core Jesuit value of advancing the freedom and responsibility to pursue truth and to follow evidence to its conclusion. In pursuit of these values, the faculty of the Department of Biology educates undergraduate students in current biological concepts, methodologies, and ethical practices in the laboratory and the natural environment to prepare them to succeed personally and professionally with the potential for advanced training in the sciences.

3. Were any changes made to the program learning outcomes (PLOs) since the last assessment cycle in October 2017? Kindly state “Yes” or “No.” 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.

The program learning outcomes are the same for the Biology major and minor, and were last reviewed and revised in spring 2017.

Program Learning Outcomes: Upon graduation, students who complete the Biology major or minor requirements should be able to meet the following program learning outcomes:

- 1) Demonstrate both in-depth and broad knowledge of the concepts that comprise the biological sciences.
- 2) Apply the scientific process, including designing and conducting experiments and testing hypotheses.
- 3) Perform laboratory, field, and analytical techniques.
- 4) Discuss and critically review scientific papers and prepare oral and written reports in a standard scientific format.
- 5) Demonstrate an awareness of the significance ethics plays in the biological sciences.

4. Which particular Program Learning Outcome(s) did you assess for the academic year 2017-2018?

For the 2017-2018 academic year the Biology Department assessed program learning outcome #1: Demonstrate both in-depth and broad knowledge of the concepts that comprise the biological sciences.

II. METHODOLOGY

5. 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.*

1. Final exams were collected from the following foundation courses, which are taken by all students in the Biology major and Biology minor:

BIOL 105-General Biology I (20 exams)

BIOL 106-General Biology II (20 exams)

BIOL 212-Cell Physiology (10 exams)

BIOL 310-Genetics (10 exams)

2. For each course, a panel of two people was formed to evaluate the final exams. Panels consisted of full-time faculty members who had taught the course within the past two years and therefore had the knowledge to evaluate the exams.

3. Exams were rated on two measures: a) students' ability to explain scientific concepts, and b) students' demonstration of knowledge in a broad range of biological topics. Faculty members rated each measure for each exam on a scale of 1-4, with numerical ratings indicating the following performance standards: 4—exceeds expectations, 3—meets expectations, 2—needs improvement, 1—below expectations. A rubric summarizing the criteria for determining performance standards is included at the end of this report under "Additional Materials."

III. RESULTS & MAJOR FINDINGS

6. What are the major takeaways from your assessment exercise?

A. Consistency among Raters

Faculty members rating student work did not meet to discuss and calibrate their rating standards before rating exams. However, there was a fair amount of consistency among pairs of faculty members rating the same set of exams. Faculty members gave the same rating for approximately half of the exams, and ratings differed between faculty members by more than one level for only a small percentage of exams (Table 1). A better approach in the future might be for raters to meet and discuss how to apply rating criteria before rating student work. We note that for 2017-2018, by the time all student work had been collected, panels assembled, and rubrics developed, summer break was underway, and it was not feasible for panels to meet to discuss rating calibrations.

Table 1. Consistency between pairs of raters evaluating exams for a foundation course.

| | Raters gave same score (% of cases) | Rater scores differed by 1 (% of cases) | Rater scores differed by 2 (% of cases) |
|---------------------------|-------------------------------------|-----------------------------------------|-----------------------------------------|
| Explain concepts | 53.3 | 43.3 | 3.3 |
| Expresses broad knowledge | 48.3 | 46.7 | 5.0 |

B. Ability of Students to Explain Concepts and Principles

At least half of students were able to explain concepts and principles at the expected level in foundation courses (Table 2). This was true for courses typically taken during students' first year (General Biology I, General Biology II) and those taken during the second year (Cell Physiology, Genetics). Most of the students who did not meet expectations were rated as needing improvement rather than below expectations (Table 2).

Table 2. Ratings of students' ability to explain biological concepts and principles.

| | BIOL 105- General Biology I (% of students) | BIOL 106- General Biology II (% of students) | BIOL 212-Cell Physiology (% of students) | BIOL 310- Genetics (% of students) |
|-------------------------------|---------------------------------------------------|----------------------------------------------------|------------------------------------------------|------------------------------------------|
| Meets or exceeds expectations | 65 | 50 | 60 | 80 |
| Needs improvement | 30 | 40 | 40 | 10 |
| Below expectations | 5 | 10 | 0 | 10 |

3. Breadth of Knowledge Expressed by Students

As above, students were somewhat split between meeting expectations and needing improvement with the regard to the breadth of knowledge they were able to express. Ideally a larger proportion of students should meet expectations. However, we note that we assessed foundation courses in which students are introduced to a large amount of material across a broad range of topics. Assimilating this abundance of material can be a challenge to students. After completing the foundation courses in Biology, not all students have attained mastery of knowledge in biological topics, but results of our assessment suggest that they are on a trajectory to become competent in their knowledge of biology. After completing the foundation courses, Biology majors take at least six upper division Biology courses, and Biology minors complete at least one upper division course. In upper division courses, students have the opportunity to build on their existing knowledge and apply what they have learned to exploring new topics in greater depth and breadth. A more comprehensive evaluation of students' knowledge in biology might involve assessment of their work in upper division courses, which will be a part of the assessment plan for the Biology major and minor in the 2018-2019 academic year. We note that students in the Biology major and minor must earn a minimum grade of C in the foundations courses that were assessed here. We did not look at grades in this assessment, but is likely that some students who did not meet expectations in the criteria we evaluated did not earn a minimum grade of C in the specific course being evaluated, and would have the opportunity to gain competence when repeating the course.

Table 3. Ratings of students' breadth of knowledge of biological topics.

| | BIOL 105- General Biology I (% of students) | BIOL 106- General Biology II (% of students) | BIOL 212- Cell Physiology (% of students) | BIOL 310- Genetics (% of students) |
|-------------------------------------|---------------------------------------------------|----------------------------------------------------|-------------------------------------------------|------------------------------------------|
| Meets or exceeds expectations | 65 | 50 | 50 | 40 |
| Needs improvement | 35 | 50 | 40 | 60 |
| Below expectations | 0 | 0 | 10 | 0 |

IV. CLOSING THE LOOP

7. **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.**

A. There was a fair amount of consistency between faculty members in rating student work. However, to improve consistency in future evaluation of student work, faculty members might want to meet to discuss and calibrate criteria for rating the work prior to evaluating the work.

B. A committee of Biology faculty members has been formed to discuss the content of General Biology I and II and Cell Physiology. Part of the discussion will involve whether changing the amount of detail with which topics are covered in these courses might improve students' understanding and retention of material.

C. Results of our assessment suggest that a fair proportion of students do not meet expectations in the breadth and depth of their knowledge of Biology after completing the foundation courses in the Biology major and minor, but may be on a trajectory to gaining competence in their knowledge of biological topics. We will plan a follow-up assessment for 2018-2019 to determine whether upper division Biology courses allow students to broaden the scope and increase the detail of their knowledge of biology.

8. **What were the most important suggestions/feedback from the FDCD on your last assessment report (for academic year 2016-2017, submitted in October 2017)? How did you incorporate or address the suggestion(s) in this report?**

The primary suggestion in the feedback from the 2016-2017 assessment report for Biology was to update the curriculum map, especially with regard to mapping course learning outcomes onto program learning outcomes. We have updated the curriculum map. Courses that have been added to the Biology curriculum over the past few years have been added to the curriculum map. Course learning outcomes were added for courses that did not have any listed. The scale indicating coverage of program learning outcomes within courses was changed from having two levels (Introductory, Advanced) to having three levels (Introductory, Intermediate, Advanced)

ADDITIONAL MATERIALS

(Any rubrics used for assessment, relevant tables, charts and figures should be included here)

The following rubric was used to evaluate the final exams collected in each of the foundations courses included in the assessment.

| RUBRIC CRITERIA | PERFORMANCE STANDARDS | | | |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| | <i>Exceeds Expectations (4)</i> | <i>Meets Expectations (3)</i> | <i>Needs Improvement (2)</i> | <i>Below Expectations (1)</i> |
| Explains scientific concepts and principles. | Accurately explains scientific concepts while demonstrating understanding and insight (e.g., depth of analysis, cleverness, originality, thoroughness) | Accurately explains scientific concepts. | Explains scientific concepts with limited accuracy. | Does not explain scientific concepts, or makes excessive errors. |
| Expresses knowledge in a broad range of biological topics. | Expresses comprehensive knowledge within a wide variety of areas in biology. | Expresses competent knowledge within a wide variety of topics, with comprehensive knowledge of some topics. | Expresses competent knowledge within a range of biological topics, with limited knowledge of some topics. | Expresses knowledge within a limited range of topics. |