

**Biology Department Student Learning Assessment Plan
UPRM
2024- 2030**

**Prepared by Biology Department
Assessment Committee (CADbio)
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Biology Department

The goal of the Assessment Committee within the Department of Biology (at UPRM) is to foster a diverse and inclusive environment where continuous program assessment is inherent to our pedagogical culture. As a group we intend to challenge ourselves and our colleagues to support, collaborate, and actively participate in our efforts to design and collect data to appropriately develop the highest standards in higher education. We intend to identify successful new emergent education methodologies that will be inclusive, and geared towards equity, diversity and excellence to address public and private sector societal needs. For this, we will assess the biology curriculum with its strengths and weaknesses on a yearly basis. The methods to be used will include knowledge- based surveys, focus groups interventions, student exit interviews, and a progressive multi-year curriculum mapping among other individual efforts designed and implemented by the faculty at large.

The Biology Department Vision

The Biology Department of the University of Puerto Rico at Mayagüez strives to become a national and international leader in higher education with emphasis on three major areas: expanding its academic programs, updating the current usage of technology, and serve the Caribbean community by sharing new scientific knowledge through various publication venues and outreach activities. We believe that our vision can also be accomplished by being leaders in documenting, collecting and archiving biological observations, and by applying our knowledge about life in the Caribbean, e.g., through molecular, physiological, organismal, ecological and evolutionary approaches.

The Biology Department Mission

The Biology Department, with the help and support of our faculty and administrative personnel, will promote, foster, and develop in students the ability to think critically. Through inquiry- and service- based, we will promote enthusiasm, initiative and the skills necessary to create a student population of life-long Biology learners. Emphasis will be placed on core concepts and research in an environment that promotes not only discipline-specific knowledge but also develops professionals with social, cultural and humanistic sensitivity, and with deep ethical values. In this way, it will contribute to the enrichment of science and society through the creation and dissemination of new knowledge through scientific research in the Caribbean.

The department aims at generating in students love for inquiry, discovery and knowledge about biodiversity and about how life evolves in our landscapes. To accomplish this our Assessment Committee will evaluate and promote excellence in teaching and research by reviewing and creating new learning opportunities and collaborations- addressing, across the curricula, opportunities to understand current environmental, social and health challenges. Student Learning Outcomes (SLO) will be organized and mapped across the courses using mechanisms such as course redesign by highlighting critical thinking, analytical tools, strong laboratory and field experiences, and scientific communication.

Additional activities that support our mission: enhance, promote, and stimulate participation in our undergraduate research symposium, COOP programs, support and promote local and external undergraduate summer research experiences. Students will be geared to practice “hard” skills such as: database creation, statistical analysis, innovation in the creation of field and sampling techniques, and build up capacities in species identifications.

To reach a next level in research we aim to: a) facilitate cluster faculty recruitment within affinity working groups to strengthen the disciplines through collaborations, b) support funding seeking by the creation of an administrative position, a liaison between our faculty and the R&D, and c) to develop potential partnerships with industrial partners.

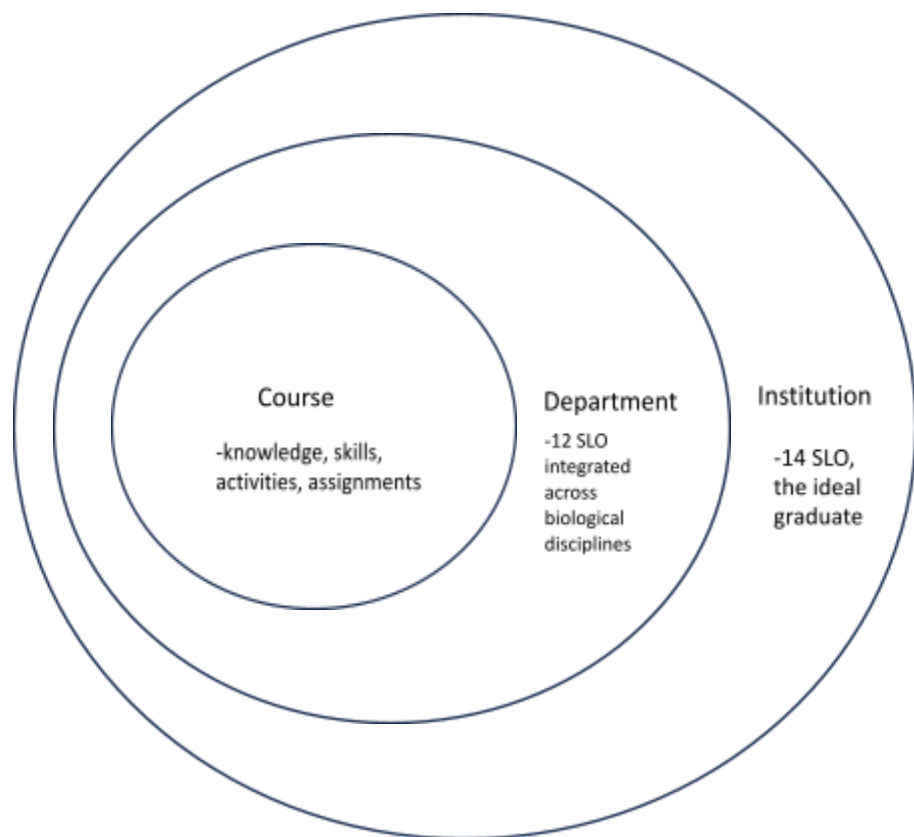


Fig 1. Alignment of the Biology Student Learning Outcomes across three embedded scales: course, departmental and institutional.

Biology Student Learning Outcomes (Alumni Biology Student Profile)

(Approved by the faculty on 02/06/2025)

The Biology Department agreed to support SLO's through dynamic updated methodologies and activities to foster, across the curricula, the following skills, values and proficiencies:

Skills and Values

Students in biology should be able to:

1. Identify knowledge gaps in their discipline, synthesize evidence from the biological literature (including data figures and tables), and critically evaluate ideas through transdisciplinary strategies.

2. Apply research methods and concepts from chemistry, mathematics, social sciences, physics, and statistics to solve biological challenges. In both during individual reasoning and specially during collaborative team efforts.
3. Develop ethical considerations that will be applied during decision-making to tackle biological and environmental challenges.
4. Possess self confidence and independence of thought, through inquiry, and evidence- based analysis.
5. Become a life-long learner and cultivate the passion for inquiry, discovery and the uncertainty of life processes.
6. Appreciate and understand the diverse forms of life across ecosystem scales in the Caribbean.
7. Effectively communicate scientific concepts and ideas in both Spanish and English.

Scientific concepts

8. Identify, compare, and contrast major taxonomic groups using morphology, anatomy, and molecular tools among others.
9. Appreciate the aesthetic, ethical and utilitarian aspects regarding the conservation of the diversity of life.
10. Become comfortable with experimental design, data collection, quantification of biological data to answer relevant research questions and communicate new knowledge.
11. Posses a critical perspective regarding the topology of the tree of life by understanding its phylogeny.
12. Have general knowledge of biological organisms and processes. Compare and contrast major morphological characteristics of living organisms through the usage of different microscopic instruments and techniques.
13. Have a basic proficiency in current tools (microscopical, molecular, analytical, sampling methods, and the application of the -omics analysis) needed to evaluate biological problems from a single cell to an ecosystem.

Biology Department Assessment Plan

Undergraduate Program:

- 1) Evaluate the level of competency among students enrolled in the first core course Biol 3061 and Biol 3062 (two semester course) regarding baseline knowledge that must be acquired to successfully transition into the subsequent specialized core courses (Botany, Ecology, Genetics, Human physiology, Microbiology, and Zoology) within our three Biology programs.
- 2) Evaluate student competency enrolled in Biol 4925 to assess the comprehensive knowledge acquired across the curricula in our department. Since this course represents the knowledge standard in Biology, scheduled to be registered during the junior and senior year in all 3 programs, we will use this data to calibrate the efficiency of our pedagogical approach.
- 3) Evaluate the acquisition of specific competencies among students enrolled in the core courses (Botany, Ecology, Genetics, Human physiology, Microbiology, and Zoology). Each course will be assessed in a progressive multi-year approach to create a curriculum map. This will be paralleled with yearly assessments of the student body enrolled in Biol 3061-62 and Biol 4925. This three tier approach will allow us to test the progression of knowledge-based competencies instead of individual single snapshots (i.e., concomitant evaluations will include the freshman in Biol3061-62, sophomores in specific core courses and the exit senior/junior evaluation in Biol 4925).
- 4) In order to keep assessing the student cohorts, we will close the loop each semester after evaluating the pre and post tests. Once we evaluate the results, we will design interventions if needed, and implement them the following semester the courses are offered followed by the pre and post tests to evaluate the efficacy of the intervention.

Pending and upon the faculty commitment to collaborate directly with the Assessment Committee of the department we could:

- 5) Create an exit questionnaire to assess the satisfaction of the graduating seniors on their experiences in our teaching laboratories, research opportunities within our department and overall administrative support during their years as Biology students.
- 6) Retrospective analysis of student participation in our annual **DEPARTMENT Research Symposium** to:
 - a. identify lifelong learners (students that participate more than one consecutive year)
 - b. determine its effectiveness in developing research and communication skills
 - c. assess the quality of the research experiences available to our undergraduates.
 - d. determine the number of participants that present results of research performed in our department versus that performed outside of our department.
- 7) Retrospective analysis of the number of sections of Biol 4901, 4902, Bota 4995, 4996 available for students each semester in our department for the last 5, 10, 15 years.

Graduate Program:

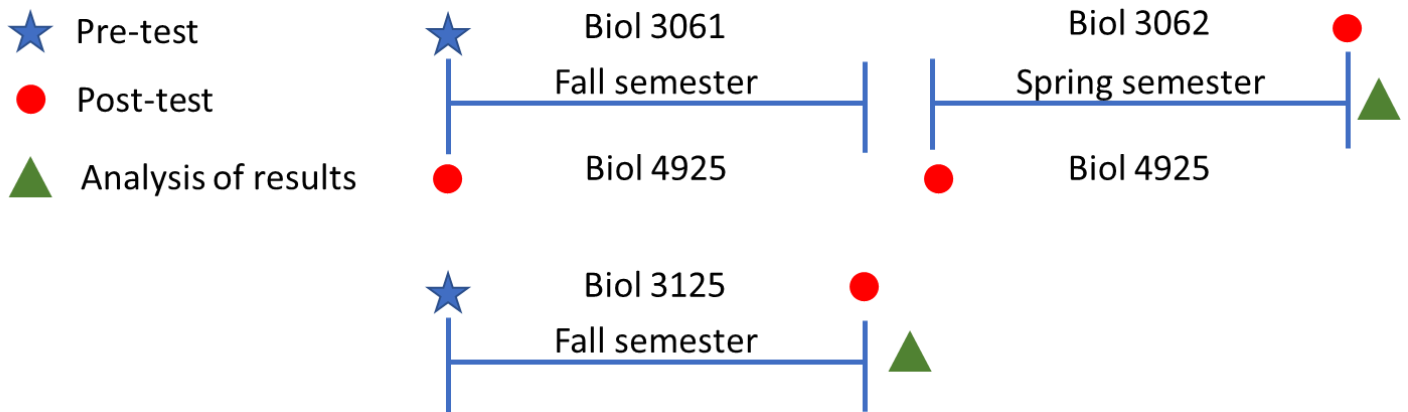
- 1) Create an exit questionnaire to assess the satisfaction of the graduating Masters students regarding their experiences as: teaching assistants for our laboratories, research assistants and overall administrative support during their years as graduate students.

Biology Department Assessment Timeline (2024-2030)

The Biology Department Assessment Committee (CADbio), with the assistance of the Biology faculty and laboratory technicians, will design and conduct the assessment surveys included in this plan. We will focus our efforts in developing six knowledge-based surveys to assess the proficiency in basic biological knowledge and concepts in the following areas: botany, ecology, genetics, human physiology, microbiology, and zoology. These surveys will be administered to the freshman population at the beginning of every year to the student body enrolled in Biol 3061 (every Fall, pre-test) and Biol 3062 (every spring at the end, post-test). Similarly, the same surveys will be administered simultaneously to the junior/senior student population enrolled in Biol 4925 (core course for our 3 programs) and the population of students enrolled in the actual core course during the same semester and academic year. For example: if we were administering the assessment instrument for botany, we would test the freshman population enrolled in Biol 3061, the sophomore population enrolled in Biol 3417, and the senior/junior population enrolled in Biol4925 which is our “end point” course simultaneously. We selected this course as our “end point” because it is typically scheduled for the senior year. In theory, if the students follow their curriculum they should have taken: eight biology courses (which include Botany, Ecology, Genetics, Human physiology, Microbiology, and Zoology) with their respective laboratories by the time of our assessment. This approach is a three tier knowledge- based study focused on the student body population instead of on the individual student. This approach will allow us to have 3 different populations with 3 different experience levels assessed at the same time.

Proposed administration of surveys in year 1: 2024-25

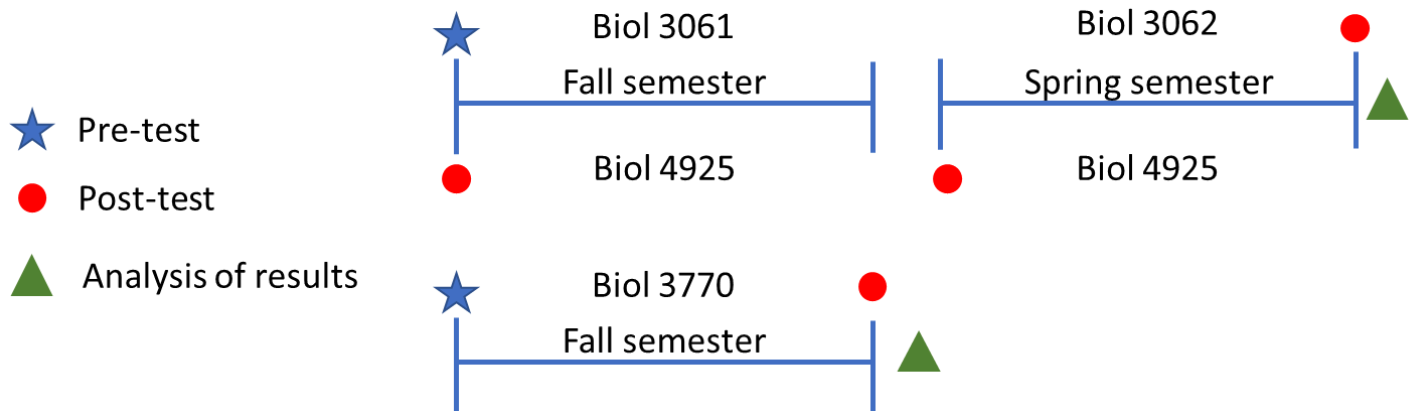
Assessment tools: Ecology survey



The proposed schedule is presented in the following figure. After the analysis, we will present the results to the faculty and will determine the need for an intervention. If necessary we will design the intervention to be incorporated in the courses Biol 3061-62 and Biol 3125 the following year. That year, prior to the incorporation of the intervention material/exercise into the course we will do a pre-test and a post-test at the end of the semester to assess the efficacy of the intervention material/exercise. This approach will be reproduced for every assessment tool and their corresponding courses every year.

Proposed administration of surveys in year 2: 2025-26

Assessment tools: Microbiology survey



Repeat the assessment before and after the intervention for the assessment of the previous year. See previous year diagram.

From the 3rd year to the 6th, we will administer the assessment tool for Genetics, Human physiology, Botany and Zoology, respectively. All interventions (if needed) will be incorporated and assessed the following year as demonstrated in year two diagram. At the end of each cycle, we will inform by presenting our findings to the faculty in our faculty meetings as well as to write a formal assessment report. It is our intention to assess the performance of our students in the core courses from the first year to their last, in order to strengthen the basic knowledge and the comprehension of the conceptual basic biology to construct a strong footing that will help our student body grow and be successful in their future careers.

**Correlation of 2025 Biology Program Outcomes with
Arts and Sciences Student Learning Outcomes**

Faculty Arts and Sciences Learning Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	13
Oral and written effective Communication.	X						X			X			
Think critically	X			X						X	X	X	
Develop knowledge and skills related to their field of study and apply them to the identification and solution of problems.	X	X		X	X			X		X		X	X
Apply mathematical reasoning.		X						X		X			
Apply scientific research methods.	X	X						X		X	X	X	X
Apply information technologies.		X						X		X	X		X
Recognize the ethical implications of different actions and integrate ethical codes in decision-making.			X		X				X				
Demonstrate respect for nature and the environment in Puerto Rico .			X			X			X		X		
Be knowledgeable about Puerto Rican heritage and culture.						X			X				
Appreciate the values of a democratic society and the role of the individual in such a society.					X								
Understand contemporary social, political, economic and environmental issues in a local and global context.		X	X	X	X								
Demonstrate respect for human diversity in all its dimensions.				X	X				X				
Develop an appreciation for the humanities, the arts, and the sciences.		X				X		X	X				
Be committed to improve the quality of life at the personal and the community level.			X	X	X					X			X