

UNIVERSITY OF SAN FRANCISCO
College of Arts and Sciences

Undergraduate Biology—Program Assessment Plan

Program Goals

At the completion of the Bachelor of Science degree in the Department of Biology, it is the intention that a graduate will have a strong foundation for lifelong learning and career development by having acquired:

¹ an understanding of major biological concepts and an awareness of how these concepts are connected within various areas of the biological and physical sciences; and ² problem-solving, analytical, and communication skills that provide the basis for a career in the biological sciences.

In addition, it is intended that USF Biology graduates will have a strong appreciation of science as an integral part of society and everyday life, particularly so that they can develop an informed scholarly personal position on contemporary social and ethical issues (e.g., environment and medicine).

Learning Outcomes and Assessment

Biology majors will learn specific skills and knowledge that will enable them to:

| Learning Outcomes | Assessment |
|--|---|
| Recognize the relationship between structure and function at all levels: molecular, cellular, and organismal. | Students participate in class discussions, complete assigned projects, take quizzes and examinations, maintain journals, take lab practicals, prepare research papers or give oral presentations. |
| Describe the flow of genetic information, the chromosome theory of heredity and the relationship between genetics and evolutionary theory. | Students participate in class discussions, complete assigned projects, take quizzes and examinations, maintain journals, take lab practicals, prepare research papers or give oral presentations. |
| Recognize the ecological relationships between organisms and their environment. | Students participate in class discussions, complete assigned projects, take quizzes and examinations, maintain journals, take lab practicals, prepare research papers or give oral presentations. |
| Evaluate the principles of evolutionary biology. | Students participate in class discussions, complete assigned projects, take quizzes and examinations, maintain journals, take lab practicals, prepare research papers or give oral presentations. |
| Demonstrate the ability to understand and critically review scientific papers. | Students present a critical analysis of the primary literature in oral or written format. |
| Develop an awareness of careers and professions available in the biological sciences. | Tracking the career paths of alumni. |

Program Matrix: Required Coursework in Biology

| Learning Outcomes | BIOL105 General Biology I | BIOL106 General Biology II | BIOL212 Cell Physiol. | BIOL310 Genetics | Upper Division Courses | BIOL414 Evolution |
|--|--|---|--------------------------------------|-----------------------------|---------------------------------------|------------------------------|
| Recognize the relationship between structure and function at all levels: molecular, cellular, and organismal. | I | I | I | I | R, EC | R |
| Describe the flow of genetic information, the chromosome theory of heredity and the relationship between genetics and evolutionary theory. | I | I | I | EC | R, EC | R |
| Recognize the ecological relationships between organisms and their environment. | I | I | I | R | R, EC | EC |
| Evaluate the principles of evolutionary biology. | I | I | R | R | R, EC | EC |
| Use current research techniques to apply the scientific process by testing hypotheses through experimentation. | I | I | | | R, EC | |
| Demonstrate the ability to understand and critically review scientific papers. | I | I | R | R | R, EC | EC |
| Develop an awareness of careers and professions available in the biological sciences.* | I | I | I | I | R | |

I = Introduced, R = Reinforced, EC = Extended Coverage

*Other resources available to students include academic advisors, course professors, the USF Career Center, and special-interest clubs

Assessment Plan

Program Goal 1: Upon graduation, a student will have acquired an understanding of major biological concepts and awareness of how these concepts are connected within various areas of the biological and physical sciences.

Learning Outcomes Associated with Program Goal 1

- Recognize the relationship between structure and function at all levels: molecular, cellular, and organismal.
- Describe the flow of genetic information, the chromosome theory of heredity and the relationship between genetics and evolutionary theory.
- Recognize the ecological relationships between organisms and their environment.
- Evaluate the principles of evolutionary biology.

Assessment Methods for Program Goal 1

Assessment of the achievement of Program Goal 1 will be initially based on grades in coursework as indicated in the Program Matrix (page 2) since grades in the designated courses are directly related to student learning.

1. One metric for indicating that the Biology curriculum is successfully promoting student learning is if at least 50% of students complete their Biology courses with a GPA of 2.5 or higher.
2. The first four Biology courses in the curriculum are sequential and require specific grade prerequisites to progress from one to the next: General Biology I (BIOL105, minimum grade C-), General Biology II (BIOL106, C-), Cell Physiology (BIOL212, C) and Genetics (BIOL310). A minimum grade of C is required in Genetics to proceed into the third year of the Biology program. Since grades in these courses are associated with all of the learning outcomes outlined in the Program Matrix above, an analysis of students earning the minimum and higher grades in these four initial successive courses will be used to assess success in student learning and progression towards completing the Biology Program.
3. The percentage of students earning a C or higher in the capstone Evolution course will be monitored to evaluate the achievement of learning outcomes. Target values for curriculum improvement will be determined based on review of archival data.
4. In addition to course grades, student learning and achievement of Program Goal 1 will be evaluated with standardized testing. In the semester prior to graduation, students will take the Major Field Test in Biology administered by the Educational Testing Service (ETS) (<http://www.ets.org>). This exam will provide feedback on student learning of biological facts and concepts, as well as testing for analytical skills. Results from the ETS exam will allow for evaluation of the various component areas covered by the exam (e.g., cell biology, organismal biology, population biology, analytical skills), as well as provide the ability to compare results for USF students to Biology majors across the country.

Time Frame

- Biology GPAs for graduating students will be reviewed each spring semester.
- Percent of students progressing through the required introductory courses will be determined each academic year.
- Percent of students earning a C or higher in Evolution will be recorded each semester.
- Graduating students will take the EST Major Field Test in Biology during their final semester at USF.

Who Will Do the Assessment

Department Chair and appointed committee.

How Will Data be Used to Improve Program or Revise the Curriculum?

On an annual basis, the Biology Department Faculty will review and discuss the data collected from the above assessment findings to devise and implement appropriate changes to the curriculum.

Program Goal 2: Upon graduation, a student will have acquired the necessary problem solving, analytical, and communication skills that provide the basis for a career in the biological sciences.

Learning Outcomes Associated with Program Goal 2

- Use current research techniques to apply the scientific process by testing hypotheses through experimentation.
- Demonstrate the ability to understand and critically review scientific papers.
- Develop an awareness of careers and professions available in the biological sciences.

Assessment Methods for Program Goal 2

1. Representative lab reports, field notebooks and journals will be collected and reviewed by faculty using an appropriate rubric. The rubric will be developed to evaluate common components across assignments required in Biology courses.
2. Data will be collected on the career paths of alumni in order to determine what percentage of graduates
 - Acquire jobs in industry (e.g., biotechnology, consulting).
 - Complete teaching credentials and/or enter teaching positions.
 - Continue on to graduate programs in biological sciences.
 - Pursue advanced degrees in health professions (e.g., medical, dental, pharmacy, veterinary).
 - An exit survey will be conducted for graduating seniors to document their immediate plans after graduation.
 - An alumni survey will be conducted to learn what the longer-term achievements are for USF Biology graduates.

We anticipate that accomplishing this portion of the assessment plan will be challenging as it has traditionally been difficult to collect data on alumni. (Future assessment plans could include a follow-up employer survey to evaluate student competencies.)

Time Frame

- Evaluation of student assignments will be completed every two years.
- An exit survey will be conducted annually for graduating students.
- An alumni survey will be conducted every 3-5 years.

Who Will Do the Assessment

Department Chair and appointed committee.

How Will Data be Used to Improve Program or Revise the Curriculum?

On an annual basis, the Biology Department Faculty will review and discuss the data collected from the above assessment findings to devise and implement appropriate changes to the curriculum.